



# KENNEBUNK: CLIMATE ACTION PLAN - May 2024

Includes Progress Updates (end of document)



# TABLE OF CONTENTS

## 04 Preface

---

- 05 *Acknowledgements*
- 07 *Letters from the Town Manager & Select Board*
- 09 *Executive Summary*

## 16 Introduction and Background

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- 17 *What is a Climate Action Plan?*
- 18 *Our Climate Action Planning Timeline*
- 20 *Kennebunk's Purpose & Goals*
- 21 *Community Engagement*
- 22 *What We Heard*
- 23 *Planning for Equitable Climate Action*

## 24 Climate Change in Kennebunk

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- 25 *How Climate Change is Affecting Kennebunk*
- 33 *Kennebunk's Greenhouse Gas Emissions*
- 34 *Greenhouse Gas (GHG) Inventory Key Takeaways*

## 35 Climate Actions

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- 37 *Buildings and Energy*
- 41 *Transportation and Infrastructure*
- 45 *Land Use and Natural Resources*
- 48 *Health, Safety, and Well Being*
- 51 *Leadership and Capacity*

# TABLE OF CONTENTS

## 54 Conclusion

55 *What's Next*

57 *Looking Ahead*

## 58 Appendices

59 *Appendix A: Glossary of Terms*

61 *Appendix B: Strategy Matrix*

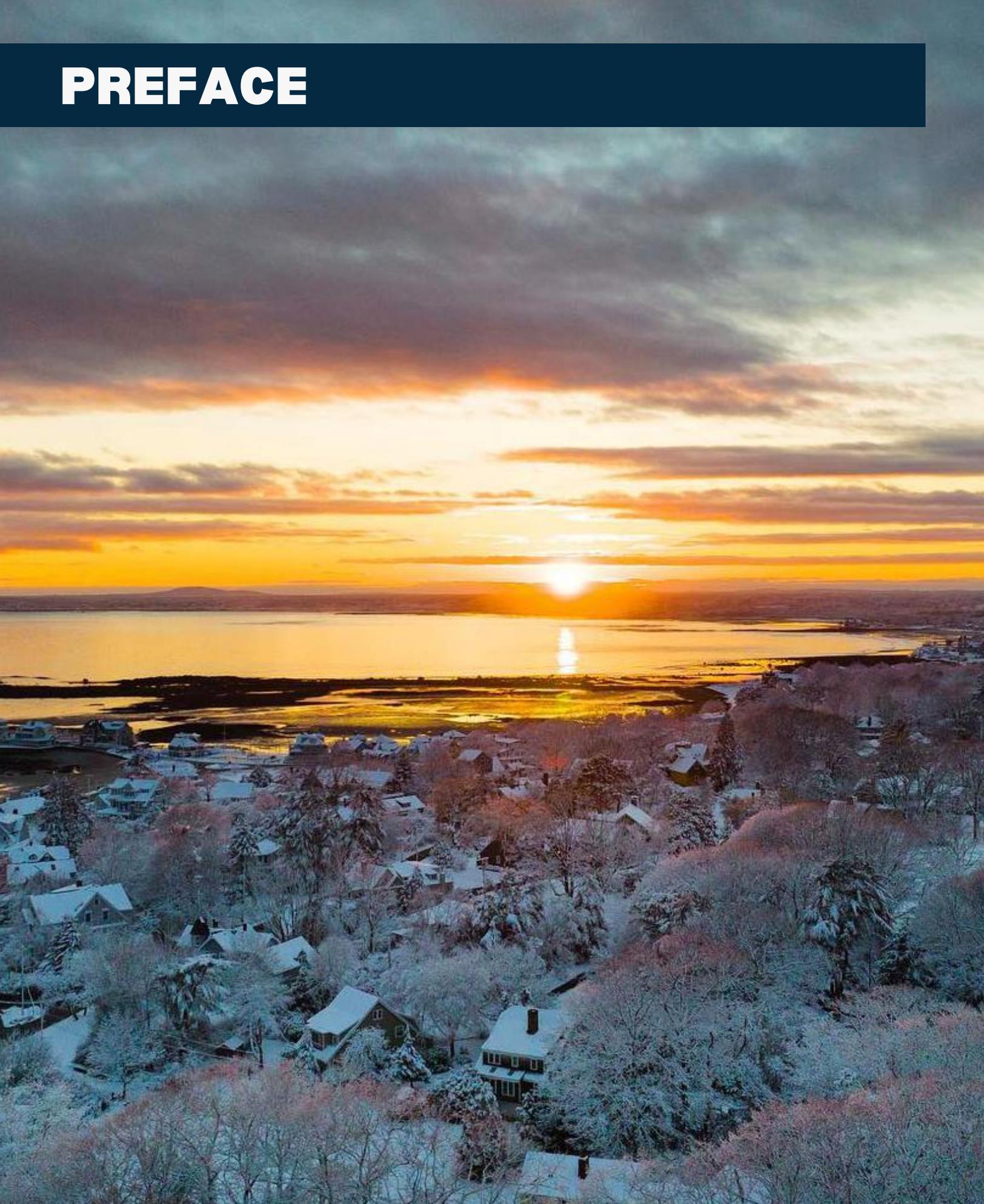
71 *Appendix C: Public Engagement Summary*

76 *Appendix D: Climate Change Vulnerability Assessment*

152 *Appendix E: Greenhouse Gas Summary and Forecast*



# PREFACE



# ACKNOWLEDGMENTS

## Kennebunk Select Board

Shiloh Schulte, Chair  
Miriam Whitehouse, Vice Chair  
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Kortney Nedeau  
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## Partner Organizations

The Brick Store Museum  
Avesta Housing  
The Climate Initiative  
The Chamber of Commerce  
RSU 21

## Kennebunk Climate Task Force

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Lisa Pratt, Select Board Representative  
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Josh Tabor, Community Member  
Tom Berry, Community Member

## Consultants

Southern Maine Planning and Development Commission  
Morris Communications  
ICLEI – Local Governments for Sustainability USA

## Cohort Communities

City of Biddeford  
Town of Kennebunkport  
Town of Kittery

## Community Stakeholders

All residents, businesses, students, visitors, and organizations, Community Sounding Board participants, workshop participants, and survey respondents.

Special thanks go to **Southern Maine Planning and Development Commission**. Without the leadership of SMPDC this effort would not have been possible.

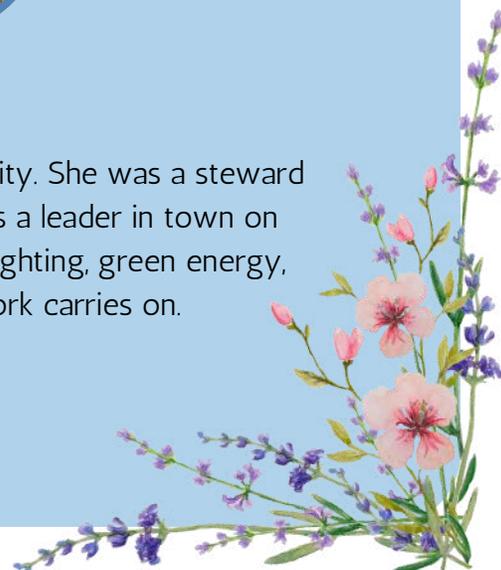


This work was supported by a Community Action Grant from the Maine Community Resilience Partnership. The work by SMPDC was also partially supported by award CZM NA21NOS4190082 to the Maine Coastal Program from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce. The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of the National Oceanic and Atmospheric Administration or the Department of Commerce.

The Kennebunk Climate Action Plan is dedicated to the memory of Sharon Staz



Sharon was a committed member of the Kennebunk community. She was a steward and a passionate advocate for our environment. Sharon was a leader in town on issues such as our carbon footprint, energy efficiency, LED lighting, green energy, solar and more. Her knowledge is missed, but her work carries on.



# LETTER FROM THE TOWN MANAGER



**Town of Kennebunk**  
**1 Summer Street, Kennebunk, ME 04043**  
**Visit us: [www.kennebunkmaine.us](http://www.kennebunkmaine.us)**



May 15, 2024

The Town of Kennebunk is excited to support the completion of our first ever Climate Action Plan. The plan was developed by the Climate Action Plan Task Force, formed in 2022, and includes Town staff, stakeholders, specialists from other Town committees and community members. While the Town Departments have worked to address climate change impacts by way of increasing energy efficiency in its buildings, waste reduction and composting efforts, EV capacity and more, the lack of a specific plan has made long-range efforts difficult.

The Kennebunk Climate Action Plan establishes climate action as a top priority for the Town and guiding principle for decision making. This plan creates a framework for climate action across a broad range of policy concerns including land use, economic development, natural resource management, transportation systems and more. The plan's 22 strategies lay out immediate actions as well as medium- and long-range efforts that will help prepare the Town for a sustainable future.

The Town's next steps include the creation of a new committee that will focus on implementation and prioritization of the plan's strategies. The Climate Committee will balance issues of cost, staff capacity and other resources to meet the urgency of the policy needs while working within the existing budget process.

As the Climate Action Plan is adopted the Town anticipates utilizing the assessment data and strategies to support the efforts of staff and community stakeholders in future policy development as it relates to capital investment, land use policy and environmental stewardship.

Given the regional nature of climate impacts, a number of strategies require cooperation and coordination that go beyond Town lines. Kennebunk Town Staff are ready and willing to embrace local, regional, state and agency partnerships and to utilize best practices, collaboration, and efficiencies of scale to counter the negative effects of climate change.

The Town of Kennebunk and its staff look forward to pursuing the strategies outlined in the Kennebunk Climate Action Plan to reduce greenhouse gas emissions and further address the impacts of climate change.

Sincerely,

Heather Balsler  
Town Manager

# LETTER FROM THE SELECT BOARD

## Town of Kennebunk, Maine



Kennebunk Select Board  
selectboard@kennebunkmaine.us

(207) 604-1308

May 15, 2024

Kennebunk is pleased to put forward the first Climate Action Plan in the history of the Town. In recent years, the Town has worked to address the impacts of climate change. We signed the U.S. Mayors Climate Protection Agreement in 2007 and joined the Global Covenant of Mayors for Climate & Energy in 2018. We took steps to increase the efficiency of our buildings, support the transition to electric vehicles, measure our greenhouse gas emissions, and promote safe and accessible transportation options. Our partnering utility organizations have taken innovative approaches to incorporate hydro-electric and solar production into the Town's energy supply.

These efforts made strides towards our climate goals, but, until today, they lacked a unified plan or strategy. The Climate Action Plan is a detailed strategic framework to guide Kennebunk's efforts to reduce greenhouse gas emissions and increase our resilience to climate change impacts. The Plan was spearheaded by the Climate Action Plan Task Force, a group of volunteer community members and staff representing various committees, departments, and the community at large. Over many meetings and public forums, the Task Force drafted and refined Kennebunk's strategies, incorporating substantial input and feedback from community members, staff, and other boards and committees. These strategies were shaped by Kennebunk community members.

Since climate impacts transcend municipal boundaries, climate planning requires regional action. This Plan reflects our community's values, but it is also part of a broader regional climate action effort. Kennebunk is part of the Southern Maine Climate Action Planning Cohort, in which the Southern Maine Planning and Development Commission is leading the Towns of Kennebunk, Kittery, and Kennebunkport and the City of Biddeford through a coordinated climate action planning effort. Kennebunk now joins other communities in identifying actions that will benefit from a regional or multi-municipal approach.

The Plan includes 22 strategies in five categories: Buildings and Energy; Transportation and Infrastructure; Land Use and Natural Environment; Health, Safety and Well-Being; and Leadership and Capacity. This Plan is consistent with the State of Maine's priorities and will allow Kennebunk to do its part to meet state and national emission reduction resiliency targets.

The completion of the Climate Action Plan requires the Town to change its focus now towards implementation, as we make every effort to execute on the strategies outlined in the Plan. Together, we can make Kennebunk a stronger and more resilient community.

Sincerely,

On behalf of the Kennebunk Select Board,  
Shiloh Schulte, Select Board Chair

Town of Kennebunk, 1 Summer Street, Kennebunk, ME 04043 • [www.kennebunkmaine.us](http://www.kennebunkmaine.us)



# EXECUTIVE SUMMARY

The Town of Kennebunk is unique in many ways, but it shares with the world the detrimental effects of climate change. Climate change is a global problem, but it is being felt on a local level first and with direct consequences. The Town of Kennebunk has responded to this problem by creating the Kennebunk Climate Action Plan Task Force to develop a Climate Action Plan (CAP) that will chart a course to navigate this complicated issue.

**Kennebunk's Climate Action Plan (CAP) will serve as a roadmap** for our climate ready future, including:

- 1 Where we are now:** Our town's climate change vulnerabilities (how we're impacted) and current greenhouse gas emissions (how we're contributing).
- 2 Where we are headed:** Goals, strategies, and actions to reduce our greenhouse gas emissions and adapt to the impacts of climate change.

## Our Goals

*Emissions Reduction:* Strive to meet the Maine Climate Council's goal of 45% emissions reduction by 2030 and an 80% reduction by 2050.

*Community Resilience:* Ensure a continued focus on community resilience to climate change through people-focused initiatives like expansion of public health resources, accessible transportation, and partnerships with local community organizations.



## Our Strategies

This plan outlines **22 comprehensive strategies** across five categories that Kennebunk will implement to further reduce the community's greenhouse gas emissions and strengthen its ability to adapt and thrive.

*These strategies were shaped by Kennebunk community members.*

We conducted a town-wide survey to secure baseline data, receiving survey feedback from 479 members of the public. **74% of survey respondents were very or extremely concerned** that climate change will affect Kennebunk over the coming decades. We also met with several community groups, provided educational materials and discussion at many events, and created a 12-member Community Sounding Board, which has met three times. We consulted with the leadership at RSU 21 to identify opportunities for partnership. We also partnered with the Kennebunkport CAP Task Force to meet with Lower Village and Dock Square business/property owners.

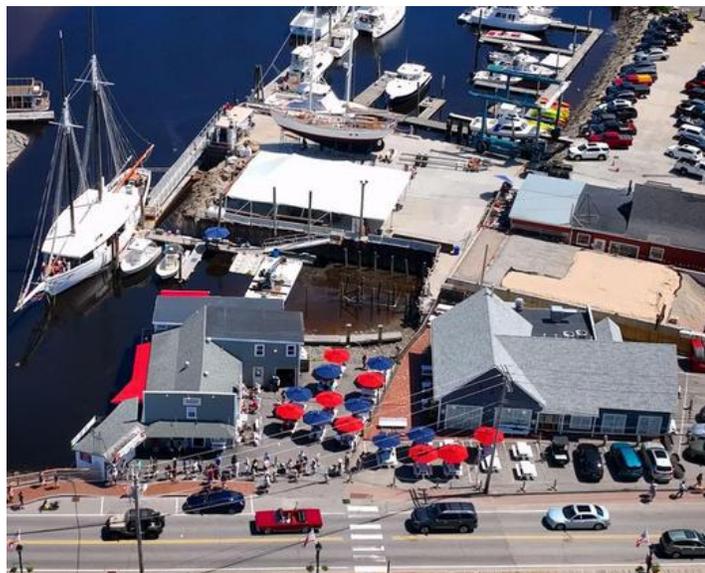
**Climate change is happening and will affect us all, but we as a community have the power to come together and minimize the impact in ways that benefit all of us.**

# Executive Summary

*A regional effort provides knowledge and efficiency.*

The planning process was guided by the Southern Maine Planning and Development Commission (SMPDC). As part of the work with SMPDC, we collaborated with three other communities currently creating Climate Action Plans – Kennebunkport, Biddeford, and Kittery – to learn from each other and consider where regional collaboration would make climate action more effective.

SMPDC provided many potential strategies based on regional best practices and Kennebunk's efforts to date on climate change. Over many meetings we whittled down and refined the strategies, focusing on those that will have the biggest climate impact, that have public support, that are most feasible, and that could have other positive co-benefits for the community.



*Implementing this plan will support local, state, and national climate efforts.*

Kennebunk will undertake the CAP strategies by bringing together community members and partners, by engaging the public on how they can make a difference, by incorporating existing and future community plans, and by working with local, state, federal and international organizations. This CAP will allow the community to budget future funds and access grants to support Kennebunk's climate goals and build a sustainable local economy that improves community health and livability. This plan is consistent with the State of Maine's priorities and will allow Kennebunk to do its part to meet state and national emission reduction and resiliency targets.



## BUILDINGS & ENERGY

Making our buildings and energy systems resilient to climate change.

 = Potential regional action

 = Potential joint action with Kennebunkport

### 1. Increase efficiency in public & private buildings.

- Support weatherization outreach and incentive programs. 
- Create incentives to build resilient, energy efficient, and low carbon affordable housing.
- Support the adoption of higher efficiency building codes at a regional level. 
- Identify and undertake energy efficiency measures for new and existing municipal facilities.
- Support efforts to identify and implement energy efficiency measures at school facilities. 



### 2. Support the shift of new & existing buildings to all-electric heating and appliances.

- Support outreach and incentive programs that promote Efficiency Maine's heat pump adoption and electrification programs. 
- Support current town plans to transition municipal buildings to heat pumps and purchase electric appliances where possible.
- Encourage the school system to consider transitioning to heat pumps and electric appliances. 

### 3. Encourage distributed renewable energy.

- Review ordinances to remove barriers to solar installations, such as height restrictions.
- Participate in the SolSmart program to reduce barriers to small scale solar.
- Support programs that provide resources on solar incentives and financing options.
- Engage in region-level discussions of off-shore wind and other renewable sources. 
- Evaluate municipal & school property for renewable energy opportunities.
- Work with Kennebunk Light and Power District (KLPD) to remove barriers to residential and commercial solar installations.

### 4. Plan for maintaining power at critical facilities during outages.

- Assess power loads at critical municipal facilities.
- Identify and implement energy efficiency measures and backup power solutions for critical facilities.
- Partner with owners/operators of critical facilities to do the same.

### 5. Support improved grid resilience.

- Support region-level planning to ensure a strong grid in the transition to greater electric dependency and for potential crises, in cooperation with utilities. 
- Work with KLPD to address resilience issues on the local grid.

### 6. Promote resilient buildings.

- Adopt resilient design standards for new and redevelopment that consider current and potential climate change hazards.
- Encourage critical facilities to consider climate-related weather risks in location and design and develop plans for resilience.
- Encourage the State to require flood risk disclosure for all property transactions. 

## TRANSPORTATION & INFRASTRUCTURE

Making our transportation systems and infrastructure ready for climate change.



= Potential regional action



= Potential joint action with Kennebunkport



### 7. Expand access to & use of public transit services.

- Support regional efforts toward expanding public transportation.
- Identify and implement measures to make transit services more accessible.
- Identify and promote measures to increase transit options for tourists.

### 8. Increase walkability & bikability.

- Identify gaps and barriers in pedestrian and bicycle networks.
- Work with stakeholders to develop off-road multiuse pathways between Kennebunk and Kennebunkport. 
- Develop and implement a bicycle and pedestrian plan to improve connectivity in the community and beyond.
- Collaborate with regional partners and the Conservation Commission to connect bicycle facilities with regional trail networks. 

### 9. Expand electric vehicle charging on public & private land.

- Expand public EV charging locations.
- Promote the installation of EV chargers or EV-ready parking in new and redevelopment.
- Streamline permitting processes for EV charging stations.
- Provide information about public EV charging and ways to charge at home.

### 10. Increase public & private use of electric vehicles.

- Explore transitioning municipal fleets, school bus fleets, and public transit fleets to EVs. 
- Provide information and resources to encourage and assist with EV purchasing.

### 11. Improve the resiliency of critical infrastructure to climate change.

- Coordinate with KKW District and the Kennebunk Sewer District to incorporate climate change resiliency in management and decision-making.
- Coordinate with KKW District and the Kennebunk Sewer District to implement resilient upgrades to sewer and water infrastructure.
- Coordinate with KKW District to establish and implement a program to protect drinking water sources.
- Advocate for a regional groundwater modeling effort to identify areas of risk for groundwater rise and saltwater intrusion, and vulnerable private septic systems and wells. 

### 12. Improve the resiliency of transportation infrastructure, such as roads, bridges, & culverts.

- Modify transportation infrastructure that are vulnerable to climate hazards to increase their resiliency.
- Assess the impacts of climate hazards (e.g. flooding, increased heat) on local transportation infrastructure to better understand vulnerabilities. 
- Integrate climate resilience measures in road crossing projects, including new and replacement culverts and bridges.
- Apply Maine CoastWise and Stream Smart principles to road crossing projects and culverts.
- Review and update flood hazard evacuation routes, signage, and maps.
- Amend road design standards to include climate resilience.



## LAND USE & NATURAL ENVIRONMENT

 = Potential regional action

 = Potential joint action with Kennebunkport

Helping our environment respond to climate change.

### 13. Direct development to areas with existing infrastructure & services & low risk of climate hazards.

- Amend ordinances to direct development toward areas that are already developed, have public services (e.g. water and sewer), and are at low risk of natural hazards and climate change impacts. Discourage growth and development in high risk areas.
- Refine ordinances to allow increased density in areas with sewer, water, energy transmission, other amenities, and low risk of climate hazards. Pair efforts to increase density with increased public transit and alternative transportation options.
- Review and modify as necessary incentives for infill development in growth areas, such as the Route 1 corridor and other areas close to goods and services.



### 14. Conserve, protect, & restore natural resources & areas that are vulnerable to climate hazards.

- Update the Open Space Plan to protect climate-threatened natural areas through acquisition, easements, and current use programs. 
- Enact policies and regulations to preserve and restore wetlands and areas that allow for marsh migration.
- Participate in a watershed protection program in coordination with watershed communities.
- Partner with and support local conservation entities like Kennebunk Land Trust to manage and expand conserved lands.
- Promote nature-based solutions (e.g. restoration of sand dunes or wetlands) to protect shorelines and coastal property from flooding and erosion.
- Support habitat restoration to sequester carbon, promote biodiversity, and provide public recreation.
- Discourage fertilizer, pesticide, and herbicide use through education and regulations.
- Advocate for statewide limits. 

### 15. Incorporate climate change considerations in land use planning & regulations.

- Identify opportunities for incorporating resilience and sustainability measures in land use ordinances and policies.
- Require consideration of climate change resilience in development project applications.
- Encourage building designs and modifications to consider climate change hazards.
- Amend ordinances to direct development away from areas exposed to climate-related risks (sea level rise, erosion, inland flooding).
- Explore a managed relocation/retreat policy to convert areas at high risk of coastal climate hazards to publicly accessible open space.
- Continue participating in the National Flood Insurance Program's Community Rating System.



## HEALTH, SAFETY, & WELL-BEING

Ensuring our community's resilience to climate change impacts.



= Potential regional action



= Potential joint action with Kennebunkport

### 16. Increase awareness & preparedness for climate-related & public health events.

- Implement public health advisories for climate-related health and weather events.
- Establish a "resilience hub" that can provide critical services to community members during climate-related disruptions and coordinate for post-disruption support.
- Educate community members and students about public health impacts of climate change, including mosquito- and tick-borne diseases, and heat-related illnesses.
- Collaborate with York County Emergency Management Agency on hazard mitigation planning. 



### 17. Implement programs to prevent food waste & waste-related emissions & decrease food insecurity.

- Collaborate with Food Rescue MAINE to implement a food recovery program.
- Establish a municipal composting program that includes a municipal composting site and curbside compost pick-up.
- Establish additional community gardens.
- Advocate for state composting requirements. 

### 18. Implement a municipal single-use plastic ban.

- Work with vendors to determine if they can provide sustainable packaging alternatives.
- Limit the purchase, use, or sale of single-use plastic bottles in municipal departments.
- Provide education and resources to local businesses, RSU 21 School District, and residents and work towards reducing and eliminating single-use plastics.
- Encourage the Town of Kennebunk Select Board to sign the U.S. Plastics Pact.
- Educate the community regarding the Ordinance Prohibiting the Release and Display of Balloons.



## LEADERSHIP & CAPACITY

Fostering leadership and support to implement our Climate Action Plan.



= Potential regional action



= Potential joint action with Kennebunkport



### 19. Establish local funding mechanisms to financially support climate actions.

- Establish a municipal fund to support climate resilience and sustainability projects. Make annual appropriations to the fund and invest the assets for long-term growth.
- Pursue federal, state, and other funding opportunities to support climate actions.
- Enact impact fees on new and redevelopment projects to help financially support climate actions.

### 20. Incorporate climate resilience and GHG emission-reduction criteria in municipal policies, expenditures, & decision-making.

- Incorporate climate resilience and sustainability in short- and long-term municipal decision-making, policies, and plans.
- Adopt protocols to account for climate resilience considerations in municipal decision-making and investments.
- Include funding for resilience and sustainability investments in annual budgets and capital plans.
- Track municipal spending for storm/flooding preparation, response and recovery to inform capital improvement spending and guide infrastructure resilience upgrades.



### 21. Increase municipal capacity to implement the Climate Action Plan.

- Create a municipal staff position and an appointed committee for sustainability efforts whose mandate will be to coordinate the implementation of the CAP.
- Work with the committee to evaluate the CAP and consider the prioritization of strategies for implementation.
- Evaluate capacity of municipal departments to implement the CAP, identify opportunities for improvements, and enhance capacity as needed.
- Work with SMPDC to provide climate change training for municipal boards and committees.



### 22. Actively engage community members in local climate & sustainability issues.

- Partner with community organizations to engage community members on local climate and sustainability issues through events and other outlets.
- Collaborate with local schools to incorporate climate change and sustainability into school curricula and operations.



# INTRODUCTION AND BACKGROUND



# WHAT IS A CLIMATE ACTION PLAN?

A Climate Action Plan (CAP) is a strategic plan that lays out policies and programs for reducing a community's greenhouse gas (GHG) emissions and adapting to the impacts of climate change. CAPs include an inventory of the municipality's current GHG emissions and existing vulnerabilities, goals for emissions reductions and climate adaptation, and actions to achieve those goals.

This CAP will serve as a roadmap to ensure Kennebunk's climate ready future.



**Emissions reductions** – Actions that help reduce the total amount of GHGs in the earth's atmosphere. These actions put the brakes on the speed at which climate change is happening.



**Climate adaptation** – Actions taken to strengthen a community's ability to adjust to climate change and thrive in spite of its impacts. Adaptation softens the blow of climate change.



The failure to act against the effects of climate change carries a great risk for Maine, as doing nothing will cause costly damage to Maine's buildings & infrastructure, vulnerable ecosystems, iconic species, & public health.

– *Maine Won't Wait, the State of Maine's 2020 Climate Action Plan*

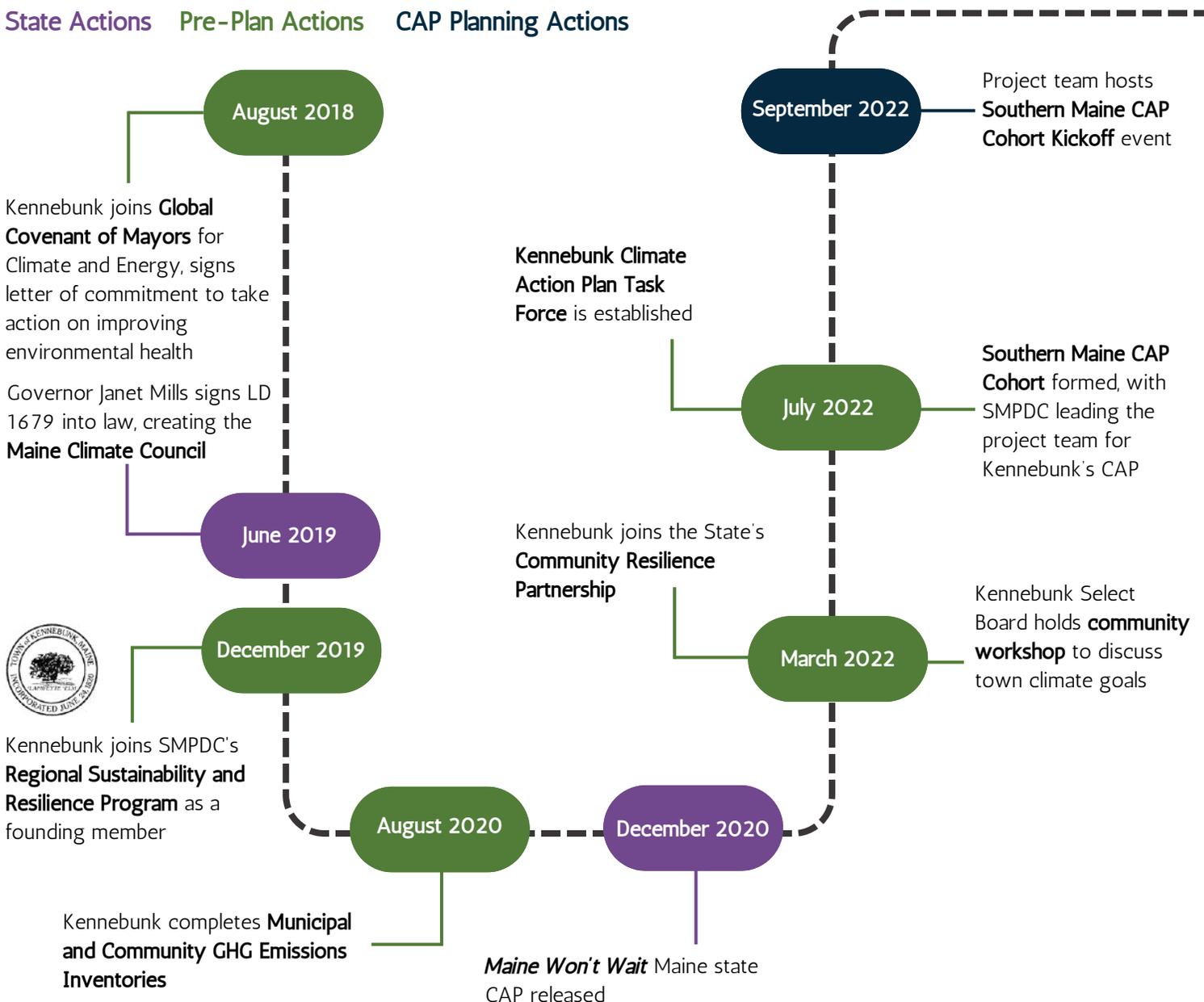


# OUR CLIMATE ACTION PLANNING TIMELINE

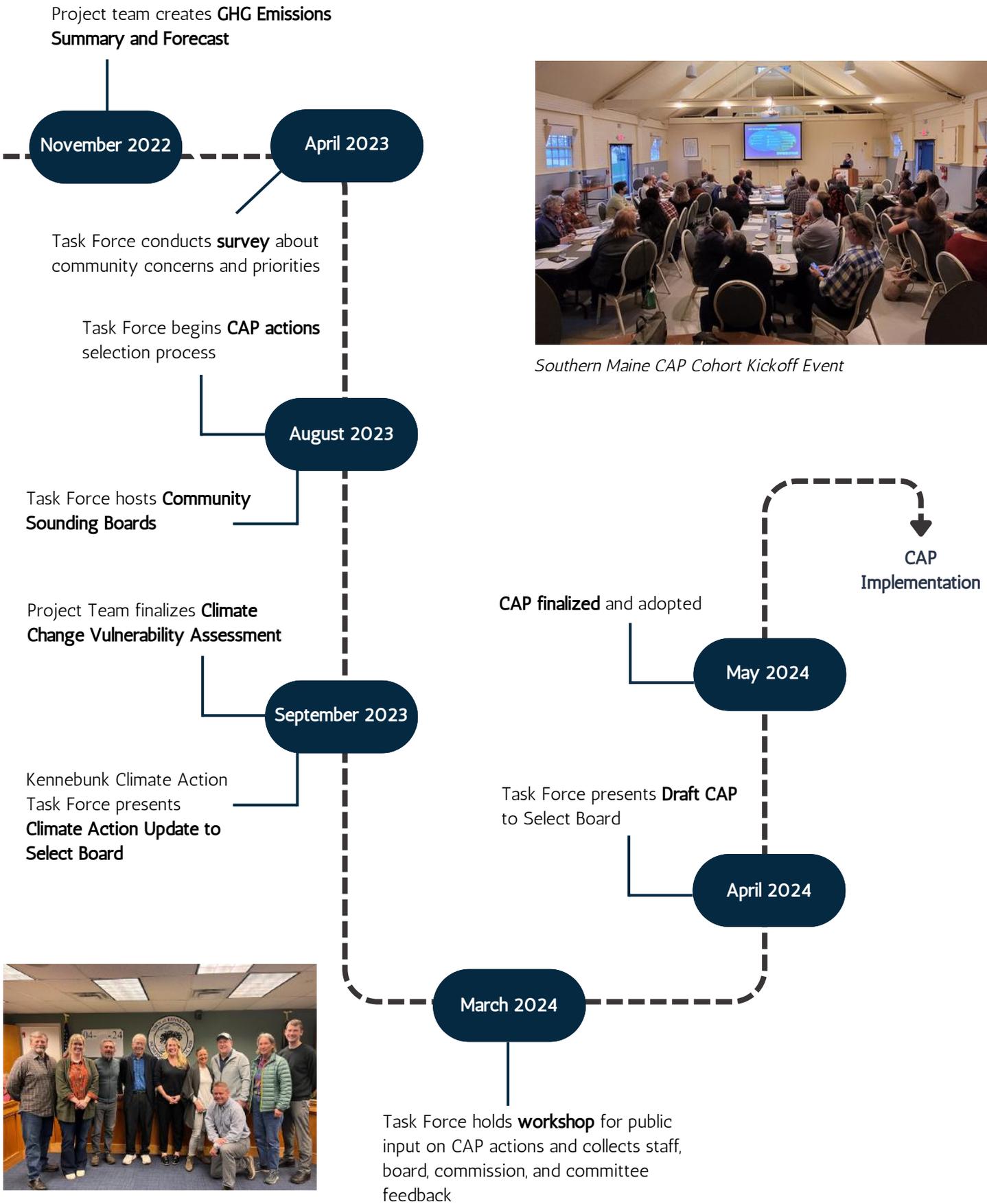
In 2018, the Select Board voted unanimously to join the Global Covenant of Mayors for Climate and Energy and signed a commitment letter to take action on improving the health of our environment. This sparked a multi-year effort to address climate change impacts in Kennebunk. The Climate Action Plan Task Force was established in 2022 and the process of creating our town's Climate Action Plan kicked off shortly after.

Our climate action planning efforts were perfectly timed to coincide with efforts to plan for climate change by the State of Maine and by our neighboring communities. We decided to work with the city of Biddeford and towns of Kennebunkport and Kittery as part of the Southern Maine Planning and Development Commission (SMPDC) Southern Maine CAP Cohort. All four of our Task Forces developed our CAPs concurrently. While we each set our own priorities and actions, we learned from one another, sharing ideas for actions to include and ways to engage with our communities. We also discussed and agreed upon regional actions to include in our plans and work on together in the future.

## State Actions    Pre-Plan Actions    CAP Planning Actions



# Our Climate Action Planning Timeline



Southern Maine CAP Cohort Kickoff Event



Kennebunk Climate Task Force members. Absent from photo: Maggie Bartenhagen

# PURPOSE AND GOALS



## Our Purpose

The Town of Kennebunk is unique in many ways, but it shares with the world the detrimental effects of climate change. Climate change is a global problem, but it is being felt on a local level first and with direct consequences. The Town of Kennebunk has responded to this problem by creating the Kennebunk Climate Action Plan Task Force to develop a Climate Action Plan that will chart a course to navigate this complicated issue. This plan lays out policies and programs to further reduce the community's greenhouse gas emissions and strengthen its ability to adapt and thrive during these challenging times.

We will do this by bringing community members and partners together, by engaging with the public on how they can make a difference, by incorporating existing and future community plans, and by working with local, state, federal and international organizations toward a common goal. This endeavor will allow us as a community to budget future funds and access grants to support our climate goals and build our local economy in a sustainable way that improves community health, livability, and supports the local economy. This plan is consistent with the State of Maine's priorities, allowing us to do our part to meet state and national emission reduction and resiliency targets.

## Our Goals

**Emissions Reduction:** Strive to meet the Maine Climate Council's goal of 45% emissions reduction by 2030 and an 80% reduction by 2050.

**Community Resilience:** Ensure a continued focus on community resilience to climate change through people-focused initiatives like expansion of public health resources, accessible transportation, and partnerships with local community organizations.



# COMMUNITY ENGAGEMENT

Community engagement was critical to the development of this CAP. We used a variety of engagement methods to educate the community and seek out public input, informing the actions in this plan that will direct Kennebunk's climate efforts.

## Spring 2023

- Climate Action Public Survey launched
- Election Day Table

## Summer 2023

- First Community Conversation on climate change impacts
- **Community Sounding Boards:** We convened 2 Community Sounding Board meetings where participants discussed their top climate concerns, community impacts, and more.

## Fall 2023

- 3 Avesta Housing Conversations
- HarvestFest Table
- West Kennebunk Committee Presentation
- **Local Business Outreach:** We met with local businesses to learn how they are being affected by climate change impacts. In collaboration with Kennebunkport we held several individual meetings and a group meeting.
- Select Board Presentation



## Spring 2024

Public engagement chapter closes, but the implementation dialogue continues!

- Select Board Presentation on CAP Strategies
- Staff, boards, committees, and commissions provided feedback on draft strategies.

## Winter 2023-24

- Community Sounding Board to review draft strategies
- 2 sessions with environmental classes at Kennebunk high school
- Meeting with RSU 21 Facilities Committee
- **Climate Action Plan Open House:** We hosted an open house at Kennebunk Town Hall to give community members a chance to provide feedback on the proposed CAP strategies. This input shaped how the strategies appear in the plan.



# WHAT WE HEARD

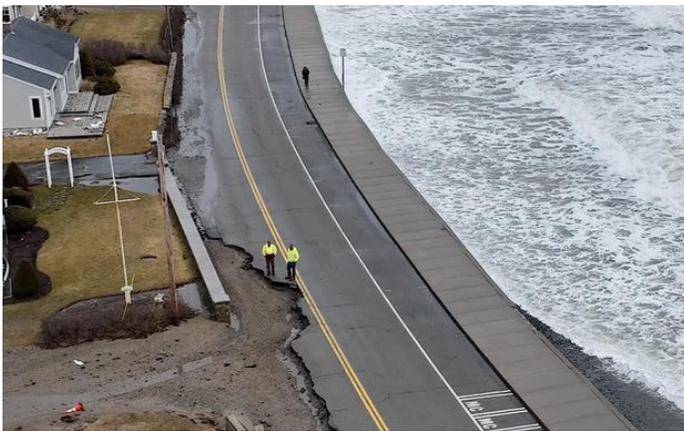
## Climate Concerns

We listened to the climate concerns shared by our community members.

- 1 Natural environment (greater than 70% of respondents)
- 2 Infrastructure (greater than 70% of respondents)
- 3 Economy and jobs (38% of respondents)

**74% of survey respondents were very or extremely concerned that climate change will affect Kennebunk over the coming decades.**

*Data source: Kennebunk Climate Action Public Survey (479 responses)*



## Climate Action Feedback

At the Climate Action Plan Open House, we heard your ideas for actions and approaches Kennebunk can take to tackle climate change.

“

To protect the beach and homes on Beach Ave, the wall, sidewalks, and road must be replaced by seagrass and sand.

“

Sea rise will continue and make housing impossible along the beach.

“

Discussion sessions of town/community organizations for collaboration.

“

More financial incentives to promote energy efficiency.

“

Planting of native trees and/or native shrubs should be a priority.

“

Air quality is a key issue.

“

I hope repurchased properties near the beach or in flood zones would be used for natural flood or erosion protection.



**For more details about Kennebunk's public engagement**

See [Appendix C: Public Engagement Summary](#).

# PLANNING FOR EQUITABLE CLIMATE ACTION

Social equity means all community members can participate, prosper, and reach their full potential. Climate change and social equity are closely intertwined. Climate change affects some members and groups of our community differently, some more severely than others. Equally, climate action has many co-benefits, and in some cases, negative impacts, that can be distributed unevenly and unfairly to different groups.

**Kennebunk's climate actions must address social equity every step of the way.** We've embedded equity in the design and implementation of our CAP to ensure that actions respond to social inequities and the needs of those who are most vulnerable.

- Public engagement efforts such as the survey, focus groups, and Climate Action Open House were designed to reach vulnerable community groups including youth, low income community members, and senior citizens.
- Equity was one of three priority criteria for the action evaluation process. In considering each potential action, we asked, "Are the costs, benefits of this action distributed fairly? Does this action minimize harm to the most vulnerable groups?"

**As we look towards implementing our CAP, we will need to be flexible, adaptive, and reflexive to ensure the biggest benefit and least harm to our vulnerable community members.**

## Kennebunk's Equity Considerations

Part of understanding climate equity is recognizing specific populations that are particularly vulnerable to climate change impacts. In Kennebunk, vulnerable groups include:

- Older Adults (31% aged 65+)
- People with Disabilities (30% of households with 1+ persons)
- Low-income households (26% with income less than \$50,000)
- Children (19% of population)
- People of Color (7% of population)
- As well as
  - People with chronic medical conditions
  - First responders
  - Outdoor workers
  - Pregnant women



When vulnerable community members live in areas that are exposed to climate hazards, they can be disproportionately affected. Vulnerable groups generally have less capacity to prepare for, respond to, and recover from climate hazards and events. Areas in Kennebunk with especially vulnerable populations include:

- **Neighborhoods along Kennebunk's coast**, and along the tidal Mousam, Kennebunk, and Little Rivers are both very vulnerable to flooding and coastal storms and have a relatively high percentage of people that are older (65+) and living alone.
- **Downtown Kennebunk** has the highest percentage of the population and households that include children, identify as a minority, speak English less than well, are unemployed, have no internet access and are single parent households. This area is vulnerable to flooding and power outages from extreme precipitation as well as health impacts due to extreme heat.

# CLIMATE CHANGE IN KENNEBUNK



# HOW CLIMATE CHANGE IS AFFECTING KENNEBUNK

Kennebunk is a town marked by tidal waters and sandy beaches. Bordered to the west by the Little River, the east by the Kennebunk River, the south by the open coast, and cleaved by the Mousam River, the Town is particularly vulnerable to flooding. Its geographic location, physical characteristics, and demographic makeup make Kennebunk, and the town's 10,000+ residents, vulnerable to the climate hazards and impacts described below.



## How were these impacts determined?

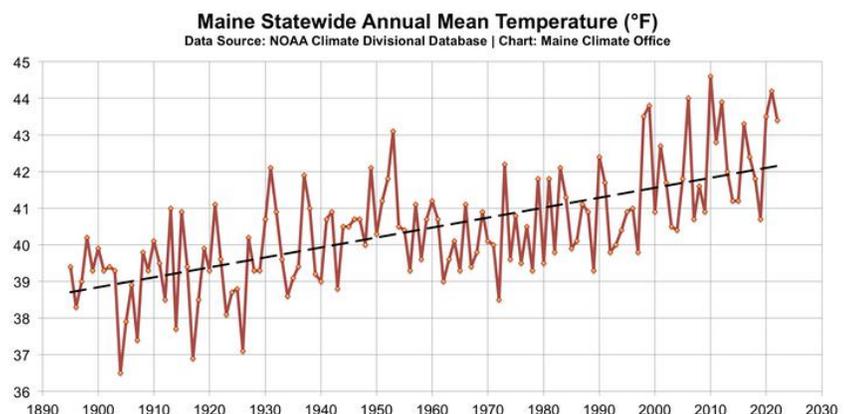
We conducted a climate change vulnerability assessment to identify who, what, and where will be impacted by local climate hazards and what those impacts could be. The assessment used a combination of national, state, and local data sets, as well as input from the Task Force and community members, to assess local impacts of climate hazards (flooding from sea level rise and storm surge, precipitation and extreme storms, extreme temperatures, drought, and changing marine conditions) and Kennebunk's vulnerability to those hazards. Find the full assessment in Appendix D.

## Climate Hazards

*We face major threats to the future of our community and the places we love. Increasing temperatures, changing precipitation, sea level rise, and shifting ecosystems are driving changes here in Kennebunk.*

### Increasing Temperatures

- Maine's statewide annual temperature has increased by 3.2 °F (≈1.8 °C) since 1895.
- There will be 4 times more extreme heat days (heat index >95 °F) in Southern Maine by 2050.
- Five of the ten warmest years on record have occurred within the past ten years based on data from the local NWS station.



# Climate Change is Affecting Kennebunk

## Changing Precipitation

- Maine's annual precipitation (rain and snowfall) has increased by more than 6 inches since 1895, and extreme precipitation events are becoming more frequent.



The area along the Mousam River between I-95 and Route 1 is more vulnerable to extreme precipitation because of a high degree of impervious surfaces. Lower Village, Mother's Beach, and Gooch's Beach also have a high degree of impervious surfaces and are more vulnerable to the combined impacts of extreme precipitation and coastal flooding during severe storms.

## Drought and Wildfires

- Warmer air temperatures and changing precipitation patterns are increasing the severity of droughts.
- In the last five years, York County experienced three severe droughts, each lasting between two and eight months.
- Wildfire frequency, particularly in the spring, is increasing due to drought, decreased snowpack, and windier conditions.



In 2018, a major wildfire burned 60 acres near the Kennebunk and Sanford town line. The risk of more wildfires like this will increase with more intense periods of drought. This elevated risk presents a threat to both public safety and the natural environment.

## Sea Level Rise

- By 2050, Maine will likely experience between 1.1 and 1.8 feet of sea level rise. By 2100, sea level rise will likely be between 3.0 and 4.6 feet, with higher amounts possible.
- Future sea level rise will exacerbate the impacts of storm surge and increase the likelihood and severity of coastal flooding, especially during storm events.



Kennebunk's coastal areas (neighborhoods, infrastructure like roads and bridges, and natural resources) are increasingly vulnerable to flooding as sea level rises and storms become more intense and frequent. Two storms in January 2024 caused significant damage to Kennebunk's coastal areas.

## Changing Ecosystems

- System-wide changes to marine and land ecosystems are leading to a decline in biodiversity and an advantage to invasive species.
- Of the State's 378 most at-risk fish and wildlife species, nearly one-third are predicted to be negatively affected by climate-change related threats, including habitat shifts and alterations, droughts, temperature extremes, and storms and flooding.

## Climate Vulnerabilities

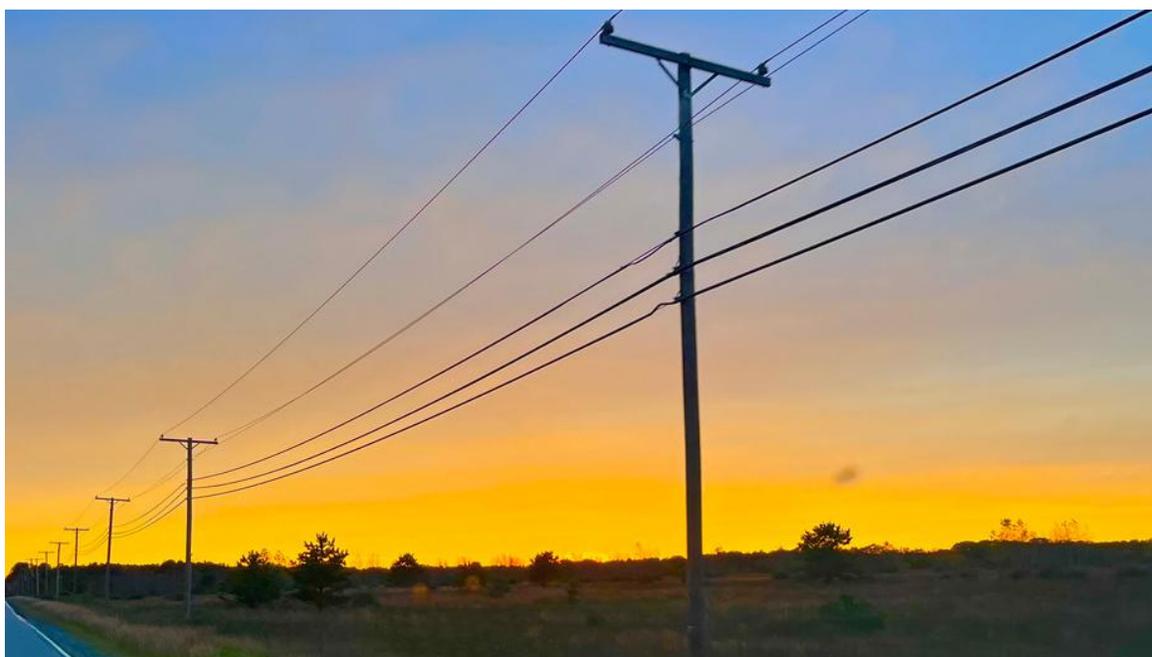
*Climate change touches every facet of our community. Our public health, infrastructure, natural environment, public services, and our local economy are all vulnerable to climate impacts.*

### Public Health

- Extreme heat is one of the most significant impacts of climate change on human health and is the leading cause of weather-related deaths across the US. Extreme heat and heat waves are putting people at risk, especially those who are elderly, have health issues, or have limited access to home air conditioning.
- Like the rest of Maine, Kennebunk's aging electrical grid is increasingly vulnerable to extreme storms and increasing temperatures. This will result in more frequent and longer duration power outages that can pose serious risks for public health and safety.
- Increasing frequency of wildfires, both locally and across North America, will negatively affect public health by creating poor air quality and public safety risks.

#### Elevated Risk

In Kennebunk, the area along Alfred Road between I-95 and the northern border of town and the Route 1 area are "urban heat islands," or areas with a lot of impervious surfaces, such as buildings and pavement, that absorb and reemit heat. Both of these areas have elevated social vulnerability due to a relatively large percentage of households having annual income levels below state and county median incomes, and who are therefore more likely at risk from extreme heat.



# How Climate Change is Affecting Kennebunk



## Public Health Continued

- Warmer, shorter winters are contributing to increased occurrences of vector-borne illnesses. The prevalence of tickborne diseases in York County has increased in recent years, with rates of Lyme disease doubling and rare diseases like anaplasmosis and babesiosis becoming more common.
- Drought and decreases in summertime precipitation are negatively impacting drinking water supply for both private wells and public water systems.

### Elevated Risk



In recent years, York County had the second highest number of annual emergency department visits for heat-related illness across Maine, behind Cumberland County. Kennebunk has a high percentage of older adults who are particularly at risk for heat-related health impacts.



Certain demographic characteristics increase the vulnerability of some community members. Relative to the rest of the state, **Kennebunk has a high number of assisted living facilities and an aging population**, with 31% of the total population aged 65+ and 30% of households having at least one person with a disability. **The town also has a relatively high proportion of lower income residents**, with 26% earning less than \$50,000 annually, which is below the State and county median income levels and the U.S. Environmental Protection Agency climate change and social vulnerability income threshold.

### Elevated Risk

Increasing temperatures paired with less snowfall has increased the occurrence of local tickborne diseases. Between 2016 and 2020, Kennebunk had the eighth highest rate of babesiosis of all York County communities.



# How Climate Change is Affecting Kennebunk

## Infrastructure

- Neighborhoods, roads, bridges, and other infrastructure located in Lower Village and surrounding the beaches are particularly vulnerable to flood hazards. With climate change, the coastal neighborhoods, where many older adults live, can expect more frequent flooding events.
- Critical community infrastructure, including roads, bridges, culverts, and stormwater systems, is at risk of damage and failure from precipitation-based flooding and sea level rise. As sea level rises and storms become more frequent and intense, Kennebunk can expect to see more damage from coastal flooding, high winds, and heavy rainfall.
- Drinking water wells, septic systems, and subsurface infrastructure such as sewer and water mains are vulnerable to failure as coastal water tables rise and groundwater becomes contaminated by saltwater due to sea level rise.

### Elevated Risk

Roadways vital for local and regional travel, emergency evacuation, and neighborhood access are vulnerable to flooding from storms and sea level rise. Vulnerable roads include Beach Avenue and Route 9 over the Mousam River. These roads have already become impassable during and after storm events, such as with the January 2024 storms. Water and wastewater infrastructure, including the wastewater treatment plant and Boothby Road pump station, are also vulnerable to coastal flooding.



### Elevated Risk

Based on an assessment by the Maine Geological Survey, many of Kennebunk's coastal engineered structures including seawalls and bulkheads are vulnerable to overtopping by flooding from the modeled current 1% annual chance storm event, not including sea level rise, and has been observed in recent storms.

# How Climate Change is Affecting Kennebunk

## Natural Environment

- Increases in precipitation, stormwater runoff, saltwater intrusion into groundwater, and drought conditions will negatively affect water quality and ecosystem health.
- Sea level rise threatens to erode and flood coastal beaches and tidal marshes. Along Kennebunk's coast, sea level rise will lead to less dry beach, which will impact local species. Kennebunk's dry beach width (distance from the mean high water to seawall or dune edge) is projected to decrease by 2.6 acres, or by 60% with 1.6 feet of sea level rise.
- Sea level rise can lead to the landward migration of tidal marshes in the absence of physical barriers that would inhibit that migration.
- Average, extreme, and wintertime temperatures are stressing local flora and fauna and aiding the spread of invasive species, decreasing biodiversity in Kennebunk's natural areas like the Kennebunk Wildlife Management Area, Alewife Woods Preserve, and Mousam River Wildlife Sanctuary.
- Some properties in coastal portions of town have private septic systems that could be vulnerable to failure from rising groundwater driven by sea level rise, resulting in possible contamination of nearby surface waters and groundwater.

Back Creek Lake, Little River, Kennebunk River, and Mousam River, especially near the Route 9 crossing, are identified as being able to support future marsh migration. Significant portions of land adjacent to the tidal rivers have been conserved, which can help to ensure that future development won't impact migrating marshes in those areas.



# How Climate Change is Affecting Kennebunk



## Public Services

- More frequent flooding and extreme weather events will likely require more frequent response, repair, and recovery efforts leading to higher municipal costs and strained municipal capacity.
- Recent droughts resulted in historically low groundwater levels in York County. The regional water district now supplements the primary Branch Brook supply with several groundwater wells. These past challenges indicate potential vulnerability to lower water quantities during more frequent, prolonged, or intense droughts in the future.
- Coastal and inland flooding may cut off emergency routes and access to neighborhoods during storm events, impeding emergency services and threatening public safety.
- Sea level rise threatens municipal budgets and the community operations, services, and programs those budgets support. As coastal properties, which generate a significant portion of municipal tax revenue, become increasingly vulnerable to flooding, their value diminishes.

### Elevated Risk

Flooding from storm surge already cuts off road access to coastal properties in Kennebunk, putting the people who live there and critical infrastructure for emergency access to them at risk.



### Elevated Risk

Properties that are vulnerable to flooding from storm surge combined with 1.6 ft of sea level rise have a total assessed value of almost \$390 million, representing 12.8% of town-wide assessed property value (2021 assessment values) and almost 11% of the town's 2021 municipal budget.

# How Climate Change is Affecting Kennebunk



## Local Economy

- More frequent and intense droughts have the potential to reduce local farmers' production, increase their costs, and disrupt the local food system and economy.
- Tourism activity driven by Kennebunk's sandy beaches and healthy coastline could decline as biodiversity decreases, flooding becomes more frequent, and the amount of dry beach decreases as sea level rises.
- Ocean warming and acidification in the Gulf of Maine are changing marine conditions. Individuals who rely on fishing for their livelihood are vulnerable to the economic impacts of changing fish and lobster stocks.

### Elevated Risk

Flood vulnerability of Lower Village, the beaches, and waterfront infrastructure will likely have significant economic impacts for the community, threatening jobs, business revenue, tourism activity, and recreational activity.



# KENNEBUNK'S GREENHOUSE GAS EMISSIONS

Greenhouse gas (GHG) emissions are created when Kennebunk's residents, visitors, and workers engage in daily activities such as driving, heating homes, and powering our appliances and devices. Measuring GHGs from specific sources helps us understand where and how to take action to achieve our goals.

## Sources of Emissions

### Transportation

Emissions from the burning of fossil fuels from cars, trucks, ships, trains and planes.

### Residential Buildings

Emissions from homes are from burning fossil fuels for heat and electricity.

### Commercial & Industry +

Emissions from businesses from electricity use and fossil fuel burning for heat and manufacturing.

### Waste

Includes emissions from septic tanks, the Kennebunk Wastewater Treatment Plant, and the incineration of all trash generated by residential and commercial activity in the community that is sent to the EcoMaine waste-to-energy plant.

## Types of Greenhouse Gases

### Carbon Dioxide (CO<sub>2</sub>)

Carbon dioxide is the main byproduct of fossil fuel combustion, such as burning gasoline, oil, coal, or other fuels for energy.

### Methane (CH<sub>4</sub>)

Methane is primarily emitted through agricultural activities, waste management, and natural gas combustion. Pound for pound, the comparative impact of methane is 25 times greater than carbon dioxide over a 100-year period.

### Nitrous Oxide (NO<sub>2</sub>)

Nitrous oxide is primarily emitted through agricultural soil management and fertilizer use. Fertilizer production and domestic wastewater management are also sources.

### Fluorinated Gases

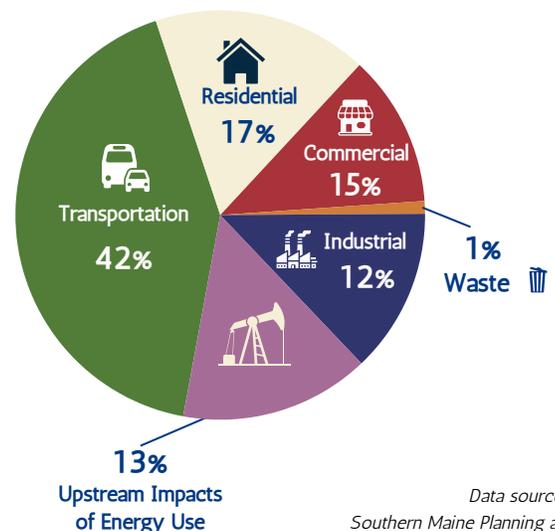
Synthetic gases that are emitted from a variety of household and commercial applications such as refrigerants, aerosol propellants, foam blowing agents, solvents, and fire retardants. Although they are emitted at far lower quantities, they are particularly potent and trap substantially more heat than carbon dioxide.



### Where does this data come from?

This data comes from a 2018 Greenhouse Gas Inventory conducted by the Town of Kennebunk. **Note - for the purposes of this CAP we have excluded Kennebunk's Consumption-based emissions estimates.** See a summary of the data in Appendix E: GHG Emissions Summary and Forecast or view the whole [GHG Inventory on the Town's website](#).

## Kennebunk's Carbon Dioxide Emissions from Fossil Fuel Combustion by Source (2018)

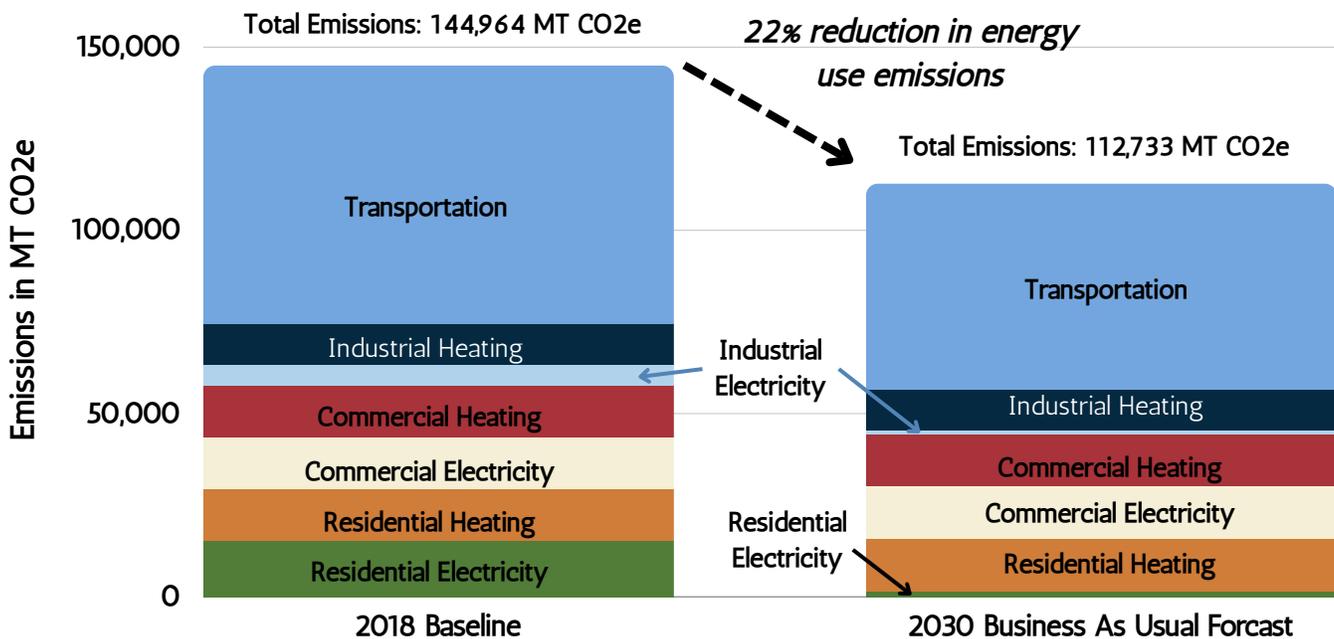


Data source:  
Southern Maine Planning and  
Development Commission, 2022

# GHG INVENTORY KEY TAKEAWAYS

- 1 The largest source (30.3%) of estimated community-wide GHG emissions is passenger vehicle fuel use by visitors and residents.
- 2 31.8% of estimated community-wide emissions are produced by combined heating and electricity consumption from the residential and commercial sectors, 16.4% are produced by combined heating from both sectors, and 15.3% by combined electricity consumption.
- 3 Municipal GHG emissions are a small subset of community-wide emissions, accounting for 2% of estimated community-wide emissions. Of this, the largest source (33.95%) of estimated municipal emissions is electricity generation supplied by the Kennebunk Light and Power District (KLPD).

## 2018 Emissions vs. 2030 Business As Usual Emissions



In order to change course on GHG emissions, we should know where we are headed if we take no intentional reduction action. Forecasting "Business as Usual" emissions can help to identify the greatest barriers and opportunities for getting to net-zero emissions.

**Without taking any additional action at the community or municipal level, Kennebunk's community-wide GHG emissions are expected to fall 28% by 2030** driven by 1) increasing renewable energy sources on the electricity grid as a result of state targets and Renewable Portfolio Standard, and 2) decreasing transportation emissions due to federal fuel efficiency standards and electric vehicle expansion.

With ambitious but realistic actions to reduce emissions, Kennebunk can achieve an even greater reduction in emissions and play our part in the global effort to prevent the worst impacts of climate change.

# CLIMATE ACTIONS



# CLIMATE ACTIONS

## Climate Actions Overview

To make a difference on climate change, we're focusing on taking action in five focus areas:



- **Buildings and Energy:** Making buildings and energy systems resilient and reducing their emissions.



- **Transportation and Infrastructure:** Facilitating the transition to low and zero emissions transportation while supporting alternatives to single-occupancy vehicles and strengthening local infrastructure.



- **Land Use and Natural Environment:** Protecting and enhancing natural resources while directing development to protect vulnerable people and places.



- **Health, Safety, and Well-Being:** Ensuring the health and safety of Kennebunk's community members and increasing overall community resilience.



- **Leadership and Capacity:** Building support and cooperation for climate action between municipal staff, community members, and partner organizations.

## Strategy Selection

To assess and prioritize actions that align with Kennebunk's values and priorities, we undertook a three step evaluation process:

**Step 1:** We reviewed over 70 potential strategies, which were provided by SMPDC and based on regional best practices and local considerations. We sorted these potential strategies into **Yes**, **Maybe**, and **No** categories based on four criteria.

Impact	Equity	Co-Benefits	Cost
To what extent does this strategy reduce greenhouse gas emissions and/or reduce either physical or social vulnerability and/or build resilience to climate change?	Does the strategy minimize harm for the most vulnerable groups? Does it promote equity?	Does this strategy provide broader benefits for health, social well-being, the environment, and the economy?	What is the financial cost to implement the strategy and what are the financial cost savings?

**Step 2:** We eliminated the **No** strategies and evaluated our **Yes** and **Maybe** strategies using a comprehensive rubric that provided a weighted score to each strategy. The weighted score was based on each strategy's relative value in each of the four criteria. Based on their scores, we combined and refined the strategies and sorted them into general strategies with specific action items.

**Step 3:** We used public, municipal staff, board, and committee feedback to further refine and finalize the strategies and action items.



## Connection to Climate Change

The electricity, natural gas, and/or oil that we use in our homes, businesses, institutions, and municipal facilities result in over half of greenhouse gas emissions in Kennebunk. We must enhance energy efficiency and switch our building systems and appliances over to electricity that is sourced from clean, low carbon energy. At the same time, we need to ensure that our buildings and energy systems are resilient to increasing climate hazards like storms, sea level rise, and extreme precipitation.

## Where We Stand

- **Taking steps to reduce municipal fossil fuel consumption and implement municipal energy efficiency measures:**
  - Municipal energy audit completed by the Energy Efficiency and Sustainability Committee (EESC) in 2016 to identify opportunities for energy conservation.
  - Changed lights over to LEDs in municipal facilities. Installed motion sensors in Town Hall.
  - Taking steps to weatherize Town Hall, including installing window inserts with Window Dressers.
  - Converting streetlights to LEDs in collaboration with Kennebunk Light and Power and Real Term Energy.
- **Promoting energy efficiency for residents and businesses:**
  - Published information on the EESC website about weatherization and energy savings programs including Efficiency Maine, Habitat for Humanity, and Window Dressers.
- **Enabling the development of and access to renewable energy:**
  - Passed PACE ordinance in 2011 to enable household energy improvement projects.



## How We'll Get There

B1. Increase efficiency in public and private buildings.			
Equity Considerations: Design outreach and incentive programs to support renters, non-tax payers, and lower income community members.		Partners	Category
Action Items	Support weatherization outreach and incentive programs that provide resources and information on efficiency evaluation, Efficiency Maine incentives, contractors, and financing options.	York County Community Action Corp. (YCCAC), SMPDC	Regional
	Create incentives to build resilient, energy-efficient, and low-carbon affordable housing.	Planning Board	
	Support the adoption of higher efficiency building codes at a regional level.	Planning Board	
	Identify and undertake energy efficiency measures for existing municipal facilities and incorporate stringent energy efficiency standards into new municipal buildings.	Energy Efficiency and Sustainability Committee (EESC)	
	Support efforts at RSU21 to identify and implement energy efficiency measures at school facilities.	RSU21, EESC	Joint with Kennebunkport
Ongoing Efforts: New regional program, Southern Maine Energy Navigator Pilot Program, will provide support for lower income community members to access energy efficiency rebate programs. The Town has had preliminary discussions with RSU21 about exploring energy efficiency measures and solar.			

B2. Support the shift of existing buildings & new construction to all-electric heating and appliances.			
Equity Considerations: Design outreach and incentive programs to prioritize low-income homeowners, multi-unit rental properties, and homes using fuel oil.		Partners	Category
Action Items	Support outreach and incentive programs that provide resources and information for Efficiency Maine's heat pump adoption programs and electrification programs.	YCCAC, SMPDC	Regional
	Support current town plans to transition more municipal buildings to heat pumps and purchase electric appliances where possible.		
	Encourage the school system to consider opportunities to transition to heat pumps and electric appliances.	RSU21	Joint with Kennebunkport
Ongoing Efforts: New regional program, Southern Maine Energy Navigator Pilot Program, will provide support for lower income community members to access energy efficiency rebate programs. The Town has had preliminary discussions with RSU21 about exploring energy efficiency measures and solar.			

## B3. Encourage distributed renewable energy.

**Equity Considerations:** Support renters and lower income homeowners in solarization efforts. Connect participants with programs with reduced upfront costs and promote solar on multi-unit dwellings.

		Partners	Category
Action Items	Review and amend ordinances to remove barriers to solar installations such as height restrictions.	Planning Board	
	Participate in the SolSmart program to reduce barriers to small scale solar in Kennebunk.		
	Support solarization programs that provide resources and information on solar evaluation, incentives, contractors, and financing options.	EESC	
	Actively engage in discussions of off-shore wind and other renewable sources at the regional level.	EESC	Regional
	Evaluate municipal & school property for renewable energy opportunities and install renewable energy generation where feasible.	EESC, RSU21	
	Work with KLPD to understand and remove barriers to residential and commercial solar installations.	Kennebunk Light and Power District (KLPD)	

## B4. Develop and implement a plan for maintaining power at critical facilities during power outages.

**Equity Considerations:** Target those that provide public services to vulnerable community members (healthcare facilities, emergency services, community centers, and police stations).

		Partners	Category
Action Items	Identify critical municipal and community facilities and assess their power loads.		
	Identify and implement energy efficiency measures and backup power solutions on critical facilities.		
	Partner with owners/operators of critical facilities to do the same, including RSU21 and any facility that serves as a warming center.	RSU21	



## B5. Support improved grid resilience.

**Equity Considerations:** Strengthening the grid will benefit vulnerable community members, who are disproportionately affected by power outages. This includes people with disabilities and health conditions who rely on equipment powered by electricity, like motorized wheelchairs and oxygen generators.

Action Items		Partners	Category
	Support regional-level planning in cooperation with utilities to ensure a strong grid in the transition to greater electric dependency and for all potential crises.	KLPD, Central Maine Power, SMPDC	Regional
	Work with Kennebunk Light and Power District (KLPD) to address resilience issues on the local grid.	KLPD, EESC	

## B6. Promote resilient buildings.

**Equity Considerations:** Ensure that resilient design standards place no additional cost burden on vulnerable community members.

Action Items		Partners	Category
	Adopt resilient design standards (or encourage development designs) for new and redevelopment that consider both current and potential future hazards from climate change.	Planning Board	
	Encourage critical facilities to consider climate-related weather risks in both location and design and develop plans for resilience.		
	Encourage the State to require flood risk disclosure for all property transactions.	Planning Board	Regional





# TRANSPORTATION AND INFRASTRUCTURE

FACILITATING THE TRANSITION TO LOW AND ZERO EMISSIONS TRANSPORTATION WHILE SUPPORTING ALTERNATIVES TO SINGLE-OCCUPANCY VEHICLES AND STRENGTHENING LOCAL INFRASTRUCTURE.

## Connection to Climate Change

Our travel choices have a big impact on climate change, especially when most of us drive alone in gas or diesel vehicles to commute. Transportation emissions make up over 40% of Kennebunk's GHG emissions. We must create a sustainable transportation system that prioritizes safe, accessible, clean options for travel, including public transportation, bicycling, and walking. At the same time, we need to ensure that Kennebunk's infrastructure, including roads, bridges, and wastewater systems, are resilient to increasing climate hazards like storms, sea level rise, and extreme precipitation.

## Where We Stand

- **Promoting and facilitating pedestrian and bike networks:**
  - Added bike lanes to several roads including Summer Street and Dane Street and planning for bike lanes in future road projects.
  - Proactively constructing or reconstructing sidewalks where residents have requested them and as part of Complete Streets projects.
  - Bicycle parking is provided at parks and beaches, and at most municipal facilities.
- **Increasing access to public transit:**
  - Partnered with York County Community Action Corporation (YCCAC) to pursue multi-modal transport options.
  - Partnered with Biddeford Saco Old Orchard Beach Transit (BSOOB) to expand workforce transit services.
  - Pursued a workforce transportation grant in collaboration with local employers to meet shift and staffing needs.



## How We'll Get There

### T1. Expand access to and use of public transit services.

**Equity Considerations:** Public transit is an essential public service, especially for more vulnerable community members such as those who are disabled or without a vehicle.

		Partners	Category
Action Items	Support a concerted regional effort toward expansion of public transportation throughout southern Maine.	RideMaine, York County Community Action Corp. (YCCAC)	Regional
	Identify and implement measures to make transit services more accessible (e.g. welcoming bus stops, bus frequency and hour modifications, route redesigns).	RideMaine, YCCAC	Regional
	Identify and promote measures to increase transit options for tourists, such as through a trolley service.		Regional

### T2. Increase walkability and bikeability.

**Equity Considerations:** Bicycle and pedestrian infrastructure investment should be designed to benefit portions of the community who are most reliant on biking or walking as their primary mode of transportation.

		Partners	Category
Action Items	Identify gaps in pedestrian and the bicycle networks and barriers to active modes of travel.	Planning Board	
	Work with stakeholders to develop off-road multi use pathways between Kennebunk and Kennebunkport.	Kennebunk Land Trust, Eastern Trail Alliance	Joint with Kennebunkport
	Develop and implement a bicycle and pedestrian plan to improve connectivity in the community and beyond with safe, comfortable, and convenient paths and sidewalks.	SMPDC/ Kittery Area Comprehensive Transportation System (KACTS)	
	Collaborate with regional partners and the Conservation Commission to connect on- and off-road bicycle facilities with existing and planned regional trail networks.	Kennebunk Land Trust, KKW Water District	Regional

**Ongoing Efforts:** The Town and other partners are currently working to create a task force to identify connectivity of existing trails and potential for expanding the network.

## T3. Expand electric vehicle charging on public and private lands.

**Equity Considerations:** Expanding access to EV charging will benefit low- and moderate-income drivers who have less access to charging-enabled off-street parking.

		Partners	Category
Action Items	Expand public EV charging locations through public/private partnerships, including in existing publicly-accessible but privately-owned lots.	Planning Board	
	Promote the installation of EV chargers or EV-ready parking in new development and redevelopment projects.		
	Identify opportunities for streamlining or clarifying permitting processes for EV charging stations.		
	Provide educational resources about EV charging (public stations and ways to charge at home).		

**Ongoing Efforts:** The Town is reviewing all municipal site plans and requesting all sites with multiple units be equipped with EV chargers.

## T4. Increase public and private use of electric vehicles.

		Partners	Category
Action Items	Target municipal fleets, school bus fleets, and public transit fleets for transitioning to EVs.	RSU21, YCCAC	Regional
	Ensure the public has user-friendly information and resources to encourage and assist with purchasing EVs.		

## T5. Improve the resiliency of critical infrastructure to climate change.

**Equity Considerations:** Upgrades to infrastructure should consider how upgrades will impact utility ratepayers by involving the community in decision-making.

		Partners	Category
Action Items	Coordinate with KKW District and Kennebunk Sewer District to incorporate climate change resilience and sustainability principles in management and decision-making.	Planning Board, KKW District, Kennebunk Sewer District	
	Coordinate with KKW District to establish and implement a program to protect drinking water sources and ensure safe and reliable drinking water supply.	KKW District	
	Coordinate with KKW and Kennebunk Sewer District to identify and implement resilient upgrades to sewer and water infrastructure, especially in areas at risk of flooding.	KKW District, Kennebunk Sewer District	
	Advocate for a regional groundwater modeling effort to identify areas of risk for groundwater rise and saltwater intrusion and locations of vulnerable private septic systems and wells.	SMPDC	Regional

## T6. Improve the resiliency of surface transportation infrastructure, such as roads, bridges, and culverts, to climate change

	Partners	Category
Action Items		
	SMPDC	Regional

**Ongoing Efforts:** Through Climate Ready Coast Southern Maine, a regional coastal resilience planning effort, the Lower Village area and beach neighborhoods were identified as high priority vulnerable sites.





# LAND USE AND NATURAL ENVIRONMENT

PROTECTING AND ENHANCING NATURAL  
RESOURCES WHILE DIRECTING DEVELOPMENT TO  
PROTECT VULNERABLE PEOPLE AND PLACES.

## Connection to Climate Change

Land use is how the physical world is modified or put to use for our purposes, while the natural environment includes all aspects of healthy and functioning ecosystems. How we use the land directly relates to how the natural environment is able to withstand and adapt to climate change impacts. We must ensure that Kennebunk's land use policies and regulations protect the natural environment and encourage sustainable, healthy relationships with the land. In doing so our community will gain many resilience benefits, including cooling (through shade and evapotranspiration), reduction and filtration of stormwater runoff, and carbon sequestration– the removal of GHGs from the atmosphere.

## Where We Stand

- **Integrating climate resilience measures in zoning and development standards:**
  - Updated the floodplain ordinance in 2023 to require residential and commercial buildings in coastal areas to be elevated at least two feet above base flood elevation (BFE), one foot higher than state minimum..
- **Incorporating consideration of climate hazards into municipal planning and policies:**
  - Updated shoreland zoning maps in the Comprehensive Plan to show highest astronomical tide.
  - Planning annual review of floodplain management and land use ordinances to strengthen standards and consider enhanced setback requirements in vulnerable areas.
- **Promoting and practicing sustainable landscaping approaches:**
  - Developed an integrated pest management program for municipal landscapes using low-impact alternative products.
  - Encouraging sustainable management of cultivated landscapes.
- **Supporting the protection, conservation, and restoration of natural lands and waters:**
  - Passed Wetlands Mitigation Ordinance in 2022.
  - Approved Open Space Plan and Open Space Standards Ordinance in 2004.
  - Member of the Branch Brook Watershed Coalition.
  - Kennebunk Tree Committee recommends policy and plans with regards to the planting, care and removal of municipal trees.



## How We'll Get There

**LN1. Direct growth and development to areas with existing infrastructure, services, and low risk of climate hazards, decreasing needs for private vehicles and increasing accessibility to services.**

		Partners	Category
Action Items	Amend ordinances to continue to direct growth and development toward appropriate areas that are already developed, have public services (e.g. water and sewer), and are at low risk of natural hazards and climate change impacts. Discourage growth and development in areas at high risk of climate hazards.	Planning Board	
	Refine ordinance to allow increased density in areas with sewer, water, energy transmission, other amenities, and low risk of climate hazards. Pair efforts to increase density with increased public transit and alternative transportation options.	Planning Board	
	Review and modify as necessary incentives for infill development in growth areas, such as the Route 1 corridor and other areas close to goods and services, including downtown and village centers outside of flood hazard areas.	Planning Board	

**Ongoing Efforts:** The Town is reviewing all municipal site plans with this in mind and promoting projects that meet this criteria. The Comprehensive Plan, approved in 2022, supports this strategy.

**LN2. Conserve, protect, and restore natural resources, areas that are vulnerable to climate hazards, and those that help to mitigate climate risks.**

		Partners	Category
Action Items	Update the open space plan to promote the protection of climate-threatened natural areas as well as those areas that provide carbon sequestration and water quality benefits through acquisition, easements, and current use programs.	Conservation Commission	
	Enact and enforce policies and land use regulations, such as a wetland impact assessment, increased buffers and setbacks, and regulation of wetlands smaller than the state threshold of 10 acres, that preserve and restore wetlands.	Planning Board	
	Refine ordinances to preserve areas that allow for marsh migration by protecting them from development.	Planning Board	
	Promote and encourage "nature-based solutions", such as the restoration of sand dunes or wetlands, to protect shorelines and coastal property from flooding and erosion.	Planning Board, Energy Efficiency and Sustainability Committee (EESC), Conservation Commission, Kennebunk Land Trust	

## LN2 . Continued

		Partners	Category
<b>Action Items</b>	Participate in a watershed protection program and coordinate with watershed communities on stormwater management and watershed protection measures.	Watershed communities	Regional
	Support restoration of habitat that enhances resilience, sequesters carbon, promotes biodiversity, and provides public recreational benefits and public access.	Conservation Commission, Kennebunk Land Trust	
	Discourage fertilizer, pesticide, and herbicide use by conducting education and outreach and adopting land use regulations.		
	Advocate for statewide limits on residential use of fertilizers, pesticides, and herbicides, particularly in shoreland areas.		Regional

**Ongoing Efforts:** The Town currently regulates wetlands greater than 1 acre and passed a Wetland Mitigation Ordinance in 2022 to regulate impacts greater than 499 square feet.

## LN3. Incorporate climate change considerations into land use planning and regulations.

<b>Equity Considerations:</b> Those who write, administer, or enforce zoning regulations should take steps to avoid unfair outcomes and mitigate the unequal ability to participate in or influence all parts of the zoning process. Involve community members in the design and decision making of buyout programs. Ensure there are areas of the community that can accommodate and have been zoned for relocation of willing property owners. Provide adequate compensation for willing property owners.		Partners	Category
<b>Action Items</b>	Conduct a review of land use ordinances and policies to identify opportunities for incorporating resilience and sustainability measures and standards.	Planning Board	
	Amend land use and site plan/subdivision ordinances to require consideration of climate change resilience in development project applications.	Planning Board	
	Encourage that building designs and modifications consider both current and potential future hazards from climate change.	Planning Board	
	Amend ordinances to direct development away from areas that are exposed to climate-related risks, including sea level rise, erosion, and inland flooding.	Planning Board	
	Explore a managed relocation/retreat policy and utilize voluntary federal or state buyout programs to purchase properties and remove structures from areas at high risk of coastal climate hazards and convert them to open space with public access. Target areas most vulnerable to flooding such as beach neighborhoods.		
	Continue participating in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) and take actions to improve the town's CRS rating.		



# HEALTH, SAFETY, AND WELL BEING

ENSURING THE RESILIENCE OF OUR COMMUNITY  
TO CLIMATE-RELATED PUBLIC HEALTH HAZARDS  
WHILE INCREASING COMMUNITY WELL BEING.

## Connection to Climate Change

The impacts of climate change are heavily intertwined with public health and safety. Climate hazards like sea level rise, increasing tick populations, and increases in extreme heat will all affect our community, particularly our most vulnerable community members. We must ensure that Kennebunk is prepared to respond to increasing public health hazards. We must also work to increase community resilience and meet all community members' needs for safe drinking water, housing, and green space.

## Where We Stand

- **Maintaining a sustainable waste system that prioritizes reducing, reusing, and recycling:**
  - Adopted a plastic bag ban in 2016, five years prior to the statewide ban.
  - Kitchen composting program and Treasure Chest swap shop are available at the town Transfer Station.
  - Town hosts annual community yard sale and annual textile recycling event to promote waste reduction.
  - Pay-As-You-Throw program funds curbside trash and recycling services.
  - RSU 21 composts cafeteria food waste with Agri-cycle
- **Connecting residents to resources and services that support well-being and enhance community resilience:**
  - Kennebunk Social Services works collaboratively with town departments on issues related to overall community health.
  - Healthy Kennebunk works to create and enhance workplace and community wellness.
- **Promoting local food systems:**
  - RSU 21 partners with local farms including Tibbett's Farm, Fenderson Farm, Harris Farm, and Archer Angus Beef.
  - Kennebunk Farmers Market provides opportunities for community members to purchase local produce and support local family farms.
  - Community Garden Committee oversees two public gardens, providing advice on growing and opportunities to build community.



## How We'll Get There

H1. Increase awareness of and preparedness for climate-related and public health events.			
<b>Equity Considerations:</b> Information sharing systems should be easily understandable and accessible to vulnerable community members, including those without access to internet and non-English speakers. A resilience hub should be designed and managed by community members, and should be located in a well-trusted, well-utilized community facility that serves the community's needs more broadly than a temporary emergency shelter.		Partners	Category
Action Items	Develop and implement communication strategies for public health advisories for climate related health and weather events.		
	Develop a plan for establishing a designated site to serve as a "resilience hub" that can provide critical services (e.g. electricity, food, water, shelter, medical supplies, heating/cooling) to community members during climate-related emergencies or disruptions and coordinate partners for post-disruption support.		
	Implement community and school-based programs to educate community members and students about public health impacts of climate change, including mosquito- and tick-borne diseases, air quality, and heat-related illnesses.	RSU21	
	Work to strengthen collaboration with York County Emergency Management Agency on hazard mitigation planning.	York County Emergency Management Agency	Regional

H2. Implement programs to prevent food waste and waste-related emissions and decrease food insecurity to increase community resilience.			
<b>Equity Considerations:</b> Access to affordable, healthy food is a major issue for low-income and vulnerable community members. Efforts to reduce food waste should include strategies for rescuing and donating unwanted or excess foods.		Partners	Category
Action Items	Collaborate with Food Rescue MAINE to implement an edible food recovery program (produce sharing, leftover food sharing, etc).	Energy Efficiency and Sustainability Committee (EESC), Food Rescue MAINE	
	Establish a municipal composting program that includes a municipal composting site, curbside compost pick-up, and access to satellite compost drop-off sites.	EESC	
	Create more community gardens within the Town of Kennebunk.		
	Advocate for state composting requirements.	EESC	Regional

## H3. Implement a municipal single-use plastic ban.

	Partners	Category
<b>Action Items</b>	Town staff will work with vendors to determine if they can provide environmentally preferable packaging alternatives.	Vendors
	Each department shall take appropriate steps to limit the purchase, use, or sale of single-use plastic bottles.	
	The Town of Kennebunk will provide education and resources to local businesses, RSU 21 School District, and residents and work towards reducing and eliminating all single-use plastics (e.g. straws, styrofoam, food containers, utensils, bags).	Local businesses, RSU21
	Encourage the Town of Kennebunk Select Board to sign the U.S. Plastics Pact.	Select Board
	Educate the community regarding the Ordinance Prohibiting the Release and Display of Balloons.	





# LEADERSHIP AND CAPACITY

ENSURING OUR CITY HAS THE RESOURCES AND SUPPORT TO IMPLEMENT CLIMATE ACTIONS.

## Connection to Climate Change

Kennebunk's town government will be instrumental in providing leadership, resources, and accountability to implement our CAP. The Town will work to ensure that departments and community members have the support and information needed to achieve the goals laid out in this plan.

## Where We Stand

- **Actively participating in national and regional climate networks:**
  - Signed the U.S. Mayors Climate Protection Agreement in 2007.
  - Joined the Global Covenant of Mayors for Climate & Energy in 2018.
  - Member of ICLEI – Local Governments for Sustainability.
  - Worked with students from UNH and The New School on climate issues.
- **Formally adopting State climate change goals, policies, and strategies:**
  - Enrolled in the State's Community Resilience Partnership in 2022.
- **Conducting outreach and education to community members:**
  - Working with The Climate Initiative (TCI), along with Kennebunkport, to train youth to lead community conversations about climate change, specifically related to sea level rise in Lower Village and Dock Square.
  - Completed a project with the Wells National Estuarine Reserve in 2018 to help beach-based businesses assess their resilience to natural disasters using the Tourism Resilience Index.
  - The Town and several local organizations have hosted educational events on climate change issues, including EESC, the Planeteers of Southern Maine local chapter, and Unitarian Universalist Church..



## How We'll Get There

### LS1. Establish local funding mechanisms to financially support climate actions.

<b>Equity Considerations:</b> Consider how use of funds can best counteract existing disparities and/or specifically benefit vulnerable community members. Prioritize community input and transparency in the decision making process.		<b>Partners</b>	<b>Category</b>
<b>Action Items</b>	Establish a municipal fund to support projects related to climate resilience and sustainability. Make annual appropriations to the fund and invest the assets to grow the fund over the long-term.		
	Identify and pursue federal, state, and other funding opportunities to support climate actions.		
	Enact impact fees on new and redevelopment projects to help financially support climate change adaptation and mitigation action within the community.		

### LS2. Incorporate climate resilience and GHG emission-reduction criteria in municipal policies, expenditures, and decision-making.

<b>Equity Considerations:</b> Evaluate potential policies and regulations for their impact on vulnerable community members. Consider how use of funds can best counteract existing disparities and/or specifically benefit vulnerable community members. Prioritize community input and transparency in the decision making process.		<b>Partners</b>	<b>Category</b>
<b>Action Items</b>	Incorporate climate resilience and sustainability in all short- and long-term municipal decision-making and policy documents and plans, including the Comprehensive Plan, to help ensure that decisions, regulations, and policies are supporting local climate change goals and priorities.		
	Adopt protocols to account for environmental conditions of today and tomorrow in municipal decision-making and investments.		
	Include funding for resilience and sustainability investments in annual budgets and capital plans.		
	Track municipal expenditures (e.g. staff time, overtime, and supplies) for preparation, response, and repair activities related to storm and flooding events to inform capital improvement expenditures and guide prioritization of upgrade efforts.		

**Ongoing Efforts:** The Town currently tracks municipal expenditures for larger storms and disaster declarations, but not for all storm related activity.

## LS3. Increase municipal capacity to implement the Climate Action Plan.

Equity Considerations: Municipal trainings should include the ways that historically disadvantaged and vulnerable populations are more vulnerable to climate change impacts and should be incorporated with equity training.		Partners	Category
Action Items	Create a municipal staff position for sustainability efforts whose mandate will be to coordinate the implementation of the Climate Action Plan with all departments as well as an appointed committee and secure funding via grants and private/state/federal monies to support the implementation of strategies.		
	Create a committee to evaluate the Climate Action Plan and consider the prioritization of strategies for implementation of the plan.		
	Evaluate existing capacity of municipal departments to implement the Climate Action Plan, identify opportunities for improvements, and implement actions to enhance capacity.		
	Work with SMPDC to provide climate change training for municipal boards, commissions, and committees.	SMPDC	Regional

## LS4. Actively engage community members in local climate, sustainability, and resilience issues.

		Partners	Category
Action Items	Partner with community organizations to actively engage community members on local climate, sustainability, and resilience issues through education events, the town website, and other communication outlets.	Energy Efficiency and Sustainability Committee (EESC), Southern Maine Planeteers, The Climate Initiative	
	Collaborate with local schools to incorporate climate change, resilience, and sustainability into school curricula and operations (buildings, vehicle fleet, etc).	EESC, RSU21, The Climate Initiative	Joint with Kennebunkport



# CONCLUSION



# WHAT'S NEXT

One of our priority steps upon completion of the plan is to request that the Town of Kennebunk create a new Climate Committee. **If approved, this committee will report annually to the Select Board and town staff to provide updates and report progress towards the actions and goals outlined in this plan.** The committee will engage in activities such as:

- Create work plans for CAP implementation, including action leads, costs, funding sources, and timeframes.
- Partner with town and regional groups to implement priority actions.
- Work with partners to model CAP GHG emissions reduction strategies in line with our goals of reducing greenhouse gas emissions 45% by 2030 and 80% by 2050.
- Regularly update Kennebunk's GHG inventory to measure changes in emissions.
- Aid the town in tracking our climate goals.



Throughout the process of creating this plan, Kennebunk has engaged with the Southern Maine CAP Cohort to work with the towns of Biddeford, Kennebunkport, and Kittery to identify potential regional actions and opportunities for collaboration. This partnership and focus on action that both we and our neighbors can take to combat climate change will be a guide for what we do next upon completion of the plan.



## Potential Regional Strategies

### Buildings and Energy



- Increase efficiency in public and private buildings. **(B1)**
- Support the shift of existing buildings and new construction to all-electric heating and appliances. **(B2)**
- Encourage distributed renewable energy. **(B3)**
- Develop and implement a plan for maintaining power at critical facilities during power outages **(B4)**
- Support improved grid resilience. **(B5)**
- Promote resilience buildings. **(B6)**

### Transportation and Infrastructure



- Expand access to and use of public transit services. **(T1)**
- Increase walkability and bikeability. **(T2)**
- Expand electric vehicle charging on public and private lands. **(T3)**
- Increase public and private use of electric vehicles. **(T4)**
- Improve the resiliency of critical infrastructure to climate change. **(T5)**
- Improve the resiliency of surface transportation infrastructure, such as roads, bridges, and culverts, to climate change. **(T6)**

### Land Use and Natural Environment



- Direct growth and development to areas with existing infrastructure, services, and low risk of climate hazards, decreasing needs for private vehicles and increasing accessibility to services. **(LN1)**
- Conserve, protect, and restore natural resources, areas that are vulnerable to climate hazards, and those that help to mitigate climate risks. **(LN2)**
- Incorporate climate change considerations into land use planning and regulations. **(LN3)**

### Health, Safety, and Wellness



- Increase awareness of and preparedness for climate-related and public health events. **(H1)**
- Implement programs to prevent food waste and waste-related emissions and decrease food insecurity to increase community resilience. **(H2)**
- Implement a municipal single-use plastic ban. **(H3)**

### Leadership and Capacity



- Establish local funding mechanisms to financially support climate actions. **(LS1)**
- Incorporate climate resilience and GHG emission-reduction criteria in municipal policies, expenditures, and decision-making. **(LS2)**
- Increase municipal capacity to implement the Climate Action Plan. **(LS3)**
- Actively engage community members in local climate, sustainability, and resilience issues. **(LS4)**

# LOOKING AHEAD

Southern Maine is a rapidly changing region, and Kennebunk is no exception. With the development of new technologies, shifting populations, and a changing climate, it is vital that the actions and timelines we've laid out in this CAP are adaptable to future conditions. **Our CAP is a dynamic document that we will constantly refer to and revise when necessary and appropriate to determine the best path forward to make progress on our climate goals.** We will also hold ourselves accountable to report on our progress in meeting our milestones and targets.

## How To Stay Involved!

Follow along with progress on our CAP through the Climate Action Plan Task Force webpage: <https://www.kennebunkmaine.us/1153/Climate-Action-Planning>



# APPENDICES



# APPENDIX A: GLOSSARY

**Co-benefits** – The added benefits received when acting to control climate change, above and beyond the direct benefits of a more stable climate.

**Community solar** – A solar project or farm that allows customers unable to access roof top solar to buy or lease shares based on usage and that delivers solar-generated power from the project or farm to the grid.

**Efficiency** – Describes energy-related measures taken to reduce climate change impacts, such as building energy-efficient buildings, producing fuel efficient vehicles, and reducing industrial greenhouse gas emissions.

**Electrification** – The process of converting fossil fuel technologies and processes to electricity, for example vehicles that use gasoline and buildings heated with oil or gas.

**Extreme heat** – At least two to three days of heat and humidity with temperatures above 90 degrees.

**Greenhouse gas emissions (GHG)** – Gases released during combustion of fossil fuels, the majority of which are carbon dioxide, with smaller amounts of methane and nitrous oxide. These emissions trap heat in the atmosphere and warm the planet.

**Groundwater rise** – The movement upward of the groundwater table due to fluctuations in rainfall recharge rates and/or river, ocean, or tidal levels.

**Heat island** – An area that is denser with buildings, roads and sidewalks which absorb and re-emit the sun's heat at higher rates than less developed areas which tend to have more trees and vegetation.

**Heat-related illness** – A serious medical condition resulting from the body's inability to cope with a particular heat load, resulting in heat cramps, heat exhaustion, and heat stroke.

**Heat pump** – An appliance that uses electricity to provide both heating and cooling to a building. To warm a building, it extracts heat from outside the building and moves it inside. To cool a building, it moves heat from inside the building to outside.

**Infill development** – Refers to development, often housing, that is built within an already established neighborhood or area of town on unused or underutilized land.

**Impervious surface** – A non-vegetated, hard surface such as pavement, roads, sidewalks, gravel driveways, stone paths or roofs, which causes rainwater to run off rather than soak into the soil.

**Infrastructure** – The Town's physical structures and facilities such as public roads, stormwater management systems, wastewater management plants and systems, and drinking water systems.

**Multi-modal transport** – Transportation which supports the needs of all users whether they choose to walk, bike, use transit or drive.

**Nature-based Solutions (NBS)** – Planning, design and engineering practices that weave natural features or processes into the built environment to promote adaptation and resilience.

**Resilience** – Refers to climate resilience which means the ability to prepare for, recover from, and adapt to the impacts of climate change.

# Appendix A: Glossary

**Saltwater intrusion** – Occurs when saltwater infiltrates freshwater sources either underground or by overtopping lower land areas near the coast. Sea level rise and storm surge are among the causes of saltwater intrusion into freshwater drinking sources.

**Social equity** – The fair treatment and involvement of all people and communities—regardless of race, gender, national origin, or income level—in the development, implementation, and enforcement of environmental laws, regulations, and policies.

**Stormwater** – Water, generated by rain, hail and snowmelt events that flows over land or impervious surfaces such as roads, parking lots and roofs.

**Sustainability** – As defined by the United Nations in their publication Our Common Future: “meeting the needs of the present without compromising the ability of future generations to meet their own needs”. There are three pillars of sustainability as described in the UN publication: environmental, social and economic.

**Sustainable Landscaping** – An approach to landscape design, construction, and maintenance that encompasses ecologically sound practices, including the use of Northeastern native plants that have demonstrated abilities to tolerate heat, drought and/or flooding while requiring little to no fertilization and watering once established.

**Upstream Impacts** – Greenhouse gas emissions that result from the production and delivery of electricity to Kittery.

**Vector-borne disease** – Disease, such as Lyme, resulting from an infection transmitted to humans by blood-feeding mosquitoes, ticks or fleas.

**Vulnerable populations** – Residents who due to social and economic factors like income, education, health care access and housing are more vulnerable to the impacts of climate change such as flood and heat-related impacts.

# APPENDIX B: COMPLETE CLIMATE ACTIONS MATRIX

## B1. Increase efficiency in public and private buildings.

**Equity Considerations:** Design outreach and incentive programs to support renters, non-tax payers, and lower income community members.

		Partners	Category
Action Items	Support weatherization outreach and incentive programs that provide resources and information on efficiency evaluation, Efficiency Maine incentives, contractors, and financing options.	York County Community Action Corp. (YCCAC), SMPDC	Regional
	Create incentives to build resilient, energy-efficient, and low-carbon affordable housing.	Planning Board	
	Support the adoption of higher efficiency building codes at a regional level.	Planning Board	
	Identify and undertake energy efficiency measures for existing municipal facilities and incorporate stringent energy efficiency standards into new municipal buildings.	Energy Efficiency and Sustainability Committee (EESC)	
	Support efforts at RSU21 to identify and implement energy efficiency measures at school facilities.	RSU21, EESC	Joint with Kennebunkport

**Ongoing Efforts:** New regional program, Southern Maine Energy Navigator Pilot Program, will provide support for lower income community members to access energy efficiency rebate programs. The Town has had preliminary discussions with RSU21 about exploring energy efficiency measures and solar.

## B2. Support the shift of existing buildings & new construction to all-electric heating and appliances.

**Equity Considerations:** Design outreach and incentive programs to prioritize low-income homeowners, multi-unit rental properties, and homes using fuel oil.

		Partners	Category
Action Items	Support outreach and incentive programs that provide resources and information for Efficiency Maine's heat pump adoption programs and electrification programs.	YCCAC, SMPDC	Regional
	Support current town plans to transition more municipal buildings to heat pumps and purchase electric appliances where possible.		
	Encourage the school system to consider opportunities to transition to heat pumps and electric appliances.	RSU21	Joint with Kennebunkport

**Ongoing Efforts:** New regional program, Southern Maine Energy Navigator Pilot Program, will provide support for lower income community members to access energy efficiency rebate programs. The Town has had preliminary discussions with RSU21 about exploring energy efficiency measures and solar.

# Appendix B: Complete Climate Actions Matrix

## B3. Encourage distributed renewable energy.

<b>Equity Considerations:</b> Support renters and lower income homeowners in solarization efforts. Connect participants with programs with reduced upfront costs and promote solar on multi-unit dwellings.		<b>Partners</b>	<b>Category</b>
<b>Action Items</b>	Review and amend ordinances to remove barriers to solar installations such as height restrictions.	Planning Board	
	Participate in the SolSmart program to reduce barriers to small scale solar in Kennebunk.		
	Support solarization programs that provide resources and information on solar evaluation, incentives, contractors, and financing options.	EESC	
	Actively engage in discussions of off-shore wind and other renewable sources at the regional level.	EESC	Regional
	Evaluate municipal & school property for renewable energy opportunities and install renewable energy generation where feasible.	EESC, RSU21	
	Work with KLPD to understand and remove barriers to residential and commercial solar installations.	Kennebunk Light and Power District (KLPD)	

## B4. Develop and implement a plan for maintaining power at critical facilities during power outages.

<b>Equity Considerations:</b> Target those that provide public services to vulnerable community members (healthcare facilities, emergency services, community centers, and police stations).		<b>Partners</b>	<b>Category</b>
<b>Action Items</b>	Identify critical municipal and community facilities and assess their power loads.		
	Identify and implement energy efficiency measures and backup power solutions on critical facilities.		
	Partner with owners/operators of critical facilities to do the same, including RSU21 and any facility that serves as a warming center.	RSU21	

## B5. Support improved grid resilience.

<b>Equity Considerations:</b> Strengthening the grid will benefit vulnerable community members, who are disproportionately affected by power outages. This includes people with disabilities and health conditions who rely on equipment powered by electricity, like motorized wheelchairs and oxygen generators.		<b>Partners</b>	<b>Category</b>
<b>Action Items</b>	Support regional-level planning in cooperation with utilities to ensure a strong grid in the transition to greater electric dependency and for all potential crises.	KLPD, Central Maine Power, SMPDC	Regional
	Work with Kennebunk Light and Power District (KLPD) to address resilience issues on the local grid.	KLPD, EESC	

# Appendix B: Complete Climate Actions Matrix

## B6. Promote resilient buildings.

<b>Equity Considerations:</b> Ensure that resilient design standards place no additional cost burden on vulnerable community members.		<b>Partners</b>	<b>Category</b>
<b>Action Items</b>	Adopt resilient design standards (or encourage development designs) for new and redevelopment that consider both current and potential future hazards from climate change.	Planning Board	
	Encourage critical facilities to consider climate-related weather risks in both location and design and develop plans for resilience.		
	Encourage the State to require flood risk disclosure for all property transactions.	Planning Board	Regional

## T1. Expand access to and use of public transit services.

<b>Equity Considerations:</b> Public transit is an essential public service, especially for more vulnerable community members such as those who are disabled or without a vehicle.		<b>Partners</b>	<b>Category</b>
<b>Action Items</b>	Support a concerted regional effort toward expansion of public transportation throughout southern Maine.	RideMaine, YCCAC	Regional
	Identify and implement measures to make transit services more accessible (e.g. welcoming bus stops, bus frequency and hour modifications, route redesigns).	RideMaine, YCCAC	Regional
	Identify and promote measures to increase transit options for tourists, such as through a trolley service.		Regional

## T2. Increase walkability and bikeability.

<b>Equity Considerations:</b> Bicycle and pedestrian infrastructure investment should be designed to benefit portions of the community who are most reliant on biking or walking as their primary mode of transportation.		<b>Partners</b>	<b>Category</b>
<b>Action Items</b>	Identify gaps in pedestrian and the bicycle networks and barriers to active modes of travel.	Planning Board	
	Work with stakeholders to develop off-road multi use pathways between Kennebunk and Kennebunkport.	Kennebunk Land Trust, Eastern Trail Alliance	Joint with Kennebunkport
	Develop and implement a bicycle and pedestrian plan to improve connectivity in the community and beyond with safe, comfortable, and convenient paths and sidewalks.	SMPDC/ Kittery Area Comprehensive Transportation System (KACTS)	

# Appendix B: Complete Climate Actions Matrix

## T2. Continued

**Equity Considerations:** Bicycle and pedestrian infrastructure investment should be designed to benefit portions of the community who are most reliant on biking or walking as their primary mode of transportation.

Action Items	Partners	Category
Collaborate with regional partners and the Conservation Commission to connect on- and off-road bicycle facilities with existing and planned regional trail networks.	Kennebunk Land Trust, KKW Water District	Regional

**Ongoing Efforts:** The Town and other partners are currently working to create a task force to identify connectivity of existing trails and potential for expanding the network.

## T3. Expand electric vehicle charging on public and private lands.

**Equity Considerations:** Expanding access to EV charging will benefit low- and moderate-income drivers who have less access to charging-enabled off-street parking.

Action Items	Partners	Category
Expand public EV charging locations through public/private partnerships, including in existing publicly-accessible but privately-owned lots.	Planning Board	
Promote the installation of EV chargers or EV-ready parking in new development and redevelopment projects.		
Identify opportunities for streamlining or clarifying permitting processes for EV charging stations.		
Provide educational resources about EV charging (public stations and ways to charge at home).		

**Ongoing Efforts:** The Town is reviewing all municipal site plans and requesting all sites with multiple units be equipped with EV chargers.

## T4. Increase public and private use of electric vehicles.

Action Items	Partners	Category
Target municipal fleets, school bus fleets, and public transit fleets for transitioning to EVs.	RSU21, YCCAC	Regional
Ensure the public has user-friendly information and resources to encourage and assist with purchasing EVs.		

# Appendix B: Complete Climate Actions Matrix

## T5. Improve the resiliency of critical infrastructure to climate change.

<b>Equity Considerations:</b> Upgrades to infrastructure should consider how upgrades will impact utility ratepayers by involving the community in decision-making.		<b>Partners</b>	<b>Category</b>
<b>Action Items</b>	Coordinate with KKW District and Kennebunk Sewer District to incorporate climate change resilience and sustainability principles in management and decision-making.	Planning Board, KKW District, Kennebunk Sewer District	
	Coordinate with KKW District to establish and implement a program to protect drinking water sources and ensure safe and reliable drinking water supply.	KKW District	
	Coordinate with KKW and Kennebunk Sewer District to identify and implement resilient upgrades to sewer and water infrastructure, especially in areas at risk of flooding.	KKW District, Kennebunk Sewer District	
	Advocate for a regional groundwater modeling effort to identify areas of risk for groundwater rise and saltwater intrusion and locations of vulnerable private septic systems and wells.	SMPDC	Regional

## T6. Improve the resiliency of surface transportation infrastructure, such as roads, bridges, and culverts, to climate change

		<b>Partners</b>	<b>Category</b>
<b>Action Items</b>	Modify existing transportation infrastructure assets (roads, culverts, bridges) that are vulnerable to flooding, sea level rise, and other climate hazards to increase their resilience by raising, relocating, and/or upsizing them. Beach Ave, Boothby Rd, Parsons Beach Rd, Great Hill Rd, Durrell's Bridge Rd, Route 9 /Western Ave, and beach neighborhood roads are some of the town's most vulnerable to flooding.		
	Assess impacts of heat, groundwater rise, and saltwater intrusion and flooding caused by sea level rise on local transportation infrastructure to better understand vulnerabilities of important infrastructure assets.	SMPDC	Regional
	Integrate climate resilience measures in tidal and non-tidal road crossing projects, including new and replacement culverts and bridges.		
	Apply Maine CoastWise principles to tidal road crossing projects and require new roadway culverts and culvert replacement and upgrades in non-tidal areas to follow Maine Stream Smart principles.		
	Review and update evacuation routes, along with the signage, maps and technology that direct people away from flood hazard areas.		
	Amend road design standards to include climate resilience and adopt a policy stating the Town will only consider adopting roads that have a low vulnerability to climate impacts.		

**Ongoing Efforts:** Through Climate Ready Coast Southern Maine, a regional coastal resilience planning effort, the Lower Village area and beach neighborhoods were identified as high priority vulnerable sites.

# Appendix B: Complete Climate Actions Matrix

## LN1. Direct growth and development to areas with existing infrastructure, services, and low risk of climate hazards, decreasing needs for private vehicles and increasing accessibility to services.

		Partners	Category
Action Items	Amend ordinances to continue to direct growth and development toward appropriate areas that are already developed, have public services (e.g. water and sewer), and are at low risk of natural hazards and climate change impacts. Discourage growth and development in areas at high risk of climate hazards.	Planning Board	
	Refine ordinance to allow increased density in areas with sewer, water, energy transmission, other amenities, and low risk of climate hazards. Pair efforts to increase density with increased public transit and alternative transportation options.	Planning Board	
	Review and modify as necessary incentives for infill development in growth areas, such as the Route 1 corridor and other areas close to goods and services, including downtown and village centers outside of flood hazard areas.	Planning Board	

**Ongoing Efforts:** The Town is reviewing all municipal site plans with this in mind and promoting projects that meet this criteria. The Comprehensive Plan, approved in 2022, supports this strategy.

## LN2. Conserve, protect, and restore natural resources, areas that are vulnerable to climate hazards, and those that help to mitigate climate risks.

		Partners	Category
Action Items	Update the open space plan to promote the protection of climate-threatened natural areas as well as those areas that provide carbon sequestration and water quality benefits through acquisition, easements, and current use programs.	Conservation Commission	
	Enact and enforce policies and land use regulations, such as a wetland impact assessment, increased buffers and setbacks, and regulation of wetlands smaller than the state threshold of 10 acres, that preserve and restore wetlands.	Planning Board	
	Refine ordinances to preserve areas that allow for marsh migration by protecting them from development.	Planning Board	
	Promote and encourage "nature-based solutions", such as the restoration of sand dunes or wetlands, to protect shorelines and coastal property from flooding and erosion.	Planning Board, EESC, Conservation Commission, Kennebunk Land Trust	

# Appendix B: Complete Climate Actions Matrix

## LN2. Continued

		Partners	Category
Action Items	Participate in a watershed protection program and coordinate with watershed communities on stormwater management and watershed protection measures.	Watershed communities	Regional
	Support restoration of habitat that enhances resilience, sequesters carbon, promotes biodiversity, and provides public recreational benefits and public access.	Conservation Commission, Kennebunk Land Trust	
	Discourage fertilizer, pesticide, and herbicide use by conducting education and outreach and adopting land use regulations.		
	Advocate for statewide limits on residential use of fertilizers, pesticides, and herbicides, particularly in shoreland areas.		Regional

**Ongoing Efforts:** The Town currently regulates wetlands greater than 1 acre and passed a Wetland Mitigation Ordinance in 2022 to regulate impacts greater than 499 square feet.

## LN3. Incorporate climate change considerations into land use planning and regulations.

<b>Equity Considerations:</b> Those who write, administer, or enforce zoning regulations should take steps to avoid unfair outcomes and mitigate the unequal ability to participate in or influence all parts of the zoning process. Involve community members in the design and decision making of buyout programs. Ensure there are areas of the community that can accommodate and have been zoned for relocation of willing property owners. Provide adequate compensation for willing property owners.		Partners	Category
Action Items	Conduct a review of land use ordinances and policies to identify opportunities for incorporating resilience and sustainability measures and standards.	Planning Board	
	Amend land use and site plan/subdivision ordinances to require consideration of climate change resilience in development project applications.	Planning Board	
	Encourage that building designs and modifications consider both current and potential future hazards from climate change.	Planning Board	
	Amend ordinances to direct development away from areas that are exposed to climate-related risks, including sea level rise, erosion, and inland flooding.	Planning Board	
	Explore a managed relocation/retreat policy and utilize voluntary federal or state buyout programs to purchase properties and remove structures from areas at high risk of coastal climate hazards and convert them to open space with public access. Target areas most vulnerable to flooding such as beach neighborhoods.		
	Continue participating in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) and take actions to improve the town's CRS rating.		

# Appendix B: Complete Climate Actions Matrix

## H1. Increase awareness of and preparedness for climate-related and public health events.

<p><b>Equity Considerations:</b> Information sharing systems should be easily understandable and accessible to vulnerable community members, including those without access to internet and non-English speakers. A resilience hub should be designed and managed by community members, and should be located in a well-trusted, well-utilized community facility that serves the community's needs more broadly than a temporary emergency shelter.</p>		<b>Partners</b>	<b>Category</b>
<b>Action Items</b>	Develop and implement communication strategies for public health advisories for climate related health and weather events.		
	Develop a plan for establishing a designated site to serve as a "resilience hub" that can provide critical services (e.g. electricity, food, water, shelter, medical supplies, heating/cooling) to community members during climate-related emergencies or disruptions and coordinate partners for post-disruption support.		
	Implement community and school-based programs to educate community members and students about public health impacts of climate change, including mosquito- and tick-borne diseases, air quality, and heat-related illnesses.	RSU21	
	Work to strengthen collaboration with York County Emergency Management Agency on hazard mitigation planning.	York County Emergency Management Agency	Regional

## H2. Implement programs to prevent food waste and waste-related emissions and decrease food insecurity to increase community resilience.

<p><b>Equity Considerations:</b> Access to affordable, healthy food is a major issue for low-income and vulnerable community members. Efforts to reduce food waste should include strategies for rescuing and donating unwanted or excess foods.</p>		<b>Partners</b>	<b>Category</b>
<b>Action Items</b>	Collaborate with Food Rescue MAINE to implement an edible food recovery program (produce sharing, leftover food sharing, etc).	EESC, Food Rescue MAINE	
	Establish a municipal composting program that includes a municipal composting site, curbside compost pick-up, and access to satellite compost drop-off sites.	EESC	
	Create more community gardens within the Town of Kennebunk.		
	Advocate for state composting requirements.	EESC	Regional

# Appendix B: Complete Climate Actions Matrix

## H3. Implement a municipal single-use plastic ban.

		Partners	Category
Action Items	Town staff will work with vendors to determine if they can provide environmentally preferable packaging alternatives.	Vendors	
	Each department shall take appropriate steps to limit the purchase, use, or sale of single-use plastic bottles.		
	The Town of Kennebunk will provide education and resources to local businesses, RSU 21 School District, and residents and work towards reducing and eliminating all single-use plastics (e.g. straws, styrofoam, food containers, utensils, bags).	Local businesses, RSU21	
	Encourage the Town of Kennebunk Select Board to sign the U.S. Plastics Pact.	Select Board	
	Educate the community regarding the Ordinance Prohibiting the Release and Display of Balloons.		

## LS1. Establish local funding mechanisms to financially support climate actions.

**Equity Considerations:** Consider how use of funds can best counteract existing disparities and/or specifically benefit vulnerable community members. Prioritize community input and transparency in the decision making process.

		Partners	Category
Action Items	Establish a municipal fund with to support projects related to climate resilience and sustainability. Make annual appropriations to the fund and invest the assets to grow the fund over the long-term.		
	Identify and pursue federal, state, and other funding opportunities to support climate actions.		
	Enact impact fees on new and redevelopment projects to help financially support climate change adaptation and mitigation action within the community.		

## LS2. Incorporate climate resilience and GHG emission-reduction criteria in municipal policies, expenditures, and decision-making.

**Equity Considerations:** Evaluate potential policies and regulations for their impact on vulnerable community members. Consider how use of funds can best counteract existing disparities and/or specifically benefit vulnerable community members. Prioritize community input and transparency in the decision making process.

		Partners	Category
Action Items	Incorporate climate resilience and sustainability in all short- and long-term municipal decision-making and policy documents and plans, including the Comprehensive Plan, to help ensure that decisions, regulations, and policies are supporting local climate change goals and priorities.		
	Adopt protocols to account for environmental conditions of today and tomorrow in municipal decision-making and investments.		

# Appendix B: Complete Climate Actions Matrix

LS2. Continued		
Equity Considerations: Evaluate potential policies and regulations for their impact on vulnerable community members. Consider how use of funds can best counteract existing disparities and/or specifically benefit vulnerable community members. Prioritize community input and transparency in the decision making process.		
	Partners	Category
Action Items	Include funding for resilience and sustainability investments in annual budgets and capital plans.	
	Track municipal expenditures (e.g. staff time, overtime, and supplies) for preparation, response, and repair activities related to storm and flooding events to inform capital improvement expenditures and guide prioritization of upgrade efforts.	
Ongoing Efforts: The Town currently tracks municipal expenditures for larger storms and disaster declarations, but not for all storm related activity.		

LS3. Increase municipal capacity to implement the Climate Action Plan.		
Equity Considerations: Municipal trainings should include the ways that historically disadvantaged and vulnerable populations are more vulnerable to climate change impacts and should be incorporated with equity training.		
	Partners	Category
Action Items	Create a municipal staff position for sustainability efforts whose mandate will be to coordinate the implementation of the Climate Action Plan with all departments as well as an appointed committee and secure funding via grants and private/state/federal monies to support the implementation of strategies.	
	Create a committee to evaluate the Climate Action Plan and consider the prioritization of strategies for implementation of the plan.	
	Evaluate existing capacity of municipal departments to implement the Climate Action Plan, identify opportunities for improvements, and implement actions to enhance capacity.	
	Work with SMPDC to provide climate change training for municipal boards, commissions, and committees.	SMPDC

LS4. Actively engage community members in local climate, sustainability, and resilience issues.		
	Partners	Category
Action Items	Partner with community organizations to actively engage community members on local climate, sustainability, and resilience issues through education events, the town website, and other communication outlets.	EESC, Southern Maine Planeteers, The Climate Initiative (TCI)
	Collaborate with local schools to incorporate climate change, resilience, and sustainability into school curricula and operations (buildings, vehicle fleet, etc).	EESC, RSU21, TCI

# APPENDIX C: PUBLIC ENGAGEMENT SUMMARY

## Task Force Formation and Vision Statement

Kennebunk's Climate Action Task Force, consisting of staff and community stakeholders, served as the lead for the Climate Action Plan development. Task Force members worked to develop clear goals for the Town's Climate Action Plan, make it easy for community members to provide input on selecting climate actions, and served as a liaison to Kennebunk's Select Board throughout the process.

As the first step in creating the Plan, the Task Force agreed on a Vision Statement:

The Town of Kennebunk is unique in many ways, but it shares with the world the detrimental effects of climate change. Climate change is a global problem, but it is being felt on a local level first and with direct consequences. The Town of Kennebunk has been moved to act in response by developing a Climate Action Plan that will chart a course to navigate this complicated issue. This plan will lay out policies and programs to further reduce the community's greenhouse gas emissions and strengthen the community's ability to adapt and thrive during these challenging times. Kennebunk will do this by bringing community members and partners together, engaging with the public on how they can make a difference, incorporating existing and future community plans, and working with local, state, federal and international organizations toward a common goal.

This effort will allow the community to budget future funds and access funding through grants to support our climate goals and build our local economy in a sustainable way that improves community health and livability. This plan will be consistent with the State of Maine's priorities and will allow us to do our part to meet state and national emission reduction and resiliency targets. Climate change is happening and will affect us all, but we as a community have the power to come together and minimize the impact in ways that benefit all of us.

## Identifying the Community's Baseline Climate Concerns

Methodology: In mid-April, Kennebunk launched a community-wide online survey to understand general awareness of and specific local concerns about climate change. The survey also asked about the best ways to reach people and how people would like to learn more. The survey was publicized during April and June via local media, social media, town email alerts, and personal interactions at senior centers, Avesta Housing facilities, and Kennebunk High School. Paper copies were made available at the senior and Avesta facilities and at the Town Office and Kennebunk Memorial Library.

Survey results were released via press release, social media, town alert, and the Town website, as well as to the new CAP Interested Party email list, gathered via a survey response on interest in getting updates.

# Appendix C: Public Engagement Summary

## *Demographics:*

- The survey received 479 responses. Online responses totaled 406, with 73 submitted on paper copies. There were 185 responses from people under 45 years and 358 from people over 44 years of age.
- Compared to the town's Comprehensive Plan demographics, respondents included a similar percentage of people over 65 but are wealthier than the average. 83% were full-time residents, with 7% seasonal.
- Just 2.3% were business owners in town; 6% owned businesses in a neighboring community.
- 81 individuals were interested in being part of a Community Sounding Board.
- 290 individuals asked to receive email updates. As referenced above, this list was used to generate awareness of the process, climate actions, and opportunities for feedback.

## General concerns about climate:

- 74% of respondents were very or extremely concerned that climate change will affect Kennebunk over the coming decades. This rose slightly to 78% in the younger cohort. In those who earned less than \$59,000, the percent rose to 82%
- The top two expected climate-related impacts are 1) effects on the natural environment and 2) infrastructure, both in high 70%. People who responded via paper were most concerned about infrastructure (84%). 90% of people who earned under \$59,000 rated effects on natural environment as the top impact.
  - Effects on the economy and jobs came in a relatively weak third at 38% - except for paper survey responses (49%) and income less than \$59,000 (56%).
  - Only about one-third of respondents had any concerns about risk to municipal tax revenue, or challenges to providing public safety services. The younger cohort showed even less concern (20%).
  - Fewer than 8% of respondent did "not expect to see any climate change-related impacts." For younger cohort that dropped to 3% and for those with income less than \$59,000 the number was even lower at 1.5%.
  - Three-quarters reported that flooding, erosion, and changes to the natural environment, were all items of high concern; concern about fish and lobster was about 63%.

## Topics of Interest:

- Kennebunk respondents are interested in learning more about options for recycling electronics, safer routes for biking and walking, community gardens and adding solar panels, community solar, adding solar panels, and weatherizing their homes.
- Younger respondents ranked community gardens, solar panels and safer biking and walking as their top three choices.

# Appendix C: Public Engagement Summary

## Initial In-Person Outreach

The Task Force determined that the best way to make the community aware of their work developing a climate action plan was to informally reach out to residents in person through already scheduled events. Over the summer and fall, they participated in the following:

- Election Day Table/June: This event was specifically targeted to pulling in additional survey responses from those who had come to the Town Office to vote.
- Two Community Conversations/late summer and December: Task Force members participated in community events in Dock Square and Lower Village focused on hearing comments on river-adjacent issues related to climate change.
- Three Avesta Housing Conversations/Fall: Coordinated by Kennebunk town staff, Task Force members met with residents of three separate subsidized housing locations. In general, these residents are insulated from many of the risks of climate change since their housing/heating/utility needs are handled by Avesta.
- Harvest Fest Table at Waterhouse/Fall: Task Force members staffed a table at Harvest Fest to generate conversations about climate change, using brochures and survey results as conversation starters.
- West Kennebunk Committee/Fall: Task Force members presented to West Kennebunk residents about the Climate Action Plan, asking what their biggest concerns about climate change are at this time.
- Business Outreach, details below.
- Two sessions with environmental classes at the high school explored the students' concerns about climate and provided specific feedback on climate action strategies. These reached students in the three RSU 21 communities.

## Community Sounding Boards

The Task Force convened two initial Community Sounding Board meetings in August to drill down on the concerns identified in the survey. Invitations for specific meeting dates were emailed to those who were interested in participating; from those, two meetings of a dozen people each were scheduled. Significant background information was sent to each member prior to the meeting, including the SMPDC documents on local climate change impacts. Question prompts included:

1. What do each of you see as the MOST PRESSING concerns/challenges, both immediate and long-term, in terms of climate change here in Kennebunk?
2. What do you see these changes meaning for residents? For the environment? For the community as a whole? (Effects on tourism? Lower Village? Transportation? Recreation? Schools? Everyday?)
3. In survey, climate change effect on economy and town finances rated very low on concern – why do you think?
4. Is expectation that town will “fix” everything?
5. How do we help people understand that hard decisions will have to be made?

# Appendix C: Public Engagement Summary

*Key takeaways were:*

1. Education and community involvement is key
  - Show how actions will save money
  - Expand discussion beyond coastal change
  - Get youth Involved
  - Partner with Library on a series of programs – they are also recorded and online
1. Manage and reduce development that removes trees and threatens dunes, marshland and water sources
2. Our environment and landscape are the basis for the tourist industry – it's why people want to live here. The Town needs to understand this and act to protect it and we need to work with businesses so they understand this
3. The Town should be a leader in climate action

## **Business Outreach**

Understanding that the business community along both sides of the Kennebunk River is already being affected by sea level rise, the Climate Action Task Forces of both Kennebunk and Kennebunkport wanted to do more business-focused outreach to business owners along the river. Toward that end, individual meetings with task force members and key business property owners were scheduled in October and November, and a group meeting took place in mid-November. The individual meetings focused on larger-scale property owners such as the Nonantum, Federal Jacks, the Kennebunk Resort Collection, and Jennie Kingston (owner of multiple river-adjacent businesses and properties, including The Clam Shack) to determine if climate change had already affected their business plans. Another focus of conversation was what they might be expecting of their two town governments to maintain the critical tourist economy going forward. The larger mid-November meeting was attended by over a dozen business members, along with staff from both town governments, a state legislator, and Task Force members from both communities.

## ***Summary of comments:***

- There was a marked sense of urgency in the room to address climate change challenges already being experienced, with a strong need for both short-term measures to show that action is underway and longer-term capacity building to address the challenges on the horizon. The longevity of businesses on Dock Square is a big question mark.
- Understanding options and specific plans on various ways to respond to this crisis would be helpful - actual strategies to address challenges to flooding in Dock Square, and possible options for businesses to choose from to mitigate.
- The economic piece is going to dictate how long businesses stay in their current locations.
- Insurance rates are beginning to rise, so that impact is beginning to be felt.
- Tide charts do not reflect the reality of sea level rise already underway, i.e., they are understating the highs by a couple of feet.
- Asked whether the most affected businesses should get together and try to come up with solutions, the response was that it's the whole community's responsibility - the whole area must adjust, single businesses cannot.
- A strong yes to the need for pre and post disaster resources to support businesses.

## **Working with RSU 21**

The communities of Kennebunk and Kennebunkport – along with Arundel – partner in funding and operating RSU 21. Understanding that the RSU is a key component of these communities, representatives from both Task Forces developed strategies to address the challenges of climate change within the school system, actively seeking the cooperation and support of RSU 21 leaders. Their focus has been on two key areas: the prospects of using solar power to supply energy to the schools and town buildings, and engaging students in learning about climate change. Top administrators of RSU 21, the School Board's Facilities Committee, and enterprising high school teachers have been active participants in these unfolding efforts.

## **Board of Selectmen Updates**

While the Board is represented on the Climate Action Task Force, it is also important to keep the Board as a whole updated in terms of progress on the climate action plan. Toward that end, the Task Force made a major presentation to the Board in September, including an overview of the individuals involved, the process to date, and the results of summer community feedback. An additional workshop with the Select Board took place in early April to present and discuss the recommended Plan strategies. Included in this discussion was an overview of the community feedback derived from the Climate Action Plan Open House earlier in March.

## **Public Open House**

The Task Force created a family-friendly Open House in mid-March, asking the community to comment on the specific climate action strategies as laid out on easy-to-understand posters. Sticky notes, color-coded dots, and areas for longer written comments were provided to allow people with varying degrees of interest to easily participate. Child-care activities for younger family members were made available as well, as well as refreshments from local vendors. Task Force members were in attendance to answer questions and encourage feedback.

A wide range of comments were received. Almost all indicated a clear understanding that climate change is real and that the town needs to adapt. Focus included how to adapt the economy, infrastructure, long-term spending priorities, protection of the population during and after storms, and many suggestions and comments on increased use of electric products, waste, etc.

# KENNEBUNK

## Climate Change Vulnerability Assessment Summary

September 2023

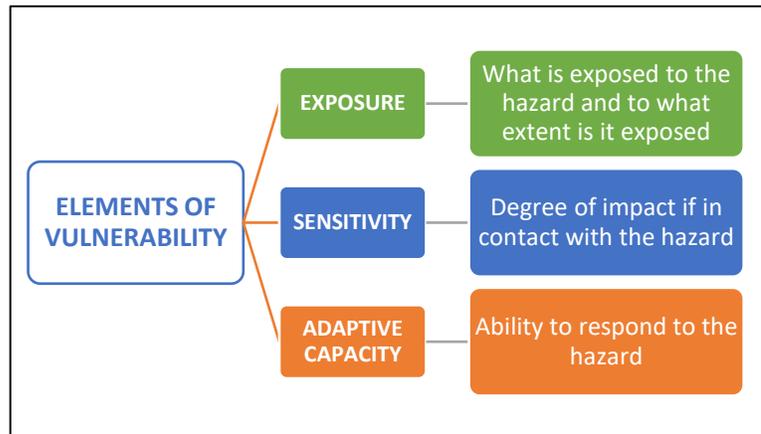
### Contents

Introduction.....	3
Key Takeaways .....	4
Social Vulnerability .....	6
Demographic Profile.....	7
Key Takeaways.....	8
Supplemental Community Information .....	11
Housing Characteristics .....	11
Age of Buildings .....	14
Household Heating Fuel Types.....	15
Zoning.....	21
Land Cover and Carbon Sequestration .....	22
Extreme Storms & Precipitation .....	23
Key Takeaways .....	23
Background Info, Trends, & Projections .....	23
Power Outages and Electric Grid Resilience .....	29
Flooding: Sea Level Rise & Storm Surge .....	31
Key Takeaways .....	31
Background Info, Trends, & Projections .....	31
Property Impacts .....	35
Infrastructure Impacts.....	38
Economic Impacts .....	43
Impacts to the Natural Environment.....	48
Beach Erosion.....	48
Marsh Migration .....	49

Extreme Temperatures & Air Quality .....	51
Key Takeaways .....	51
Background Information, Trends, & Projections .....	51
Urban Heat Islands .....	53
Public Health Impacts .....	55
Impacts to the Natural Environment.....	59
Drought & Wildfires .....	60
Key Takeaways .....	60
Background Info, Trends, & Projections .....	60
Water Supply Impacts .....	62
Water Quantity .....	62
Water Quality.....	64
Impacts to the Natural Environment.....	66
Agricultural Impacts .....	69
Changing Marine Conditions .....	70
Key Takeaways .....	70
Background Info, Trends, & Projections .....	70
Habitat Shifts and Carbon Sinks.....	71
Economic Impacts .....	74

# Introduction

One of the first steps to understanding how communities can plan for and address climate change impacts is to assess climate hazards that are projected to impact an area as well as the things, people, and places that are vulnerable to those hazards. **Climate vulnerability is commonly defined** as the product of **exposure** to climate hazards, **sensitivity** of the built, social, and natural systems to those hazards, and the **adaptive capacity** of those systems for responding to change and stressors. The more sensitive something or someone is to a hazard and the lower their adaptive capacity to respond to the hazard, the greater their vulnerability. Vulnerability also increases as exposure to the hazard does. Evaluating vulnerabilities, including what will be impacted by climate hazards, and to what extent those impacts will occur, provides a baseline for developing targeted strategies, measures, and solutions for reducing vulnerabilities.



**Vulnerability Classification**

	High	Medium Vulnerability	High Vulnerability	High Vulnerability
High	Low Vulnerability	Medium Vulnerability	High Vulnerability	
Medium	Low Vulnerability	Low Vulnerability		
Low	Low Vulnerability	Low Vulnerability	Medium Vulnerability	
	High	Medium	Low	
High	Adaptive Capacity			

*Sensitivity* (vertical label on the left)  
*Exposure* (diagonal label at the bottom left)

Figure adapted from NOAA. 2022. *Implementing the Steps to Resilience: a Practitioner's Guide*.

This draft vulnerability assessment summary presents an overview of climate hazards and associated impacts and vulnerabilities for the community of Kennebunk. The assessment uses

local, regional, state, and national data pertaining to climate hazards, historical conditions, trends, and future projections to assess impacts of and local vulnerabilities associated with the following:

- Flooding from sea level rise and storm surge
- Precipitation and extreme storms
- Extreme temperatures
- Drought and wildfires
- Changing marine conditions

The assessment evaluates impacts of those hazards to the built, social, and natural environment; public health; and the economy. The 'desktop' vulnerability assessment generated quantitative-based information about climate hazard exposure within each Cohort community. Information about adaptive capacity and sensitivity, which is usually more qualitative in nature and not readily captured by state or national datasets or numeric data, as well as information about what/where/who is of greatest concern to the community, was gathered through Task Force input and community engagement.

### Key Takeaways

- Climate change will impact all facets of the community and compounding climate change vulnerabilities will impact all areas of life, including public health, natural areas, the local economy, municipal fiscal health, and community well-being.
- The impacts of climate change will not be felt evenly across the community and will not be uniformly distributed among population groups. Socially vulnerable and marginalized populations will be disproportionately affected by climate change as they generally have less capacity to prepare for, respond to, and recover from climate-related hazards and effects.
- Across the entire community 31% of the population is 65 years or older and 30% of households have at least one disabled person, which are indicators of social vulnerability. Additionally, about a quarter of households (26%) are below the EPA climate change and social vulnerability income threshold, 32% are below the State median income, and 41% are below the County median income.
- Neighborhoods and infrastructure along Kennebunk's coast, and along the tidal Mousam, Kennebunk, and Little Rivers, are extremely vulnerable to flooding, sea level rise, and storm surge. Coastal neighborhoods also have a relatively high percentage of people that are older (65+) and living alone, making them more sensitive to climate hazards.
- In Kennebunk, areas with the highest concentration of buildings constructed before 1970 are in the Lower Village area, along Routes 1 and 9A, and along the coastline. These areas also have elevated social vulnerability based on demographic characteristics and are vulnerable to hazards, including coastal and riverine flooding, sea level rise, and urban heat islands. The concentration of older buildings in flood prone areas means that it is likely those structures are not built to modern codes and are not elevated above projected future flood levels, or even current flood levels.

- Drought is becoming a hazard of increasing risk, particularly in the more rural regions of town where there could be negative impacts to private wells and agriculture, and could lead to increased wildfire risk.
- Kennebunk's power systems are increasingly vulnerable to extreme storms and flooding. However, the presence of consumer owned KLPD presents an opportunity to work cooperatively to increase the grid's resilience.
- Increasing rates of vector borne diseases and incidents of extreme heat will negatively impact public health.

## Social Vulnerability

The impact of climate change will not be felt evenly across the community and will not be uniformly distributed among population groups. The ability to adapt and respond to climate change varies widely based on individual and household resources and characteristics, as well as existing social inequities. Individuals who already have increased social vulnerability are at greatest risk of climate change and will be disproportionately affected by climate hazards, as they generally have lower capacity to prepare for, respond to, and recover from hazard events and disruptions. Socially vulnerable groups include children; older adults; people with existing health conditions; disabled individuals; households with lower or moderate incomes; those with less formal education; people of color; and those who have limited connectivity, either physically and/or digitally, to others and resources. Demographic information can help determine local populations' adaptive capacity, or the ability to adapt and respond to a disaster.

Age can be correlated with decreased adaptive capacity, in the case of the very young, or older populations. Generally, families with children require more time and space to evacuate, and people who are 17 or younger are more dependent on family or other networks than other age brackets. Some people who are 65 and older may also be dependent on family, friends, or organizations, and may face challenges anticipating the event or finding information on how and when to evacuate or adapt. The unique physical and psychosocial challenges of the population ages 65 and over may impact their ability to prepare for, respond to, and recover from storms events.<sup>1</sup>

Maine is known to be one of the least diverse states in the country and demographic data collected from the 2021 American Community Survey supports that statistic. This highlights the need to pay specific attention to the minority populations that do live throughout the state, who may have cultural or language barriers to accessing information, resources, or accommodations. Gaps in resources, and access to those resources, leave many minority groups vulnerable to exclusion from adaptation based on economic factors.<sup>2</sup>

The coastal York County towns are among the wealthiest in the state, but they are not without low-moderate income households. Income is a significant indicator of social vulnerability with respect to natural hazards such as flooding. Households with lower income levels generally have a lower adaptive capacity to respond and adapt to natural hazards since someone with limited or no disposable income would have fewer resources to pay for evacuation, transportation, accommodation, and repair activities.

The following demographic information summarizes indicators of social vulnerability and adaptive capacity at the community level and US Census-designated block group level, which is the smallest geographic unit at which this demographic data is available. Information about the

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<sup>1</sup> EPA. 2021. Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts. U.S. Environmental Protection Agency, EPA 430-R-21-003. [www.epa.gov/cira/social-vulnerability-report](http://www.epa.gov/cira/social-vulnerability-report)

<sup>2</sup> EPA. 2021. Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts. U.S. Environmental Protection Agency, EPA 430-R-21-003. [www.epa.gov/cira/social-vulnerability-report](http://www.epa.gov/cira/social-vulnerability-report)

community's social vulnerability is supplemented and contextualized with information gathered from the Task Force and community members through project engagement efforts.

## Demographic Profile

Table 1 outlines 17 demographic indicators of social vulnerability at the community-wide and block group levels, which align closely with those used for the Maine Social Vulnerability Index.<sup>3</sup> These data are from the 2021 American Community Survey (ACS), which is conducted by the U.S. Census Bureau. The 2021 ACS is the most current demographic data available because the results of the 2020 Decennial Census have not been released yet. Block groups are the smallest geographic unit for which the U.S. Census provides demographic data. Block groups are delineated based on population and contain between 600 to 3,000 people. There are a total of 9 block groups in Kennebunk (Map 1).

The ACS is conducted annually on an ongoing basis throughout the year to collect information about changing socioeconomic characteristics in communities. Unlike the Decennial Census which surveys every household, the ACS only surveys a portion of households in the community and uses the results to estimate demographic characteristics across the community. In small communities, like many along the coast of Maine, the accuracy of ACS estimates may be imperfect due to the small sample size. In larger communities the estimates tend to be more accurate because the sample size is more statistically robust. The ACS also surveys seasonal residents which can make it difficult to understand the characteristics of the year-round population in seasonal communities. The 17 demographic indicators can inform the development of strategic climate actions by providing important information about areas of the community that may be more socially vulnerable to the impacts of climate change. However, qualitative anecdotal information about the community gathered from the Task Force, community members, and City staff helps to refine demographic data and aid with interpretation of local social vulnerability information.<sup>4</sup>

Demographic data are presented at the population and household level. The U.S. Census Bureau defines a household as a group of people who live within the same housing unit regardless of whether or not they are related. A housing unit is a room or group of rooms that is designed to be separate living quarters such as a house, apartment, or condo.<sup>5</sup>

There are three income thresholds referenced in Table 1. These thresholds were selected because they approximate the U.S. Environmental Protection Agency (EPA) climate change and social vulnerability income threshold (\$51,500), the 2021 State median income (\$64,767), and the 2021 York County median income (\$73,856).

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<sup>3</sup> Johnson et al., 2018, A lifeline and social vulnerability analysis of sea level rise impacts on rural coastal communities

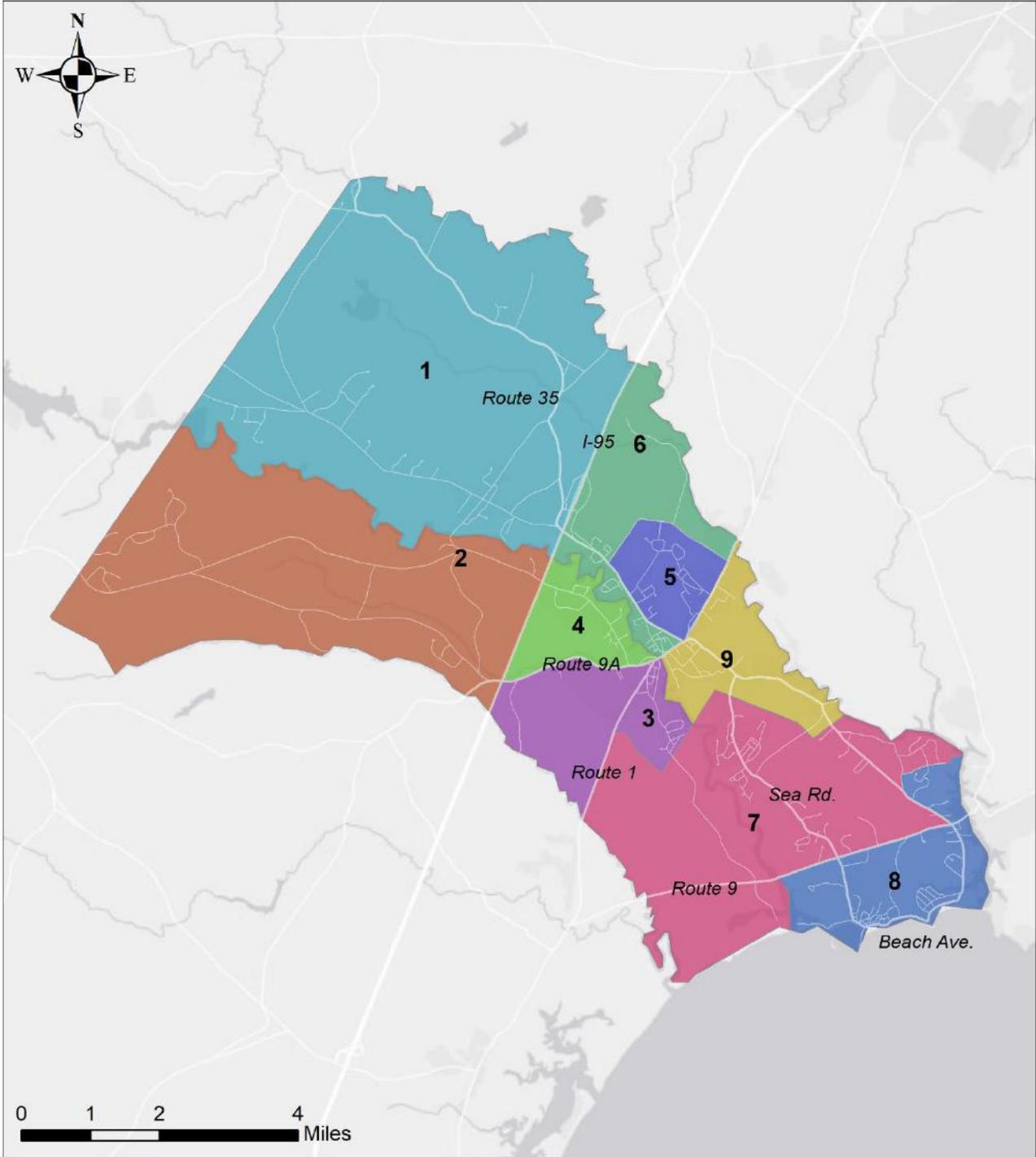
<sup>4</sup> Johnson et al., 2018, A lifeline and social vulnerability analysis of sea level rise impacts on rural coastal communities

<sup>5</sup> U.S. Census Bureau, Subject Definitions: <https://www.census.gov/programs-surveys/cps/technical-documentation/subject-definitions.html#household>

## Key Takeaways

- The neighborhood between the northern boundary of the Rachel Carson National Wildlife Refuge (RCNWR) and High Street (block group 3) has the highest percentage of the population and households within the block group that are 17 years or younger, identify as a minority, speak English less than well, are unemployed, have no internet access and are single parent households.
- The neighborhood east of the Kennebunk service plaza (block group 6) has the highest percentage of the population within the block group that are 65 years or older, have no high school diploma, are below the national poverty level, have no vehicle, are living alone, and are 65 plus and living alone.
- The neighborhoods around the Mousam River Wildlife Sanctuary and Wonderbrook Park (block group 9) have the highest percentage of households within the block group that are below the EPA climate change and social vulnerability income threshold, and are below the County and State median incomes. There is also an elevated percentage of the population within the block group that is 65 years or older, has no vehicle, are living alone, and are 65 plus and living alone compared to the rest of the community.
- The neighborhood east of the Kennebunk service plaza (block group 6) and the neighborhoods around the Mousam River Wildlife Sanctuary and Wonderbrook Park (block group 9) contain large elderly congregate housing developments and affordable housing developments.
- Across the entire community 31% of the population is 65 years or older and 30% of households have at least one person with a disability.
- Additionally, about a quarter of households (26%) are below the EPA climate change and social vulnerability income threshold, 32% are below the State median income, and 41% are below the County median income.

# U.S. Census Block Groups Kennebunk



Data source: U. S. Census Bureau  
Map created by SMPDC

Map 1. US Census-Designated Block Groups in Kennebunk (2020 Decennial Census)

Table 1. Demographic Profile Summary Table. Data source: U.S. Census Bureau 2021 American Community Survey

	Community wide	Block Groups								
		1	2	3	4	5	6	7	8	9
Total Population	11,466	2,255	1,027	1,844	1,222	961	592	1,594	1,180	791
Total Households	4,858	856	386	636	540	404	366	593	528	549
Age <18	2,175	514	204	608	203	91	70	427	37	21
% total population	19%	23%	20%	33%	17%	9%	12%	27%	3%	3%
Age 65+	3,525	423	182	263	595	258	318	583	506	397
% total population	31%	19%	18%	14%	49%	27%	54%	37%	43%	50%
Minority	853	150	25	275	102	6	19	223	53	0
% total population	7%	7%	2%	15%	8%	1%	3%	14%	4%	0%
Speaks English "Less than well"	109	0	0	72	0	0	0	0	30	7
% population age 5+	1%	0%	0%	4%	0%	0%	0%	0%	3%	1%
No HS Diploma	205	42	32	45	7	19	28	32	0	0
% population age 25+	2%	3%	4%	4%	1%	2%	5%	3%	0%	0%
1+ Persons with a Disability	1,455	178	112	83	152	257	148	160	182	183
% households	30%	21%	29%	13%	28%	64%	40%	27%	34%	33%
Below Poverty Level	269	59	0	59	26	11	52	24	10	28
% households	6%	7%	0%	9%	5%	3%	14%	4%	2%	5%
Unemployment	340	85	5	116	61	13	25	35	0	0
% population age 16+	4%	5%	1%	9%	6%	1%	5%	3%	0%	0%
Income <\$50k	1,255	231	51	59	228	22	138	123	134	269
% households	26%	27%	13%	9%	42%	5%	38%	21%	25%	49%
Income <\$60k	1,563	321	60	59	291	46	151	132	155	348
% households	32%	38%	16%	9%	54%	11%	41%	22%	29%	63%
Income <\$75k	1,979	389	111	189	310	65	222	147	164	382
% households	41%	45%	29%	30%	57%	16%	61%	25%	31%	70%
No Internet	606	18	0	172	41	8	29	112	84	142
% households	12%	2%	0%	27%	8%	2%	8%	19%	16%	26%
No Vehicle	218	30	5	0	0	0	80	0	29	74
% households	4%	4%	1%	0%	0%	0%	22%	0%	5%	13%
Single Parent	255	74	15	104	62	0	0	0	0	0
% households	5%	9%	4%	16%	11%	0%	0%	0%	0%	0%
Living Alone	1,356	200	30	83	149	8	269	173	121	323
% total population	12%	23%	8%	13%	28%	2%	73%	29%	23%	59%
65+ Living Alone	946	116	27	55	99	8	201	159	114	167
% total population	8%	5%	3%	3%	8%	1%	34%	10%	10%	21%



# Supplemental Community Information

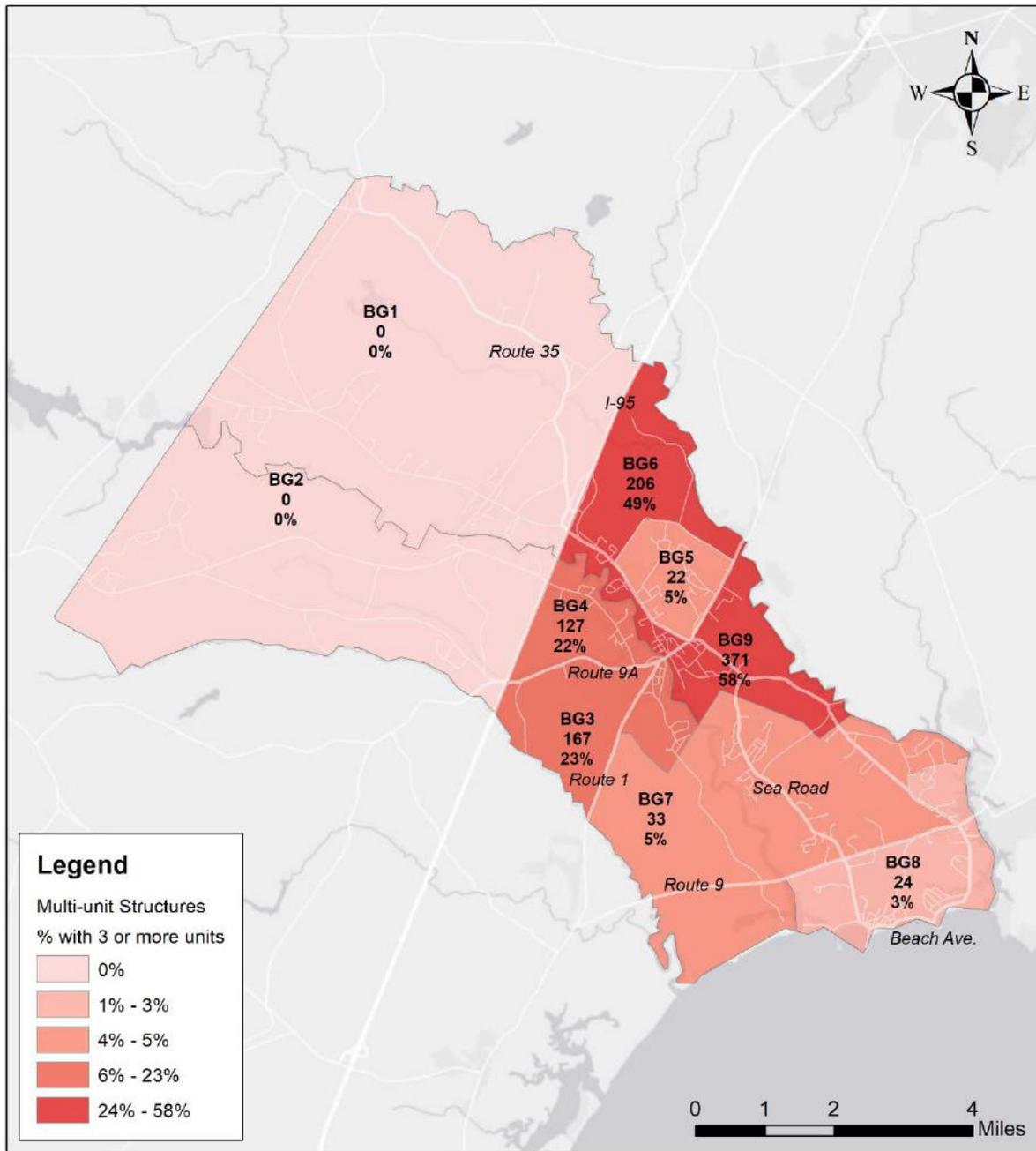
## Housing Characteristics

Renter occupied households, multi-unit homes, and mobile homes are associated with elevated social vulnerability and/or reduced adaptive capacity. For example, renters and multi-unit households generally have less adaptive capacity than single family homeowners because they tend to have lower incomes/financial resources and have less ability to make property improvements. Additionally, multi-unit households are often occupied by renters, and landlords have little incentive to improve energy efficiency because energy costs are commonly borne by tenants. Mobile homes have a higher energy cost per square foot than site-built homes and are generally more vulnerable to the impacts of climate hazards. Rented, multi-unit, and mobile homes also tend to be associated with socially vulnerable populations. Data are from the 2021 American Community Survey (see Demographic Profile for a description of ACS data). Map 2 and 3 and Table 2 show data about housing characteristics in Kennebunk.

## Key Takeaways

- Compared to the rest of the community, the neighborhoods east of the Kennebunk service plaza, and around the Mousam River Wildlife Sanctuary and Wonderbrook Park (block groups 6 and 9) have the highest percentage of households within the block group that are renter occupied and the highest percentage of housing units within the block group that are multi-unit structures. Both block groups also contain a higher proportion of socially vulnerable residents.
- The neighborhood east of the Kennebunk service plaza (block group 6) and the neighborhoods around the Mousam River Wildlife Sanctuary and Wonderbrook Park (block group 9) contain large elderly congregate housing developments and affordable housing developments.
- Mobile homes account for only 1% of all housing units in the community. They are only present in the neighborhoods west of I-95 (block groups 1 and 2) and the highest number of mobile homes are located north of the Mousam River (block group 1).

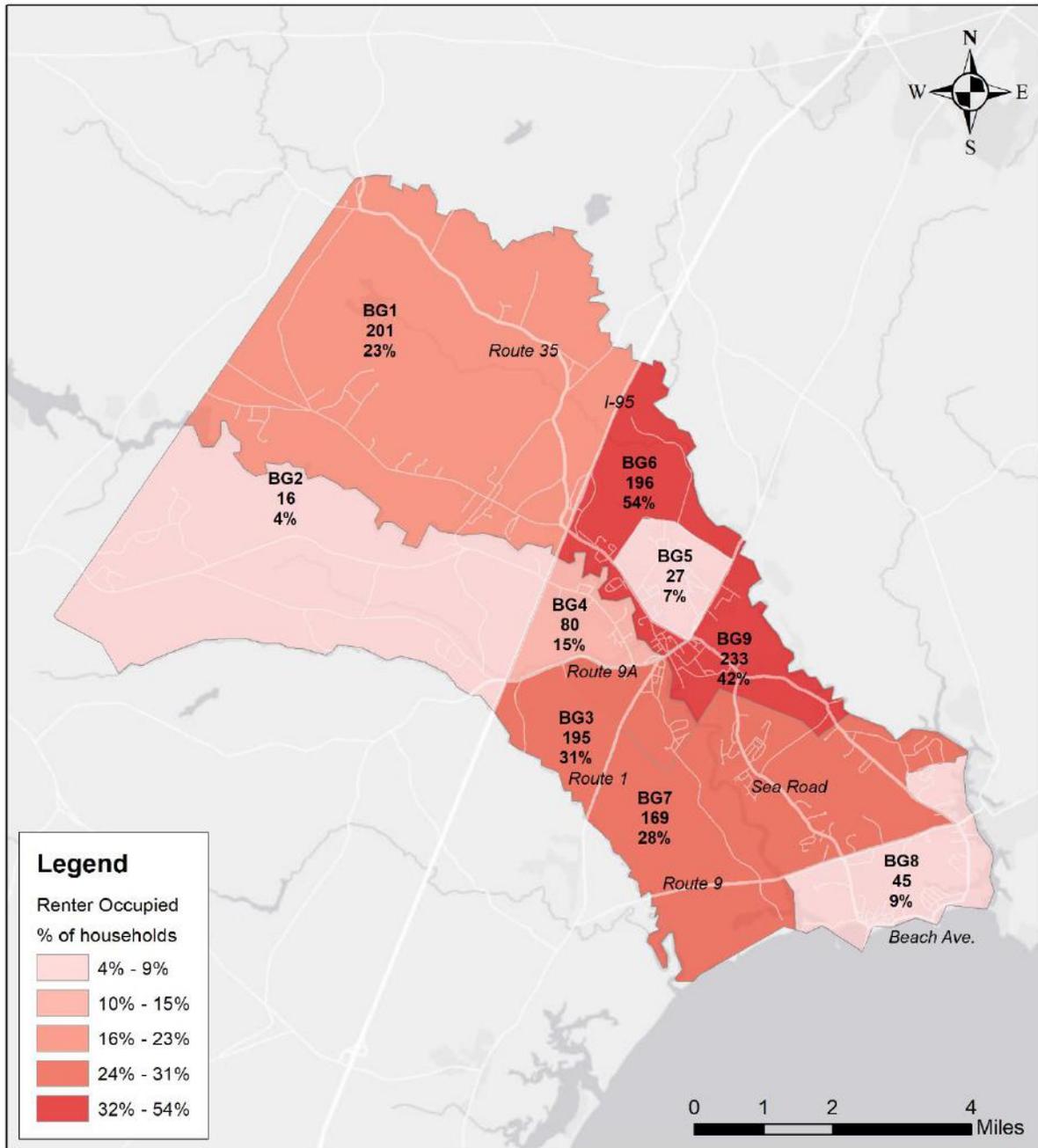
# Multi-unit Housing Structures Kennebunk



Data source: U.S. Census Bureau 2021 American Community Survey  
Map created by SMPDC

Map 2. Breakdown of multi-unit (3 or more units) housing units in Kennebunk by block group. Housing units include occupied households as well as vacant units and represent the total housing stock in Kennebunk. The block group is labeled (BG#) as well as the total number of multi-unit housing units in the block group and the percent of total housing units within the block group that are multi-unit. Data source: U.S. Census Bureau 2021 American Community Survey

# Renter Occupied Homes Kennebunk



Data source: U.S. Census Bureau 2021 American Community Survey  
Map created by SMPDC

Map 3. Breakdown of renter occupied households in Kennebunk by block group. Households do not include vacant housing units, so this data is representative of occupied housing units in Kennebunk. The block group is labeled (BG#) as well as the total number of renter occupied households in the block group and the percent of renter occupied households within the block group. Data source: U.S. Census Bureau 2021 American Community Survey

Table 2. Community wide and block group level housing characteristics in Kennebunk. Housing units include both occupied and vacant units and represent the total housing stock in Kennebunk. Households do not include vacant housing units and represent occupied housing units only. Data source: U.S. Census Bureau 2021 American Community Survey

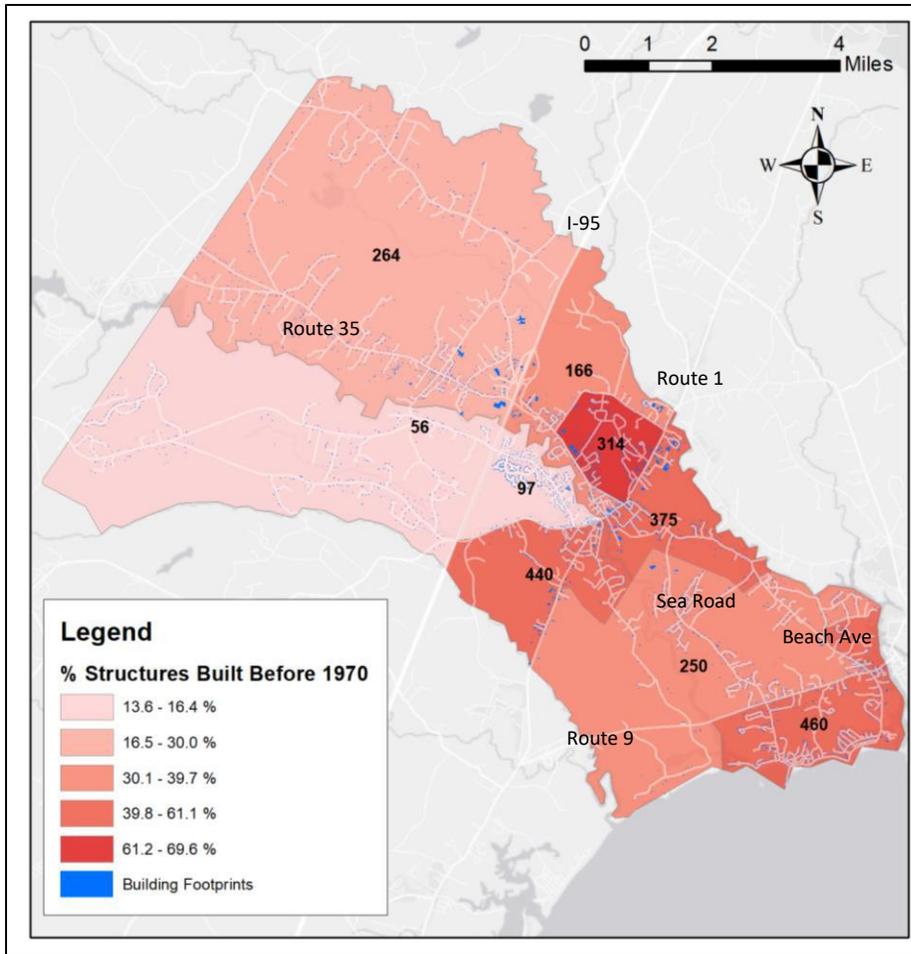
	Community wide	Block Groups								
		1	2	3	4	5	6	7	8	9
Total Housing Units	5,740	880	411	719	588	451	418	707	926	640
Total Households	4,858	856	386	636	540	404	366	593	528	549
Renter Occupied	1,162	201	16	195	80	27	196	169	45	233
% households	24%	23%	4%	31%	15%	7%	54%	28%	9%	42%
Multi-unit	950	0	0	167	127	22	206	33	24	371
% total with 3+ units	17%	0%	0%	23%	22%	5%	49%	5%	3%	58%
Mobile Homes	47	42	5	0	0	0	0	0	0	0
% total units	1%	5%	1%	0%	0%	0%	0%	0%	0%	0%



### Age of Buildings

Maine has one of the oldest housing stocks in the country. Older buildings tend to be less energy efficient, which is especially problematic during the winter and summer months when outdoor temperatures are at their extremes. Further, houses constructed before 1970 were built prior to the adoption of modern building codes and significant federal and state/local risk-reduction policies (National Flood Insurance Program (1968), Maine Shoreland Zoning (1971)). Older buildings are ideal targets for weatherization, energy efficiency upgrades, and resilience retrofits.

Map 4 shows the percentage of structures, at the block group level, built before 1970. In Kennebunk, areas with the highest concentration of buildings constructed before 1970 are in the Lower Village area, along Routes 1 and 9A, and along the coastline. These areas also have elevated social vulnerability based on demographic characteristics and are vulnerable to hazards, including coastal and riverine flooding, sea level rise, and urban heat islands. The concentration of older buildings in flood prone areas means that it is likely those structures are not built to modern codes and are not elevated above projected future flood levels, or even current flood levels.



Map 4. Percent and actual number of structures built before 1970 presented at the block group level. The block groups are color-coded by the percentage of structures built before 1970 and are labelled with the number of structures built before 1970. (Data source: year structures built: US Census American Community Survey; building footprints: Microsoft)

## Household Heating Fuel Types

Household heating fuel data is from the 2021 American Community Survey. This section includes fuel oil, kerosene, propane, natural gas, and electricity used as households’ primary heating sources. Understanding heating fuel trends is important for evaluating the potential impacts of electrifying the heating sector to reduce greenhouse gas emissions. Electrification must be paired with electricity grid resilience measures to ensure that the grid can withstand increased electricity consumption as well as climate hazards such as flooding, high winds, high temperatures, and wildfires (see Extreme Storms & Precipitation: Power Outages for more information about these impacts). Map 5, Map 6, Map 7, and Table 3 show data about primary heating fuel types across Kennebunk, which provides context about where fossil fuels are used most heavily and therefore where electricity consumption for heating is expected to increase.

## Key Takeaways

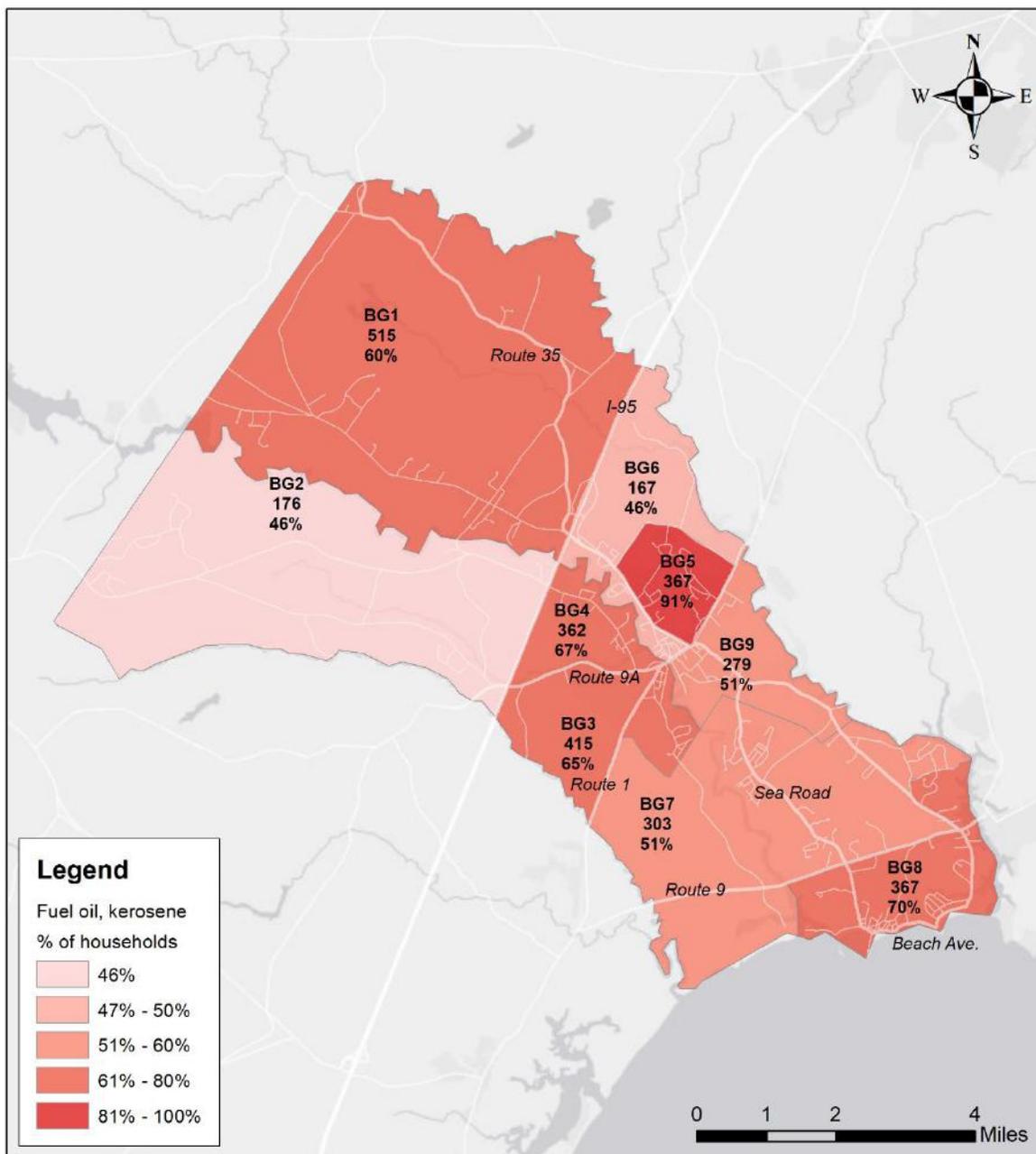
- The majority of households (61%) are primarily heated using fuel oil or kerosene followed by propane, electricity, and natural gas.

- The neighborhood behind Kennebunk High School (block group 5) has the highest percentage of households within the block group that use fuel oil and kerosene, followed by the neighborhood around Lower Village (block group 8), and the neighborhoods between I-95 and the northern boundary of the RCNWF (block groups 4 and 3).
- The neighborhood east of the Kennebunk service plaza (block group 6) has the highest percentage of households within the block group that use propane, followed by the neighborhoods west of I-95 (block groups 1 and 2).
- The areas around the Mousam River Wildlife Sanctuary and Wonderbrook Park (block group 9) have the highest percentage of households within the block group that use electricity for heating, followed by the neighborhood north of High Street and east of the Mousam River (block group 4).
- According to 2020 Natural Gas usage supplied by Unitil, only 9 homes in Kennebunk are heated with Natural gas. Natural Gas service appears to be available in the area close to the 1-95 Exit 25 interchange, from Kennebunk Highschool up to the intersection of Alfred Road with Maple Ave.<sup>6</sup>

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<sup>6</sup> <https://unitil.com/electric-gas-service/switch-to-gas/gas-availability-map>

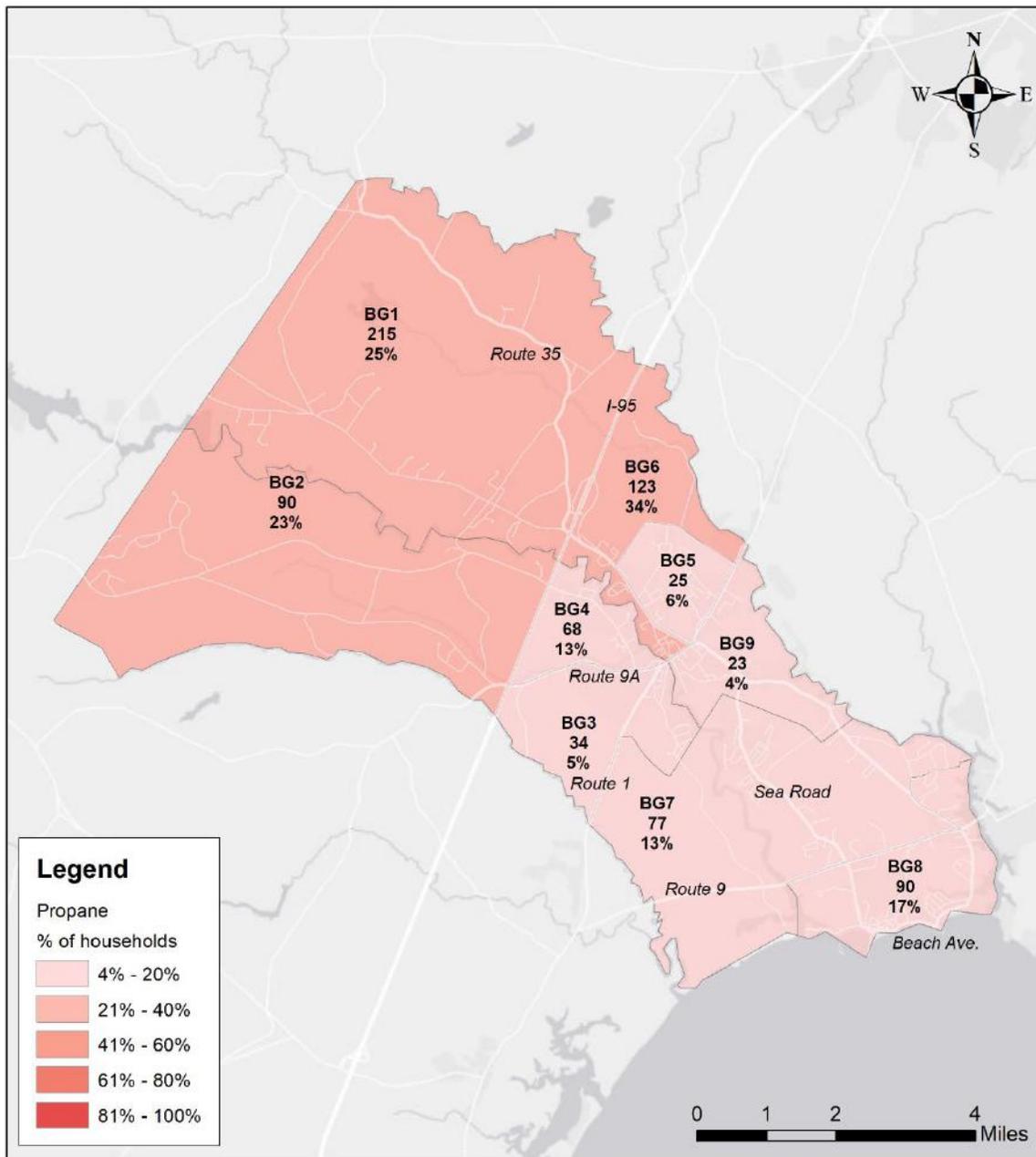
## Home Heating Fuel Type - Fuel Oil, Kerosene Kennebunk



Data source: U.S Census Bureau 2021 American Community Survey  
Map created by SMPDC

*Map 5. Breakdown of households in Kennebunk, by block group, that use fuel oil or kerosene for heating. Households do not include vacant housing units, so this data is representative of occupied housing units in Kennebunk. The block group is labeled (BG#) and includes the total number of households within the block group that use fuel oil or kerosene for heating and the percent of households within the block group that use fuel oil or kerosene for heating. Data source: U.S. Census Bureau 2021 American Community Survey*

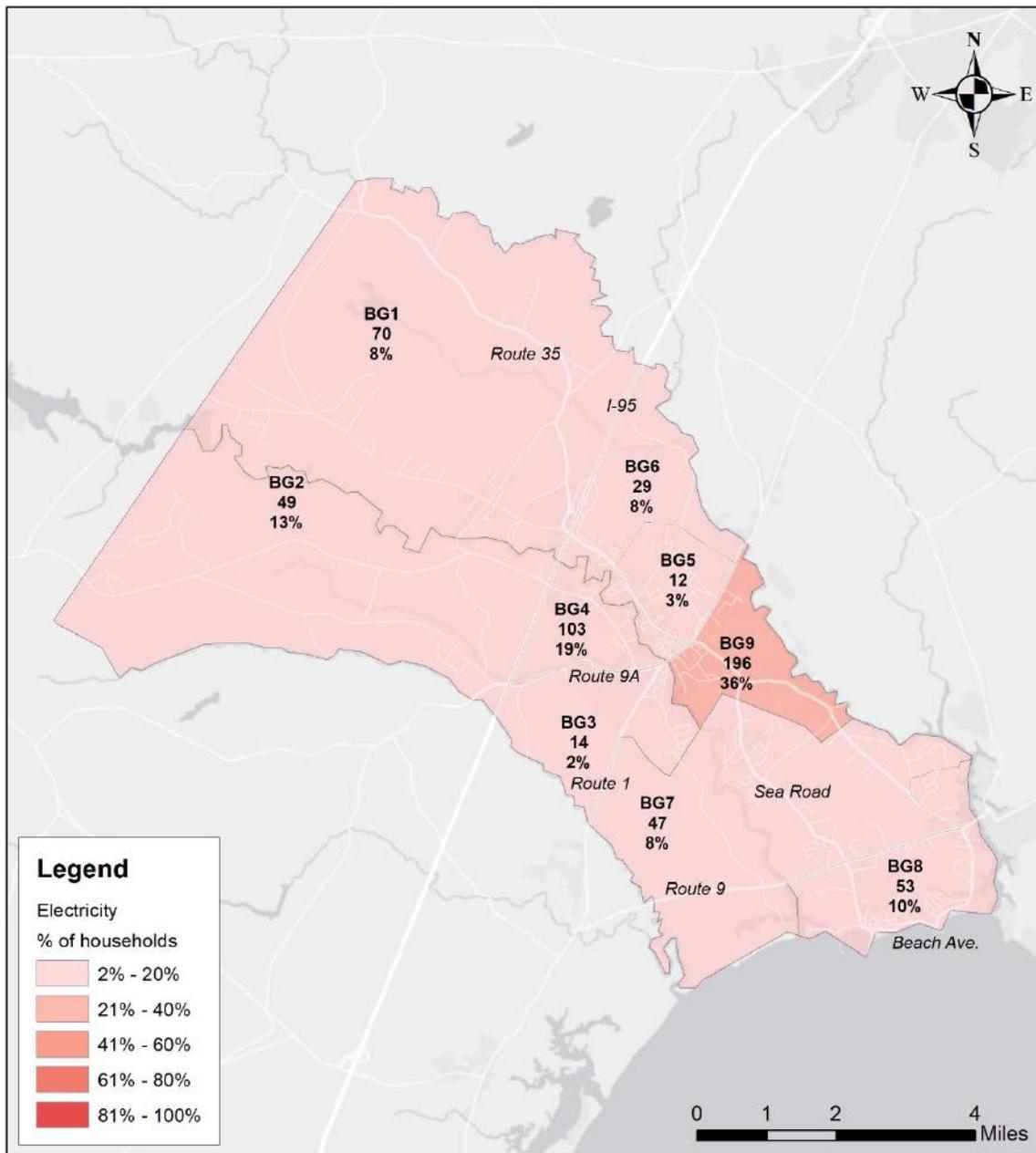
## Home Heating Fuel Type - Propane Kennebunk



Data source: U.S. Census Bureau 2021 American Community Survey  
Map created by SMPDC

Map 6. Breakdown of households in Kennebunk, by block group, that use propane for heating. Households do not include vacant housing units, so this data is representative of occupied housing units in Kennebunk. The block group is labeled (BG#) and includes the total number of households within the block group that use propane for heating and the percent of households within the block group that use propane for heating. Data source: U.S. Census Bureau 2021 American Community Survey

## Home Heating Fuel Type - Electricity Kennebunk



Data source: U.S Census Bureau 2021 American Community Survey  
Map created by SMPDC

*Map 7. Breakdown of households in Kennebunk, by block group, that use electricity for heating. Households do not include vacant housing units, so this data is representative of occupied housing units in Kennebunk. The block group is labeled (BG#) and includes the total number of households within the block group that use electricity for heating and the percent of households within the block group that use electricity for heating. Data source: U.S. Census Bureau 2021 American Community Survey*

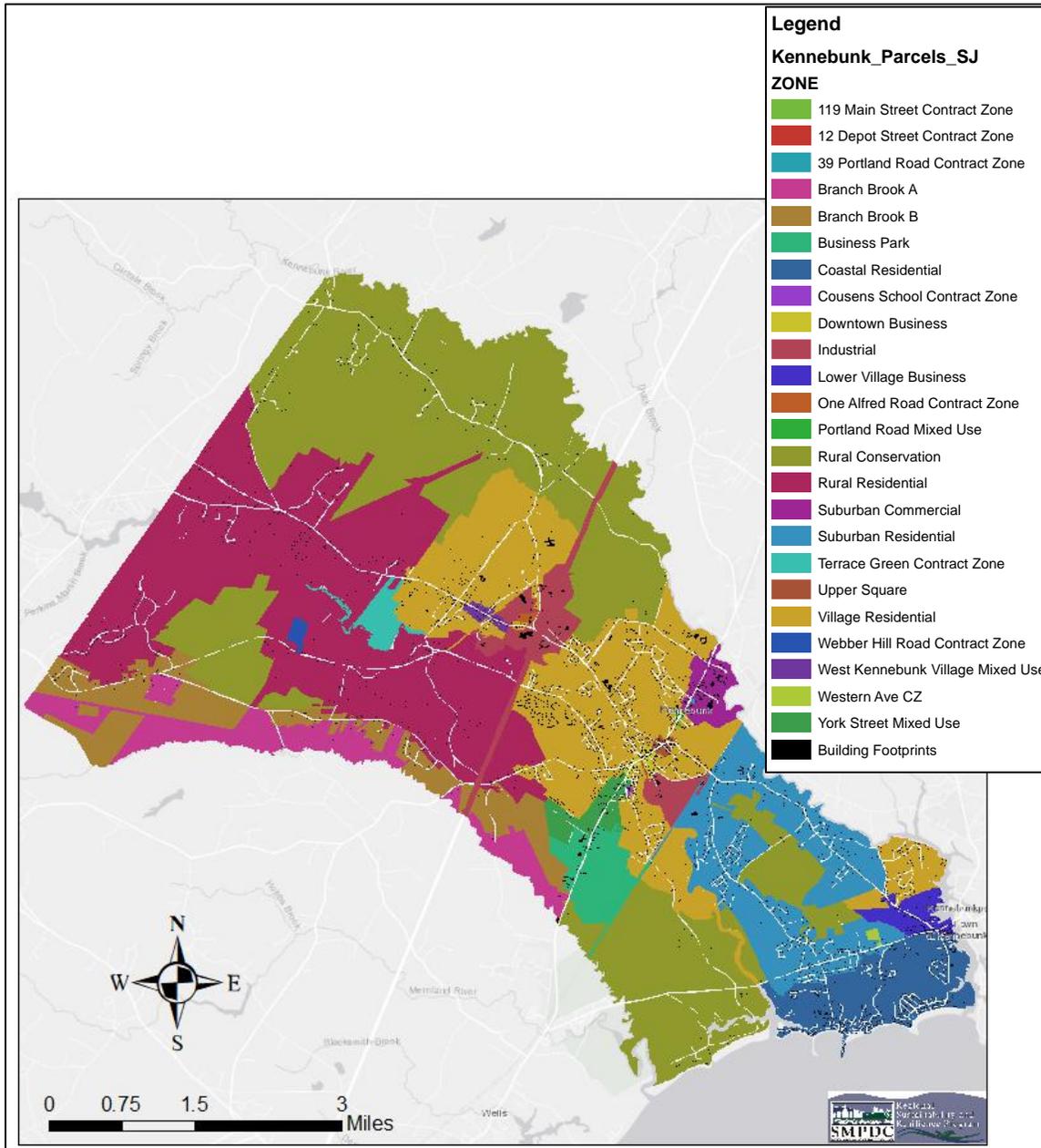
Table 3. Community wide and block group level household heating fuel types in Kennebunk based on ACS estimates. Households do not include vacant housing units, so this data is representative of occupied housing units in Kennebunk. Note that based on information from Unitol there are only 9 homes in Kennebunk that are heated with natural gas, instead of the 336 households that are estimated in the ACS data. Thus, the ACS data appears to significantly overestimate the number of households heating with natural gas. More accurate estimates may be obtained using Town assessors data. Data source: U.S. Census Bureau 2021 American Community Survey

	Community wide	Block Groups								
		1	2	3	4	5	6	7	8	9
Total Households	4,858	856	386	636	540	404	366	593	528	549
Fuel oil, kerosene	2,951	515	176	415	362	367	167	303	367	279
% households	61%	60%	46%	65%	67%	91%	46%	51%	70%	51%
Propane	745	215	90	34	68	25	123	77	90	23
% households	15%	25%	23%	5%	13%	6%	34%	13%	17%	4%
Natural gas	336	0	0	149	0	0	38	98	0	51
% households	7%	0%	0%	23%	0%	0%	10%	17%	0%	9%
Electricity	573	70	49	14	103	12	29	47	53	196
% households	12%	8%	13%	2%	19%	3%	8%	8%	10%	36%



## Zoning

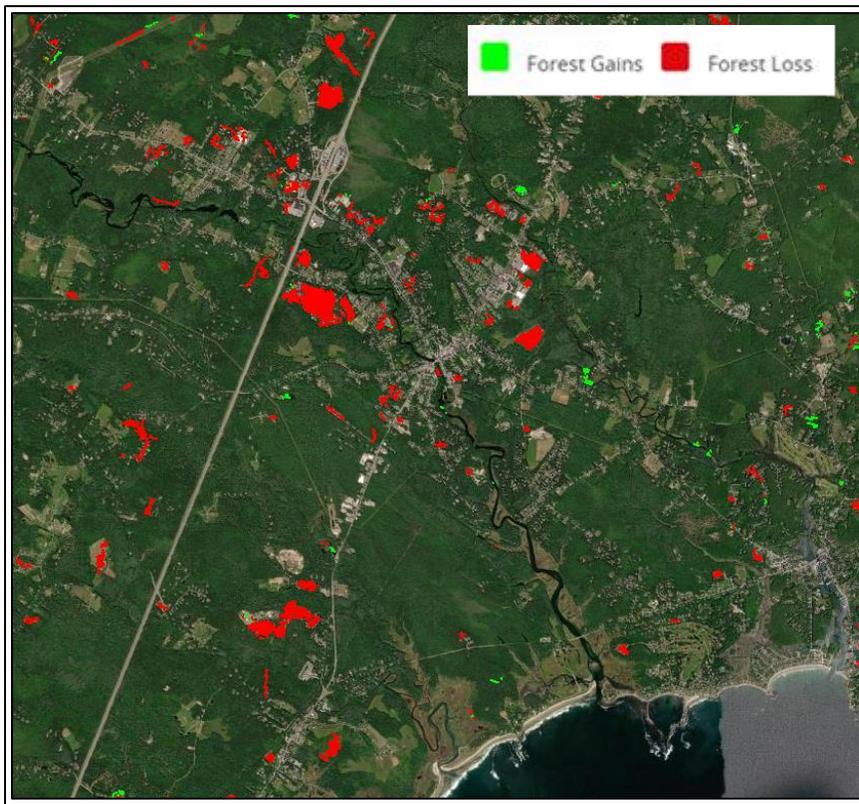
Local zoning will impact where in the community (*i.e.* particular geographic areas) certain types of development-related climate mitigation and adaptation strategies would likely have more impact due to where different types of development are allowed and what the standards are for those types of development. The zoning map below (Map 8) is provided for reference to show where areas zoned for commercial, industrial, and residential uses are located.



Map 8. Kennebunk's adopted zoning map.

## Land Cover and Carbon Sequestration

Forests, wetlands, and grasslands store high amounts of organic carbon. Coastal wetlands are among the largest natural carbon sinks of all terrestrial ecosystems, particularly on a per unit area basis. Undisturbed forest soils also store substantial amounts of carbon. Certain land use activities can enhance carbon storage, such as soil health and conservation practices, whereas others can be a source of carbon release<sup>7</sup>. In built environments, carbon is stored in trees, grassy areas, gardens, and in wooden structures and are increasingly important for reducing carbon in the atmosphere. Changes in land cover, such as conversion of forest to developed land, impacts not only the health of the natural environment, but the carbon sequestration potential of land. Map 9 shows the change in forested land coverage in Kennebunk from 1996 to 2016. Kennebunk has experienced more forest loss than gain, especially between Route 1 and I-95 along the Mousam River.



Map 9. Changes in forested land cover from 1996 to 2016. Green areas indicate a transition of non-forested land to forested, while red areas indicate a transition from forested land to a different type of land cover (e.g., impervious, grassland, wetland, shrub-scrub habitat, etc.). Source: NOAA Coastal Change Analysis Program (C-CAP) Land Cover Atlas.

<sup>7</sup> State of Maine. 2022. Maine Soil Carbon Incentives Study Policy Recommendations.

# Extreme Storms & Precipitation

## Key Takeaways

- Since 1895 annual precipitation in York County has increased 6.9 inches, and extreme precipitation events (greater than 2 inches in a day) have become more frequent. Future projections indicate that annual precipitation will likely continue to increase, and extreme precipitation events will become even more frequent.
  - Flooding events are the most common type of disaster in York County and the most destructive. In the last quarter century, flooding events have caused nearly \$45 million in property damage across coastal York County, and coastal floods alone have caused about \$22 million in property damage.
  - Kennebunk's proximity to the Kennebunk, Mousam, and Little Rivers increases the community's risk of inland flooding.
  - The area along the Mousam River between I-95 and Route 1 is more vulnerable to flooding and stormwater overflow during extreme precipitation events because of a high degree of impervious surfaces.
  - Lower Village, Mother's Beach, and Gooch's Beach also have a high degree of impervious surfaces and are more vulnerable to the combined impacts of extreme precipitation and coastal flooding during severe storms.
  - The concentration of older buildings in the flood prone areas along the Mousam River and in Lower Village means that it is likely those structures are not built to modern codes and are not elevated above projected future flood levels, or even current flood levels.
  - Kennebunk's aging electric grid is increasingly vulnerable to several climate impacts, including extreme storms and precipitation as well as increasing temperatures. This will likely result in more frequent and longer duration power outages in Kennebunk that can pose serious risks for public health and safety. Additionally, the KLPD substation on Water Street and the CMP Substation on School St. in Kennebunkport may be vulnerable to flooding in the future.

## Background Info, Trends, & Projections

Storms and heavy rainfall are becoming more frequent and intense with climate change. From 1895 to 2022 total annual precipitation in York County increased 6.9 inches (Figure 1), which is slightly higher than the statewide trend of about 6 inches. Shifting weather patterns are causing more precipitation to fall as rain rather than snow,<sup>8</sup> and extreme precipitation events (greater than 2 inches in a day) are becoming even more frequent. Coastal communities like Kennebunk are experiencing even more frequent extreme storms and precipitation events because of the influence of Atlantic storm tracks.<sup>9</sup> Hurricanes and tropical storms are tracking further northward and there is a high increase in the probability of lower category storms impacting the East Coast. A recent

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<sup>8</sup> ME Climate Council, Scientific Assessment of Climate Change and Its Effects in Maine, 2020: <http://climatecouncil.maine.gov/reports>

<sup>9</sup> University of Maine, Maine's Climate Future, 2020: <https://climatechange.umaine.edu/climate-matters/maines-climate-future/>

national study found that the Northeast is expected to see the largest increases in the annual probability of at least tropical storm wind conditions or higher, as hurricanes are expected to move further up the Atlantic coast in the future. This may have a significant impact on buildings not built to a code that considers the wind speeds they will likely face over the next 30 years.<sup>10</sup>

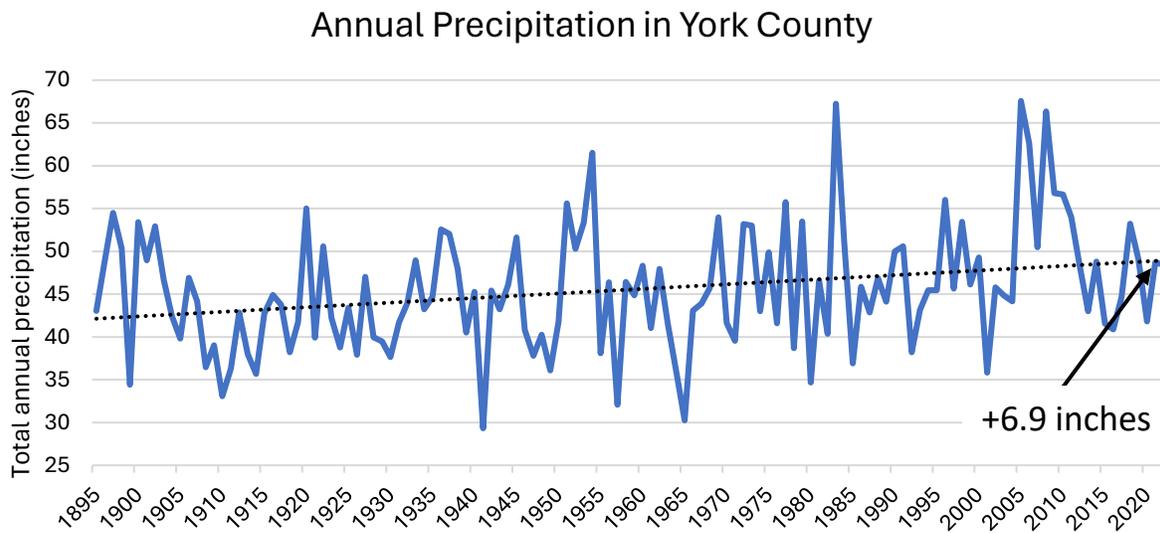


Figure 1. Total annual precipitation in York County from 1895 to 2022 based on monthly data from the [NOAA National Centers for Environmental Information](#). Over this time period total annual precipitation increased 6.9 inches.

Since 1970 there have been 34 federally declared disasters in York County related to storm events. Severe storms with heavy rains, strong winds, and coastal flooding have been the most common type of event and have occurred most frequently during the months of February and March followed by October.<sup>11</sup> NOAA maintains a database of all reported storm events, including storms that did not qualify for a disaster declaration. Since 1996 there have been a total of 361 storm events in coastal York County, and 122 events that caused significant property damage totaling about \$54 million (Table 4). Flooding events, including coastal flooding, have caused nearly \$45 million in damage across the region and coastal flooding events alone have caused approximately \$22 million in damage.<sup>12</sup>

<sup>10</sup> First Street Foundation. 2023. Embargoed: The 7<sup>th</sup> National Risk Assessment: Worsening Winds

<sup>11</sup> FEMA Disaster Declarations Summary, as of 2022: <https://www.fema.gov/openfema-data-page/disaster-declarations-summaries-v1>

<sup>12</sup> NOAA Storm Events Database, as of 2022: <https://www.ncdc.noaa.gov/stormevents/>

Table 4. Cumulative storm events and property damage in coastal York County from 1996 to 2022 based on data from the NOAA Storm Events Database.

<b>Storm Events in Coastal York Co. from 1996-2022</b>		
<b>Event Type</b>	<b>Number</b>	<b>Property Damage</b>
Coastal Flood	58	\$21,659,000
Flash Flood	8	\$12,625,000
Flood	10	\$10,653,500
Ice Storm	2	\$7,930,000
High/Strong Wind	28	\$537,500
High Surf	8	\$229,000
Lightning	8	\$145,000
<b>TOTAL</b>	<b>122</b>	<b>\$53,779,000</b>

Recent notable storms include:

- December 23<sup>rd</sup> Storm, 2022 – The highest water level recorded at the Portland tide gauge was 13.72 ft MLLW, the third highest ever recorded. Heavy rainfall, high winds, and storm surge caused extensive power outages, coastal flooding, and property damage along the coast of Maine. Governor Mills requested a disaster declaration in February 2023, but FEMA has not made a determination yet.
- Flash floods, October 2021 – (Federally declared disaster) Kennebunk reported 6.88 inches of rain in a 6-hour period, which caused widespread power outages and flooded roads.<sup>13</sup>
- Nor’easters, March 2018 – (Federally declared disaster) Two nor’easters, only days apart, brought heavy rainfall, high storm surge, and high winds which caused severe coastal flooding and damage.<sup>14</sup>
- Patriot’s Day Storm, April 2007 – (Federally declared disaster) High winds, waves, and coastal flooding caused severe damage to roads, bridges, and wastewater treatment plants as well as private homes and businesses. Extensive power outages left residents without electricity for days. The most extensive damage occurred along the coastline and was caused by flooding and storm surge.<sup>15</sup>
- Mother’s Day Storm, May 2006 – Southern Maine received up to 16 inches of rain, exceeding precipitation amounts associated with the 100-year storm event and resulting in extensive flooding and damage.<sup>16</sup>

In the future, as sea level rises and storms become more frequent and intense, Kennebunk can expect to see more damage from coastal flooding, high winds, and heavy rainfall. With 1.6 feet of

<sup>13</sup> York County Emergency Management Agency, Hazard Mitigation Plan, 2022: <https://www.yorkcountymaine.gov/emergency-management>

<sup>14</sup> SMPDC, Economic Resilience Planning for Coastal York County, 2022: <https://smpdc.org/coastal>

<sup>15</sup> York County Emergency Management Agency, Hazard Mitigation Plan, 2022: <https://www.yorkcountymaine.gov/emergency-management>

<sup>16</sup> SMPDC, Tides, Taxes, and New Tactics, 2021: <https://smpdc.org/coastal>

sea level rise by 2050, it's estimated that cumulative damage costs caused by coastal flooding could be \$16.9-\$18.2 billion statewide.<sup>17</sup>

Historically, flooding has been the most common type of disaster in York County, particularly coastal flooding caused by nor'easters.<sup>18</sup> Storm tides cause extensive coastal flooding and occur when a storm surge coincides with an astronomical high tide. The highest water level recorded at the Portland tide gauge (the closest official NOAA tide gauge to Kennebunk) occurred during the Blizzard of 1978 and exceeded 14 feet MLLW (Figure 2). The 2018 nor'easter and 2007 Patriot's Day Storm also caused storm tides within the top 20 water levels recorded at the Portland tide gauge. During the recent December 23<sup>rd</sup> storm (which is not included in Figure 2) a water level of 13.72 feet MLLW was recorded in Portland, about an inch lower than the 2018 nor'easter storm tide.<sup>19</sup>

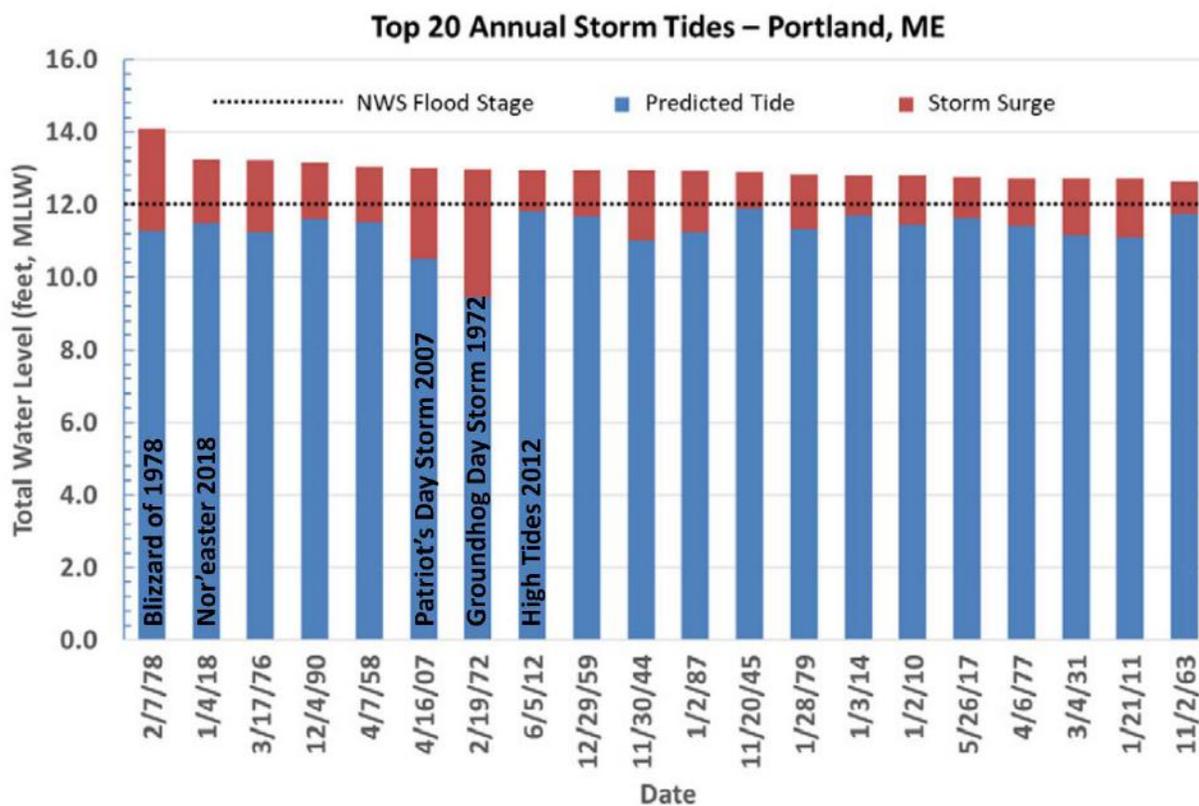


Figure 2. Major storm events and top 20 annual storm tides recorded at the Portland, ME tide gauge from 1912-2019. The National Weather Service Flood Stage of 12 feet MLLW is shown as a dashed line. This threshold indicates when elevated water levels begin to create a hazard to public safety, property, and infrastructure. Graph was created by Pete Slovinsky at the Maine Geological Survey for the [ME Climate Council, Scientific Assessment of Climate Change and Its Effects in Maine, 2020](#).

<sup>17</sup> ME Climate Council, Assessing the Impacts Climate Change May Have on the State's Economy, Revenues, and Investment Decisions, Summary Report, 2020: <http://climatecouncil.maine.gov/reports>

<sup>18</sup> York County Emergency Management Agency, Hazard Mitigation Plan, 2022: <https://www.yorkcountymaine.gov/emergency-management>

<sup>19</sup> NOAA Tides and Currents: <https://tidesandcurrents.noaa.gov/waterlevels.html?id=8418150>

Intense storms and heavy precipitation can cause inland flooding along rivers and streams and exacerbate coastal flooding. Developed areas with lots of impervious surfaces such as roads, parking lots, sidewalks and buildings experience more flooding during heavy rainfall because the water has nowhere to go. Stormwater systems can overflow because of limited capacity to handle high water volumes, causing runoff into lakes and rivers. Inland and urban flooding pose a threat to public safety, infrastructure, and property. Runoff also increases the risk of contaminated drinking water supplies and degraded water quality in coastal areas making it unsafe to swim.<sup>20</sup>

Like coastal flooding, inland and urban flooding may occur during winter nor'easters, but it also occurs during summer and fall tropical storms or intense thunderstorms. Flash floods are historically uncommon in Maine, but in October 2021 a flash flood dropped nearly 7 inches of rain in Kennebunk in 6 hours, causing extensive power outages and damage. Inland flooding is difficult to predict due to the complex interaction of factors that contribute to precipitation-based flooding conditions, but changing weather patterns and more frequent and intense hurricanes in the southern U.S. have the potential to cause more inland and urban flooding events in coastal communities like Kennebunk.<sup>21</sup>

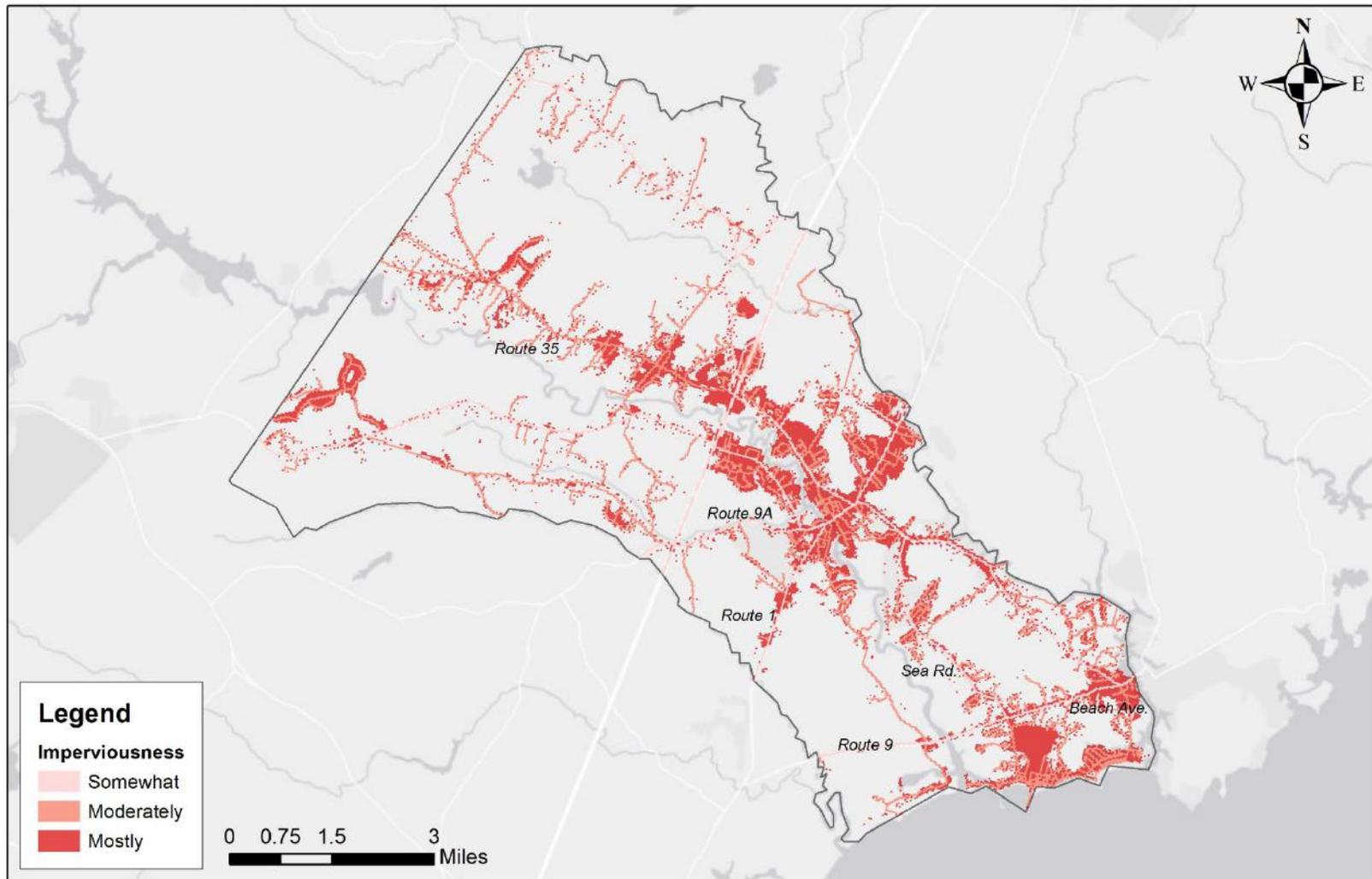
**Kennebunk's proximity to the Kennebunk, Mousam, and Little Rivers increases the community's risk of inland flooding.** Additionally, there is a high concentration of impervious surfaces along the Mousam River between I-95 and Route 1, as well as in the Lower Village, Mother's Beach, and Gooch's Beach area (Map 10). The high degree of impervious surfaces in these developed and coastal neighborhoods increases the risk of flooding and stormwater overflow from extreme precipitation events. In the coastal areas of Lower Village, Mother's Beach, and Gooch's Beach heavy rainfall coupled with a high degree of impervious surfaces can also exacerbate the impacts of coastal flooding. The concentration of older buildings in the flood prone areas along the Mousam River and in Lower Village (Supplemental Community Information Map 4) means that it is likely those structures are not built to modern codes and are not elevated above projected future flood levels, or even current flood levels. In the future, with more intense storms and extreme precipitation events these areas will be at a higher risk of flooding.

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<sup>20</sup> York County Emergency Management Agency, Hazard Mitigation Plan, 2022: <https://www.yorkcountymaine.gov/emergency-management>

<sup>21</sup> York County Emergency Management Agency, Hazard Mitigation Plan, 2022: <https://www.yorkcountymaine.gov/emergency-management>

# Impervious Surfaces Kennebunk



Data source: National Landcover Dataset (2019)  
Map created by SMPDC

Map 10. Impervious surfaces in Kennebunk based on their level of imperviousness (somewhat, moderately or mostly impervious). Data source: [2019 National Landcover Dataset](#).

## Power Outages and Electric Grid Resilience

The reliability of the electric grid is vital to the day-to-day well-being and quality of life of Kennebunk's community members, the Town's operations, and local economic activities. Breakdowns in grid operations and infrastructure result in power outages that can have significant impacts and hazards for a community. Power outages can jeopardize essential public safety services as well as drinking water and wastewater systems. Downed wires during power outages can make roads impassable or dangerous. Lack of heating/cooling and electricity during power outages puts vulnerable community members at risk. Homes and businesses also face significant costs due to power outages.

Kennebunk is served by the ISO-New England Electric Grid, which oversees the day-to-day operation of New England's electricity grid. Grid components, including substations, transmission lines, and distribution lines, are owned by energy delivery service companies. Kennebunk is served by two energy delivery service companies. Kennebunk Light and Power District (KLPD) is a small consumer-owned utility that operates most of the electric grid in the community. Central Maine Power provides electricity on one circuit that links Kennebunk's lower village with Kennebunkport and Biddeford.

The New England electricity grid is aging and is characterized by an extensive network of older, lower-capacity transmission lines serving as feeder lines to transformers and other critical system components. It is also increasingly vulnerable to several climate impacts, including extreme storms and precipitation as well as increasing temperatures.

Currently, the greatest source of power outages in Kennebunk and the broader region is storm events, including nor'easters, ice storms, snowstorms, and high wind events. A combination of high storm frequency, aging electric grid infrastructure, and an abundance of trees results in Maine having some of the worst power outages in the country. From 2015-2019 Maine had the highest average annual frequency of power outages per customer of any state (3.9 outages per year). Maine also had the second longest average duration of power outages per customer annually (14.1 hours), only behind Florida (14.6 hours).

Major weather events and storms significantly increase the duration of power outages, greatly impacting the number of hours Mainers spend without power. In 2020, a greater number of severe weather events meant that CMP customers experienced an average of 29.5 hours without power. However, in 2021 (a year with far fewer extreme weather events) CMP customers experienced only an average of 5.25 hours of power outages.<sup>22</sup>

In Kennebunk, the leading cause of power outages is tree limbs falling on power lines due to high winds or heavy ice or snow loads on trees. Tree limbs can cause outages by leaning on conductor lines, pulling lines down completely, or by damaging utility poles. In Kennebunk, tree impacts caused 66% of all CMP customer hours without power in 2021.<sup>23</sup> On the circuits serving

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<sup>22</sup> Annual Electric Power Industry Report, Form EIA-861 detailed data files, <https://www.eia.gov/electricity/data/eia861/>

<sup>23</sup> Data supplied by Central Maine Power. As a small utility, KLPD is not required to keep an extensive record of power outages and their impacts as CMP is required to do. As a result, we do not have a clear picture of power outages on the KLPD grid.

Kennebunk, CMP customers experienced an average of 4.63 power outages with an average outage duration of 1.24 hours in 2021.

In the future, increases in extreme storm frequency and duration will likely result in more power outages from downed lines, blown transformers, and other damage to regional grid infrastructure. Additional climate impacts will also strain grid infrastructure and cause power outages in the following ways:

- Increased likelihood of equipment breakdown from flooding of coastal and inland grid infrastructure from increases in storm surge and extreme precipitation events. In particular, substations can be significantly damaged by flooding. Substations are a key part of electrical power generation, transmission and distribution systems and often serve circuits that span multiple municipal jurisdictions. Flooding can damage substation components, leading to power outages and even fires. Also, during extreme storms, damage to roads and other infrastructure can prevent utility services from reaching and repairing sub-stations, prolonging power outages. A KLPD substation on Water Street that serves a large portion of Kennebunk could be potentially vulnerable in the future from flooding of the Mousam River and Rogers Pond Park during extreme precipitation or storm surge events combined with sea level rise. The lower village is served by a CMP substation located on School Street in Kennebunkport, which could be potentially vulnerable to extreme flooding of Grist Mill Pond due to extreme precipitation or storm surge. The other substations in Kennebunk, including one at the KKW water district on route one, a substation off Maguire Road, and KLPD's West Kennebunk Substation on Alfred Road, are all less vulnerable to flooding.
- Reduction in the grid transmission capacity and increase in the risk of damage to transformers due to higher average temperatures and nighttime temperatures.
- Increased risk of physical deformation of powerlines, damage to transformers, and disruptions to service due to extreme high temperatures.
- Increased demand for electricity, due to both the electrification of other energy systems as well as increased average and peak cooling demand during warmer temperatures and longer, more frequent, and more severe heat waves.

Taken together, these impacts mean that the regional electric grid is extremely vulnerable to climate change, while at the same time electrification and electricity demand are going up. These vulnerabilities are exacerbated by aging grid infrastructure that has an increasingly limited capacity to take on more electricity transmission. At the same time, increases in average and extreme temperatures lead to greater health risks for Kennebunk's vulnerable community members, which in turn amplifies the need for reliably electrified and conditioned spaces to ensure their safety.

# Flooding: Sea Level Rise & Storm Surge

## Key Takeaways

- Kennebunk's coastal infrastructure, properties, and natural resources are vulnerable to flooding.
- Lower Village and the beaches are significant drivers of tourism, key to the local economy, and are important cultural resources that are particularly vulnerable to flooding.
- More than \$388.9 million in assessed property value (FY21 assessing data) in Kennebunk is at risk of flooding from the 1% annual chance event storm surge plus 1.6 feet of sea level rise.
- Water and wastewater infrastructure, including the wastewater treatment plant and Boothby Road pump station, are in areas that are exposed to flooding, posing a risk of service disruptions and damage to critical infrastructure.
- Beach Avenue and Route 9 over the Mousam River are important transportation routes and are particularly vulnerable to flooding.
- Coastal neighborhoods, such as those between Beach Avenue and Gooch's Creek and off of Great Hill Road, are at risk of flooding and also areas of elevated social vulnerability based on a large percentage of the population being over the age of 65.
- Areas along Back Creek Lake (near the mouth of the Mousam River behind Parsons Beach), Little River, Kennebunk River, and Mousam River, especially near the Route 9 crossing are identified as being able to support future marsh migration. Significant portions of land adjacent to the tidal rivers have been conserved, which can help to ensure that future development won't impact migrating marshes in those areas.

## Background Info, Trends, & Projections

Sea level in Maine has been rising in the long-term, but over the past few decades the rate of rise has accelerated. That rise is increasing the frequency of nuisance or high tide flooding, with southern Maine seeing 4 times as many nuisance flooding events over the last decade compared with the average of the past 100 years<sup>24</sup>. According to a recent State assessment, there is a 67% probability that sea level will rise between 1.1 and 1.8 feet by 2050, and between 3.0 and 4.6 feet by the year 2100 under intermediate global greenhouse gas emissions scenarios, with higher sea level rise amounts possible<sup>24</sup>. With that rate of sea level rise, not accounting for increased intensity and frequency of storms, Maine will see a 15-fold increase in coastal flooding by 2050<sup>24</sup>. Those scenarios do not account for more intense rainfall that climate change is bringing to the region, which will exacerbate flood risk. With just 1.6 feet of sea level rise by 2050, it's estimated that cumulative damage costs caused by coastal flooding could be \$16.9-\$18.2 billion statewide<sup>25</sup>.

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<sup>24</sup> Maine Climate Council, Scientific Assessment of Climate Change and Its Effects in Maine, 2020: <http://climatecouncil.maine.gov/reports>

<sup>25</sup> Eastern Research Group. 2020. Assessing the Impacts Climate Change May Have on the State's Economy, Revenues, and Investment Decisions: Volume 2, Cost of Doing Nothing Analysis. Prepared for the State of Maine. Governor's Office of Policy Innovation and the Future.

As sea level rises in the future, normal high tides will be higher and storms, and accompanying storm surges, will be more impactful, causing extensive coastal flooding to roads, homes, and businesses. Storm surge is the abnormal rise in ocean water level during a storm event, measured as the height of the water above the normal predicted astronomical tide. This rise in water level can cause extreme flooding in coastal areas, especially when storm surge coincides with normal high tide. While future sea level rise will occur gradually over time, extreme storm events can cause damaging flooding episodically in the short-term.

In addition to rising seas, storm surge, and more nuisance flooding events, southern Maine's coastal areas are seeing more frequent and intense precipitation events. Further, the intensity and frequency of precipitation is expected to increase in the future with climate change. Stormwater runoff from rainfall events combined with surge and future sea level rise will lead to more extensive flooding in coastal areas.

Coastal flooding threatens public health and safety by putting transportation corridors, evacuation routes, and provision of emergency services at risk; disrupts economic activity through lost business and reductions in tourism; reduces property values; and imperils municipal revenue and budgets. In southern Maine, future sea level rise will cause regular inundation of low-lying coastal areas during high tide, contamination of groundwater aquifers and wells from saltwater intrusion, and increased erosion of the region's sandy beaches, dunes, and salt marshes.

To plan for sea level rise and associated impacts, the Maine Climate Council recommends a 'risk tolerance' approach of committing to manage for a higher probability, lower risk scenario, but also preparing to manage for a lower probability, higher risk scenario. That concept involves building flexibility into designs and decisions so that adjustments can be made to address more extreme sea level rise. It accounts for some of the variability and uncertainty regarding global emissions reductions efforts and evolving science about potential future melting of land-based ice. The State recommends that Maine commit to manage for 1.5 feet of relative sea level rise by 2050, and 3.9 feet of sea level rise by the year 2100, but prepare to manage for 3.0 feet by 2050, and 8.8 feet by 2100, all in relation to 2000 local sea level<sup>26</sup>. When planning for sea level rise, consideration should be given to the risk tolerance of different kinds of infrastructure. In other words, the intended lifespan, criticality, and exposure of infrastructure and assets to flood hazards should be considered when evaluating what sea level rise scenarios and planning horizons to account for in design and maintenance decisions.

Individuals who already have increased social vulnerability will be disproportionately affected by sea level rise and climate change as they have less capacity to prepare for, respond to, and recover from coastal hazard events.

This section presents assessment results of the impacts of modeled flooding from storm surge combined with sea level rise to represent what flooding from storm events could look like in the future<sup>27</sup>. The two flooding scenarios, listed below, align with the Maine Climate Council's planning

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<sup>26</sup> Maine Climate Council. 2020. Maine Won't Wait: A Four-Year Plan for Climate Action.

<sup>27</sup> Southern Maine Planning and Development Commission. 2020. Economic Resilience Assessment and Plan for Coastal York County: Towns of Kennebunk, Kennebunkport, Kittery, Ogunquit, Wells, and York.

recommendation of committing to manage 1.5 feet of rise by 2050 and preparing to manage 3.0 feet by 2050.

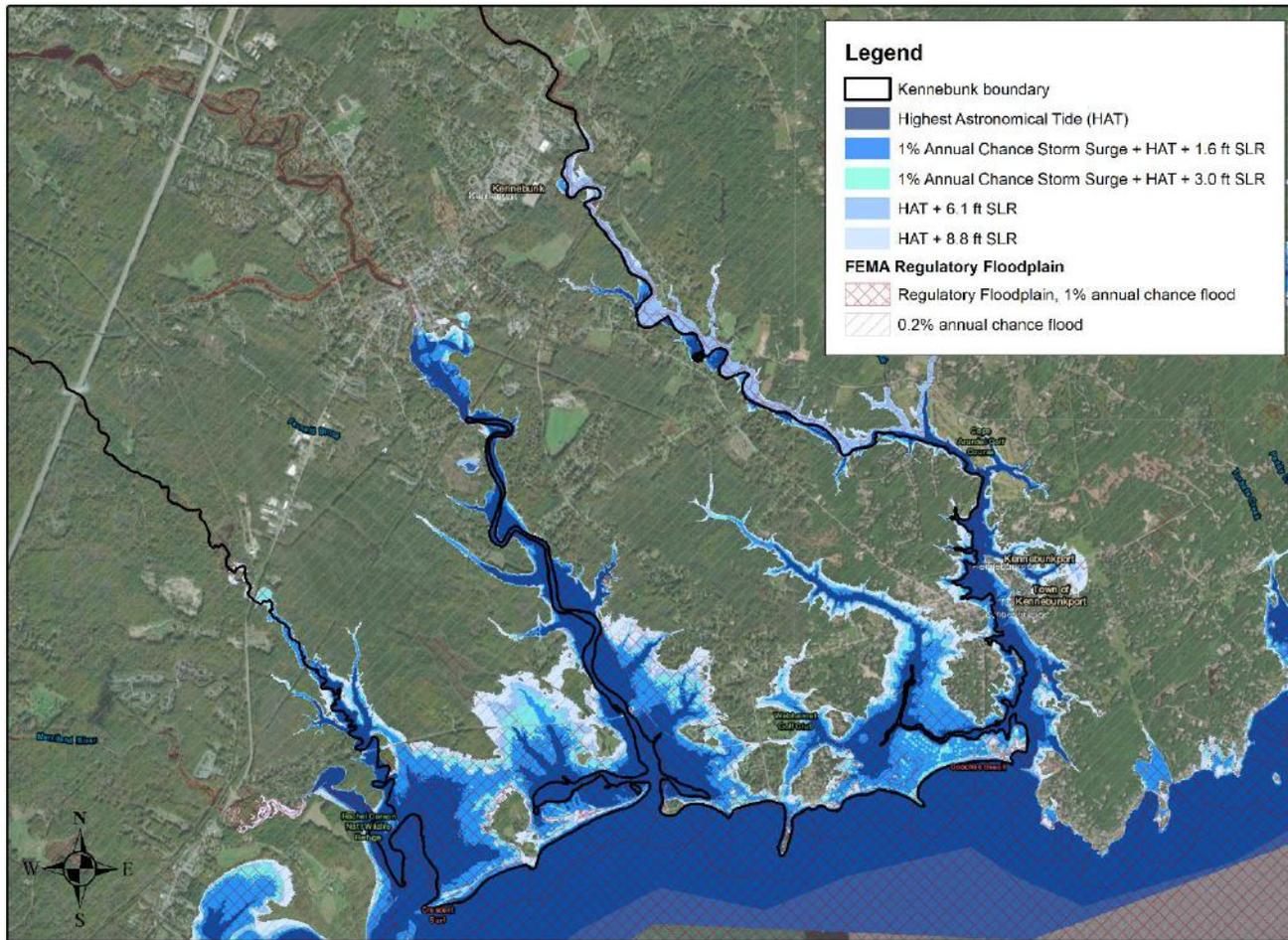
Flooding scenarios used for assessment<sup>28</sup>:

- **Storm surge from 1% annual chance event (i.e. 100-year storm) + 1.6 feet of sea level rise**
- **Storm surge from 1% annual chance event + 3.0 feet of sea level rise**

The assessment results presented below use the terms ‘vulnerable’, ‘impacted’, and ‘at-risk’ to describe impacts. All three terms mean that the subject parcels, asset, or area is touched by water under the given inundation scenario. It is important to note that the modeled flood scenarios show inundation at high tide, so not every area or thing that is directly impacted by the flood scenarios will be permanently inundated.

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<sup>28</sup> The sea level rise scenarios were developed by the Maine Geological Survey and do not account for wave action or precipitation. The storm surge values were provided by Ransom Consulting, LLC, and consist of storm surge and static wave set-up, without additional wave action due to crests or wave runup.



Data Source: Maine Geological Survey, Federal Emergency Management Agency, Ransom Engineering, SMPDC  
 Map Created by SMPDC

Map 11. Modeled inundation from sea level rise (SLR), storm surge, and the 1% annual chance storm event (Special Flood Hazard Area depicted on the FEMA-Issued Flood Insurance Rate Map).

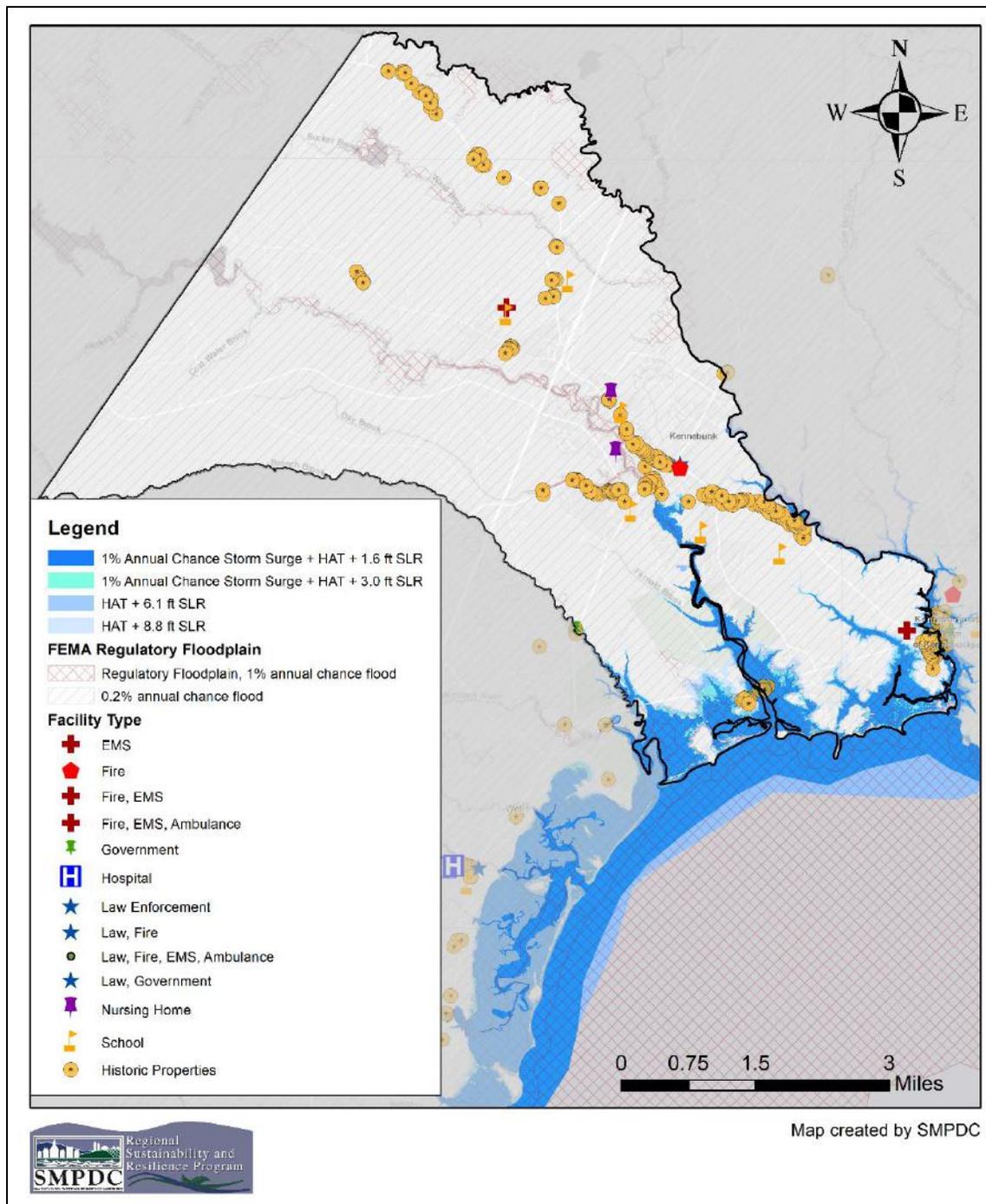
## Property Impacts

Where and how we choose to develop land profoundly impacts the resilience of our community. Buildings located in areas exposed to natural hazards like flooding are at greater risk of climate change impacts. Kennebunk's municipal budget, like most southern Maine coastal communities, is highly dependent on revenue from local property taxes, and coastal development provides a substantial portion of the municipal tax base, generating vital funds that sustain community operations, services, and programs. However, it is that same development that is most susceptible to coastal flooding, placing residents, visitors, and municipal fiscal health at risk. Studies have shown that coastal hazards and climate change diminish the value of impacted properties<sup>29</sup>. Municipal fiscal health could be negatively impacted if coastal properties, which generate a large portion of local tax revenue, are exposed to flooding and if development in vulnerable areas continues. In addition, the coastal areas and resources, especially sandy beaches, that serve as the economic engine for towns, the region, and state are particularly vulnerable to storms and rising seas as increasing water levels reduce the area of dry beach available.

The map below shows the locations of buildings and facilities that are critical for community safety, function, and well-being, and the location of historic properties. It also shows areas vulnerable to projected flooding from the 1%-annual chance event (e.g., the FEMA regulatory floodplain), projected flooding from the 1%-annual chance event (e.g., the FEMA regulatory floodplain), storm surge from the 1% annual chance event plus 1.6 feet and 3.0 feet of sea level rise, 6.1 feet of sea level rise, and 8.8 feet of sea level rise. There are mapped historical properties that are vulnerable to flooding in Lower Village and along the Mousam River. There are no emergency management buildings or schools in Kennebunk that are located in areas vulnerable to the mapped scenarios of storm surge and sea level rise.

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<sup>29</sup> Shi, L., Varuzzo, A. M. (2020). *Surging seas, rising fiscal stress: Exploring municipal fiscal vulnerability to climate change*. *Cities* 100 (2020) 102658.



Map 12. Critical facilities and buildings for public safety and well-being, historic properties, and parcels projected to be directly impacted by flooding from storm surge plus 1.6 feet of sea level rise and plus 3.0 feet of sea level rise, 6.1 feet of sea level rise, 8.8 feet of sea level rise, and the 1% annual chance event.

Table 5. Assessed value of parcels (FY21 values) impacted by storm surge from the 1% annual chance event plus 1.6 feet and 3.0 feet of sea level rise. (Source: SMPDC. 2022. Economic Resilience Assessment and Plan for Coastal York County)

	Land Only	Buildings + Land	Total	Total Municipal Tax Impact <i>(impacted assessed property value x '21-'22 tax rate of 0.01425)</i>	% of Town-Wide Assessed Value ('21)	% of FY21 Municipal Budget
<b>Storm surge + 1.6 ft SLR</b>	\$52,797,769	\$336,162,600	\$388,960,369	\$5,542,685	12.8%	11%
<b>Storm surge + 3.0 ft SLR</b>	\$56,509,559	\$423,965,200	\$480,474,759	\$6,846,765	15.8%	14%

- More than \$388.9 million in assessed property value (FY21 assessing data) in Kennebunk is vulnerable from the 1.6 ft sea level rise scenario and almost \$480.5 million in assessed value is vulnerable to the 3.0 ft scenario (Table 5).
  - Those values correspond to 12.8% and 15.8% of the town-wide assessed property value, respectively, and represent 11% and 14% of the Town's FY21 municipal budget.
  - Single-family residential homes make up the majority of the assessed property impacted by flooding, followed by multi-family residential homes.
- **Lower Village:** Businesses and the road and bridge through Lower Village into Kennebunkport are inundated in both the 1.6 ft and 3.0 ft scenario. Parking lots and road access to docks along the Kennebunk River are cut off by inundation from both the 1.6 ft and 3.0 ft scenarios.
- **Mother's, Middle, Gooch's, Parsons, and Crescent Surf Beaches** are all vulnerable to flooding.
  - The parking area in front of Kennebunk Beach is vulnerable to the 3.0 ft scenario and the neighborhood to the north has several residential properties that are vulnerable to the 3.0 ft scenario.
- Road access to 50 parcels that aren't directly at-risk of flooding is cutoff by flooding with the 1.6 ft scenario. That number increases to 104 parcels cutoff from the 3.0 ft scenario.
- Access to and from the peninsular **neighborhood of Lords Point Road** is cut off by road flooding near the intersection with Beach Avenue. The coastal **neighborhood between Beach Avenue and Gooch's Creek** is vulnerable to both the 1.6 ft and 3.0 ft scenarios. The **neighborhood off Great Hill Road** is partially inundated, especially on the landward side, by both inundation scenarios and road access to the area is cut off by flooding from both scenarios all the way to the intersection with Sea Road. Based on Census data, these

neighborhoods are located in an area of elevated social vulnerability due to the percentages of the population living alone, over the age of 65, and with annual household income less than the county and town median income. This area also has the second highest percentage of people that speak English less than well out of all block groups. These demographic characteristics can limit the adaptive capacity of people to deal with flood hazards. These areas also have a relatively high percentage (49.7%) of structures built before 1970 and are likely more sensitive to flooding as they are likely not built to modern floodplain management standards. As noted in the Social Vulnerability section of this document, these demographic data are from the US Census Bureau and have a margin of error associated with them. Further, they are estimates aggregated at the block group level rather than an accurate representation of neighborhood specific demographics. Local knowledge provided by Kennebunk Task Force members suggests that, many homes in this area are seasonal homes and have a high value.

- Properties along **Crescent Surf** and **Parsons Beaches** are particularly vulnerable to flooding as the area and access to it via Hart and Parsons Beach Roads is cutoff by inundation in both scenarios. The area that has a relatively high percentage of structures built before 1970 and are likely more sensitive to flooding as they are likely not built to modern floodplain management standards.

## Infrastructure Impacts

Sea level rise threatens surface and subsurface infrastructure. Inundation of surface infrastructure can cause short-term disruptions due to road closures and limited access to infrastructure. It can also cause substantial damage to infrastructure, including pavement, culverts, stormwater infrastructure, and utility infrastructure. Higher water levels can reverse or reduce efficiency of stormwater drainage and wastewater outfall operations.

Along the coast, groundwater and saltwater are naturally separated by the seaward movement of groundwater. As seas rise, landward intrusion of seawater pushes groundwater levels up and shifts the interface of fresh groundwater and saltwater inland. Studies conducted in coastal New Hampshire show that sea level rise induced groundwater rise is projected to extend up to three to four times further inland than surface tidal water inundation from sea level rise<sup>30</sup>.

Low-lying coastal communities and important infrastructure are at risk of impacts including intrusion of saltwater into groundwater and drinking water resources, increased flooding from higher coastal water tables, and water damage to roadways and other infrastructure from below. Researchers are working to model and assess this phenomenon in New England to better understand coastal hazards stemming from sea level rise. No assessment has yet been completed for Kennebunk, however, subsurface stormwater, transportation, and utility infrastructure; contaminated sites; septic systems; and drinking water wells in coastal areas will likely be negatively impacted by rising groundwater and saltwater intrusion. Rising groundwater can impede

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<sup>30</sup> Knott, J.F.; Jacobs, J.M.; Daniel, J.S., and Kirshen, P., 2019. Modeling groundwater rise caused by sea-level rise in coastal New Hampshire. *Journal of Coastal Research*, 35(1), 143–157. Coconut Creek (Florida), ISSN0749-0208.

the ability of septic systems to function properly as the vertical separation between the groundwater table and leachfield is reduced. This can result in contamination from septic systems into groundwater and nearby surface waters. The U.S. Geological Survey (USGS) notes that if too much freshwater is pumped from an aquifer system, saltwater can migrate landward<sup>31</sup>. Wells located near the landward migrating freshwater/saltwater interface, saltwater could be contaminated from saltwater entering the well, threatening drinking water supplies. However, the USGS also notes that this is less likely to happen with residential wells and is a larger concern for municipal or community-size wells where pumping rates are much higher.

In Kennebunk, most coastal areas in town have access to public water by Kennebunk, Kennebunkport, and Wells Water District, limiting vulnerability of private drinking water wells from saltwater intrusion (Map 15). The majority of coastal parcels east of the Mousam River are served by public sewer. However, parcels west of the Mousam River, including Parsons Beach and Crescent Surf neighborhoods, parcels located off of Shoreline Way, Seagrass Lane, western half of Great Hill Road, and areas along the Kennebunk River north of Christensen Lane just north of Lower Village/Dock Square are not served by public sewer. Septic systems in those areas could be vulnerable to failure due to rising groundwater (Map 14).

- Roughly 5.5 miles of road are impacted by the 1.6 ft scenario and almost 8 miles are impacted by the 3.0 ft scenario (Table 6, Map 13, and Map 15). A complete list of roads impacted by both flooding scenarios can be found at the end of this section.

Table 6. Road length and classification impacted by storm surge from the 1% annual chance event plus 1.6 feet and 3.0 feet of sea level rise. (Source: SMPDC. 2022. Economic Resilience Assessment and Plan for Coastal York County)

	Road Length (ft) Impacted	Road Length (Miles) and Classification Impacted
<b>Storm surge + 1.6 ft SLR</b>	28,598	<b>5.42</b> Local: 3.07 Private: 1.77 Secondary: 0.58
<b>Storm surge + 3.0 ft SLR</b>	40,867	<b>7.74</b> Local: 4.51 Private: 2.31 Secondary: 0.92

- **Route 9/Western Avenue** is a significant route for local and regional travel and is particularly vulnerable to flooding along various segments, including near the Wells border, over the Mousam River, and at the Kennebunk River.
- **Beach Avenue** is vital for access to the beach and to coastal neighborhoods and is particularly vulnerable to flooding, with most of the road flooded by the 3.0 ft scenario and portions of it flooded by the 1.6 ft scenario.
- **Boothby Road** is also an important access road to coastal neighborhoods and is vulnerable to flooding with both modeled scenarios.

<sup>31</sup> U.S. Geological Survey. 2019. <https://www.usgs.gov/mission-areas/water-resources/science/saltwater-intrusion>

- A small portion of **Durrell’s Bridge Road** and bridge are vulnerable to inundation, primarily from the 3.0 ft scenario, but a portion of the bridge is vulnerable to the 1.6 ft scenario. The road is the only crossing over the Kennebunk River for quite a distance both up and downstream.
- **Parsons Beach and Hart Roads** are vulnerable to flooding from both scenarios and are the only access routes to residential properties along Crescent Beach.
- Table 7 shows wastewater and water infrastructure, as well as other critical facilities, that are vulnerable to flooding from the 1.6 feet and 3.0 feet scenarios. Kennebunk, Kennebunkport & Wells Water District is responsible for water infrastructure and the Kennebunk Sewer District is responsible for wastewater infrastructure.
  - The **wastewater treatment plant** and parking lot are inundated by flooding and access to and from the plant via Water Street is impacted by flooding from both the 1.6 ft and 3.0 ft scenarios. The estimated replacement cost of the plant, in 2018 dollars, is between roughly \$4.6 million and \$13.7 million <sup>32</sup>.
  - Observations from Town staff indicate that the sewer pump station on Boothby Road, which is vulnerable to both the 1.6 and 3.0 ft scenarios, is already routinely impacted by floodwaters.
  - There are no schools, public safety, emergency response, or healthcare facilities exposed to the modeled flood scenarios.
- Most coastal areas of Kennebunk are served by public water, limiting vulnerability from saltwater intrusion into wells (Map 15).
- Coastal neighborhoods near Gooch’s Beach, Parsons Beach, and Crescent Surf and along the Kennebunk River north of Lower Village/Dock Square are on public sewer, but those sewer lines are located in areas that are exposed to flooding from sea level rise (Map 14). The second half of Great Hill Road does not appear to be served by sewer, thus septic systems in that area could be at risk of failure from sea level induced groundwater rise, posing risk of contamination to nearby surface waters and groundwater.
- Based on an assessment by the Maine Geological Survey, coastal engineered structures (e.g., seawalls, bulkheads, jetties, etc.) in the following areas are vulnerable to overtopping by flooding from the modeled current 1% annual chance storm event, not including sea level rise.
  - Rip-rap along Parsons Beach Road over the Back Creek Lake inlet (near the mouth of the Mousam River).
  - Sections of bulkhead along Crescent surf beach.
  - Sections of bulkhead and rip-rap along Great Hill Road on both the ocean and landward side of the peninsula.
  - Most of the bulkhead and rip-rap sections along Lord’s Point and Kennebunk Beach.
  - Almost all of the sections of bulkhead and rip-rap along Beach Avenue.
  - All of the bulkhead along the Lower Village area, including the marina, and around Doane’s Wharf.

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<sup>32</sup> Eastern Research Group, Inc. State of Maine. 2020. Assessing the Impacts Climate Change May have on the State’s Economy, Revenues, and Investment Decisions: Volume 2: Cost of Doing Nothing Analysis.

Road Name	Road Classification	Impacted by Storm Surge + 1.6 ft Sea Level Rise	Impacted by Storm Surge + 3.0 ft Sea Level Rise
Arundel Way	Private	✓	✓
Atlantic Cir	Private	✓	✓
Bayberry Ave	Private	✓	✓
Bayberry Ave	Local	✓	✓
Bayberry Ave	Private		✓
Beach Ave	Local	✓	✓
Boothby Rd	Local	✓	✓
Bruen Pl	Local	✓	✓
Christensen Ln	Local		✓
Coveside Ln	Private		✓
Crescent Ave	Local	✓	✓
Crescent Surf Dr	Private	✓	✓
Doanes Wharf Rd	Local	✓	✓
Durrells Bridge Rd	Local	✓	✓
Dutcher Ln	Local	✓	✓
Ebb Tide Ln	Private	✓	✓
Evergreen Ave	Local	✓	✓
Fairway Dr	Local		✓
Forest Hill Ln	Private	✓	✓
Gooch Ave	Local	✓	✓
Great Hill Rd	Local	✓	✓
Harbor Ln	Private	✓	✓
Harris Ln	Local	✓	✓
Harts Rd	Private	✓	✓
Hickory Ln	Local	✓	✓
Larboard Ln	Local	✓	✓
Leeward Ln	Private	✓	✓
Little River Way	Private	✓	✓
Lords Point Rd	Local	✓	✓
Magnolia Ave	Private	✓	✓
Marsh View Ave	Local	✓	✓
Mineral Spring Way	Private	✓	✓
Oak St	Local		✓
Oceanside Ln	Private	✓	✓
Parsons Beach Rd	Private	✓	✓
Peninsula Dr	Local	✓	✓
Preserve Dr	Local	✓	✓
Railroad Ave	Local	✓	✓
Ridge Ave	Local	✓	✓
Robie Rd	Private	✓	✓

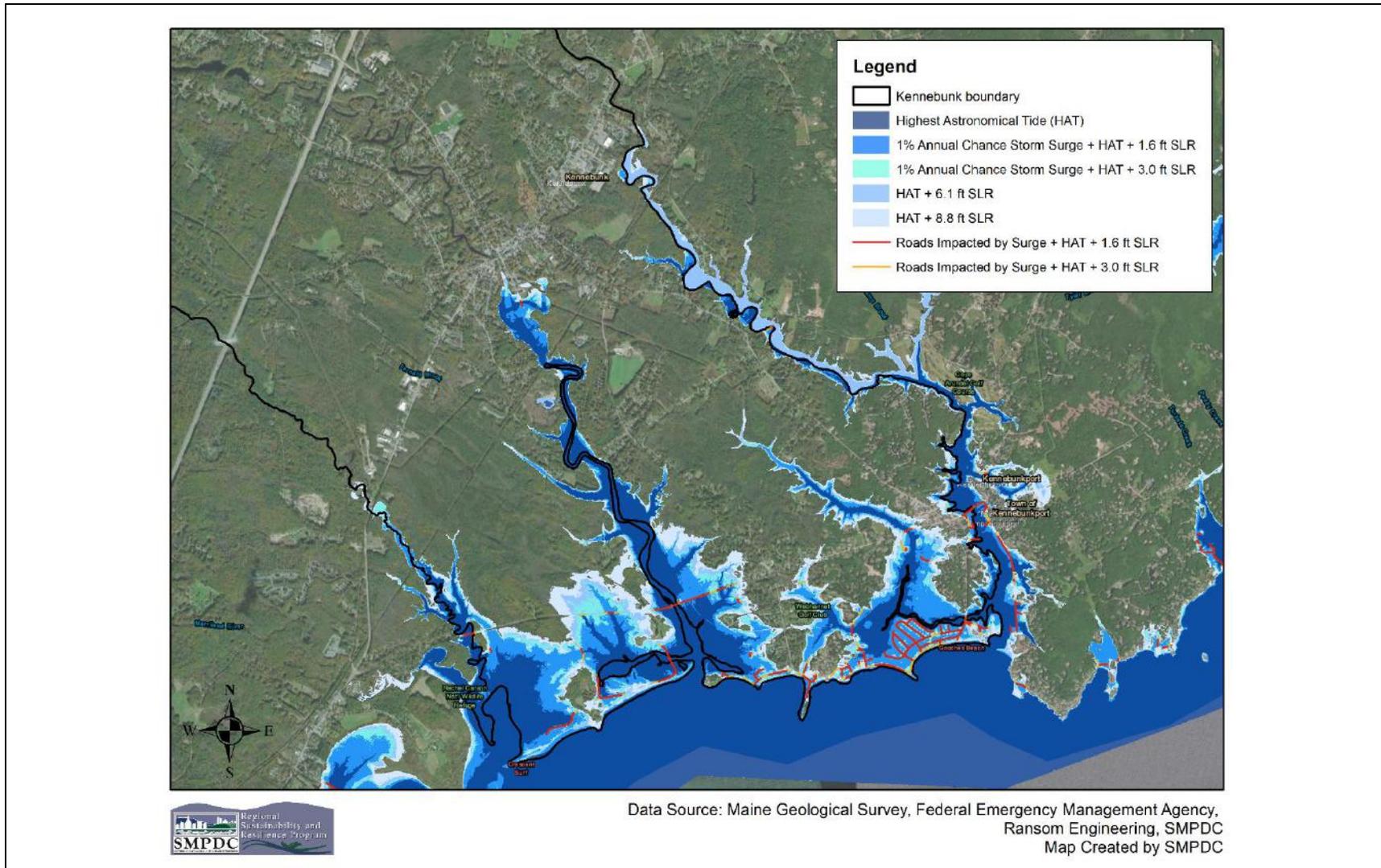
Sand Dollar Ln	Private		✓
Sea Garden Cir	Private	✓	✓
Sea Grass Ln	Private	✓	✓
Ship Locks Dr	Private		✓
Shoreline Way	Private	✓	✓
Starboard Ln	Private	✓	✓
Surf Ln	Local	✓	✓
Valley Ave	Local		✓
Water St	Local	✓	✓
Western Ave - Route 9	Secondary	✓	✓
Woodland Ave	Local	✓	✓

Table 7. Sewer and water infrastructure and facilities impacted by storm surge plus 1.6 feet and 3.0 feet of sea level rise. (Source: SMPDC, 2022. Economic Resilience Assessment and Plan for Coastal York County.)

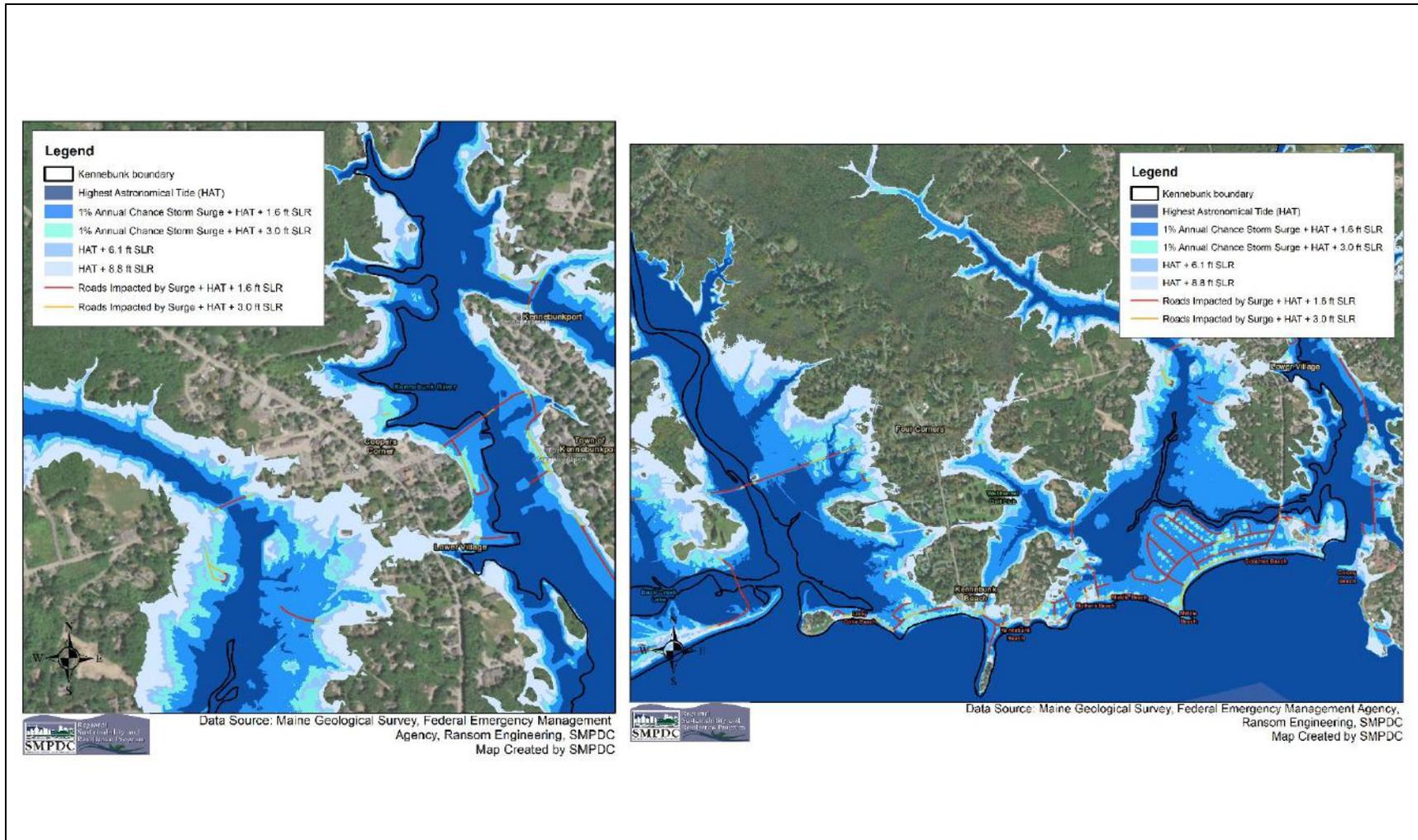
Infrastructure Type		Vulnerable to SS + 1.6 ft SLR Scenario	Vulnerable to SS + 3.0 ft SLR Scenario	Not vulnerable to 1.6 ft or 3.0 ft Scenarios
<b>Wastewater</b>	Treatment Plant	Yes	Yes	-
	Sewer Pump Stations	<b>3</b> (Boothby Road, Wells Road near the Route 9 Mousam River crossing, and Great Hill)	<b>8</b> (Boothby Road, Wells Road near the Route 9 Mousam River crossing, Great Hill, Larboard Lane, Lakebrook, Doanes Warf, Deer Trees, and Grants Farm)	29
	Sewer Gravity Mains	17,724 ft	22,838 ft	166,785 ft
	Sewer Force Mains	6,795 ft	8,955 ft	51,263 ft
<b>Water</b>	Water Structures	<b>1</b> (Station and Spring House)	<b>1</b> (Spring House)	49
	Water Mains	136,172 ft	167,432 ft	1,127,962 ft
<b>Other critical Facilities</b>	Schools, public safety and emergency response, nursing homes, and healthcare facilities	-	-	19

## Economic Impacts

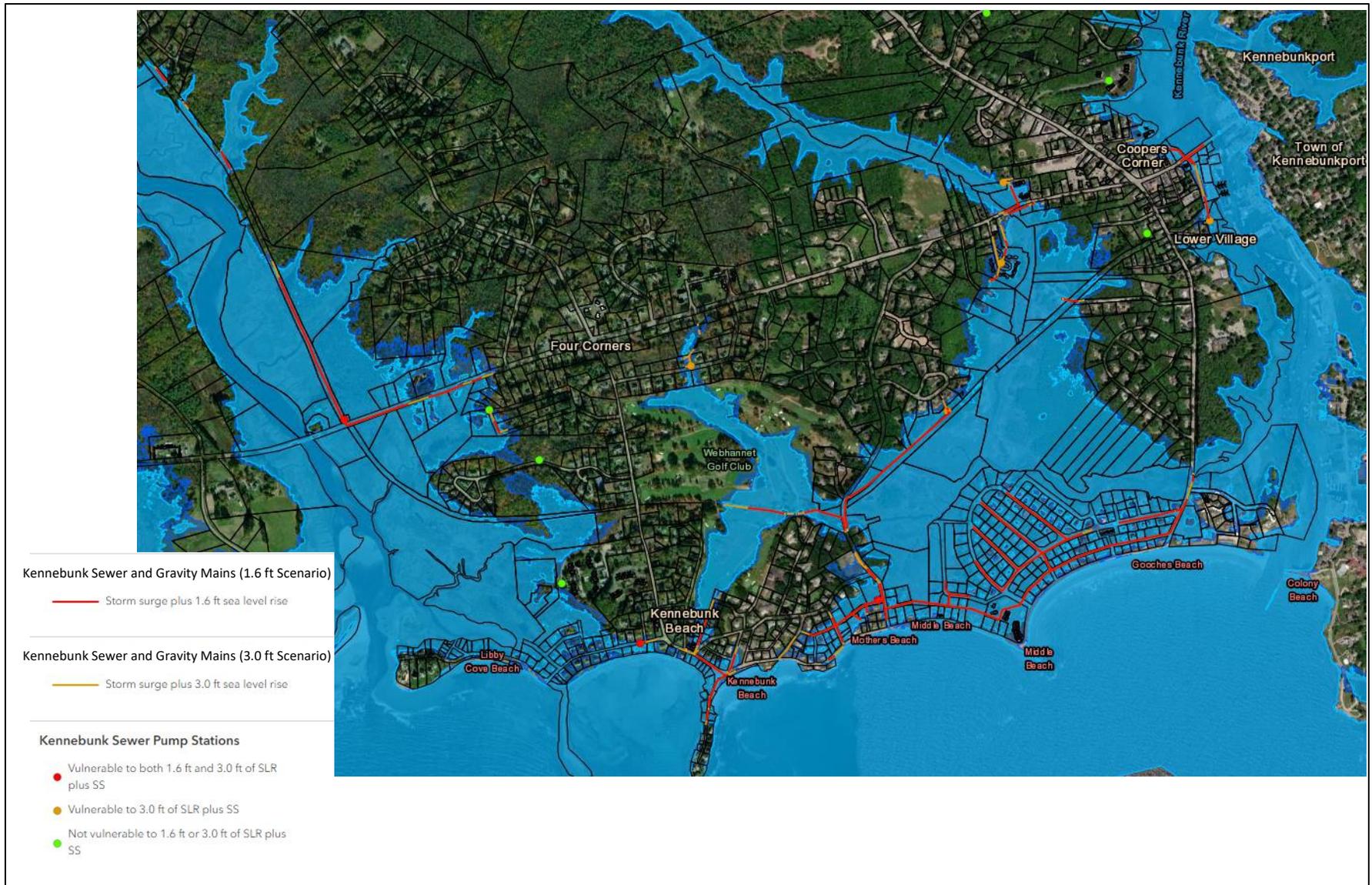
- More than 300 jobs, over \$20 million in labor income, nearly \$30 million in area gross domestic product, and over \$53 million in revenue may be affected in some way by sea level rise and storm surge.
- 1 out of every 25 jobs in Kennebunk is impacted by the 3.0 ft scenario, and nearly \$1 out of every \$20 generated in Kennebunk is connected to a business that is directly impacted by flooding from the modeled scenarios.
- Flood vulnerability of Lower Village, an economic hub in Kennebunk, the beaches, and waterfront infrastructure will likely have significant economic impacts for the community, threatening jobs, business revenue, tourism activity, and recreational activity.



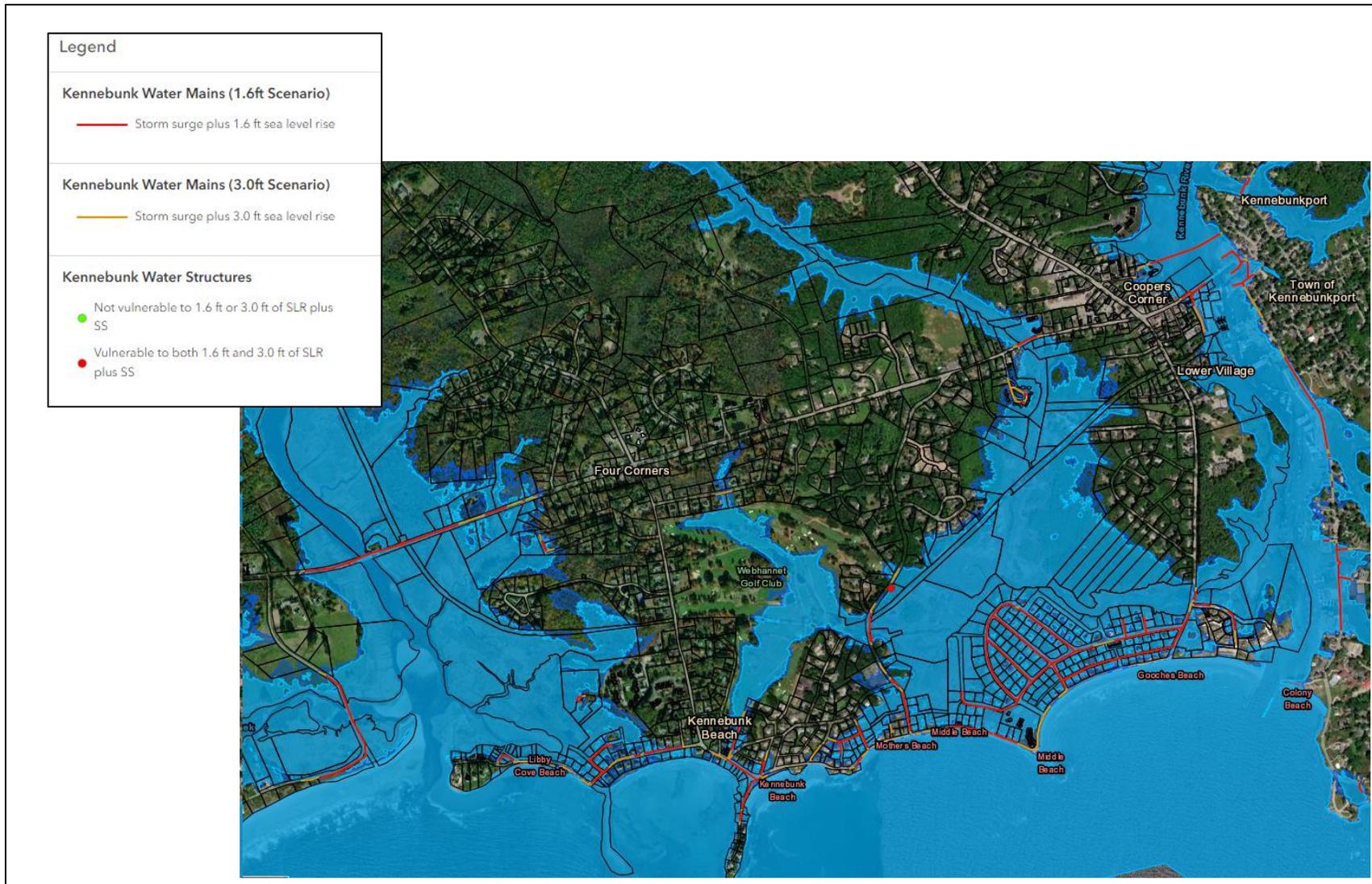
Map 13a. Roads impacted by storm surge from the 1% annual chance (i.e. 100-year) event plus 1.6 feet and 3.0 feet of sea level rise. Road impacts account for bridge elevation, as LiDAR was used to confirm whether a bridge would be overtopped based on bridge deck elevations and the water surface elevations of the inundation scenario. So, even if the inundation boundary appears to ‘cover’ a bridge, the bridge is only projected to be inundated by water if it is shown as red or orange on the map. (Source: SMPDC. 2022. Economic Resilience Assessment and Plan for Coastal York County).



Map 14b. Roads impacted by storm surge from the 1% annual chance (i.e. 100-year) event plus 1.6 feet and 3.0 feet of sea level rise. Road impacts account for bridge elevation, as LiDAR was used to confirm whether a bridge would be overtopped based on bridge deck elevations and the water surface elevations of the inundation scenario. So, even if the inundation boundary appears to ‘cover’ a bridge, the bridge is only projected to be inundated by water if it is shown as red or orange on the map. (Source: SMPDC. 2022. Economic Resilience Assessment and Plan for Coastal York County).



Map 15. Kennebunk sewer mains and pump stations located in areas vulnerable to storm surge from the 1% annual chance (i.e. 100-year) event plus 1.6 feet and 3.0 feet of sea level rise. (Source: SMPDC. 2022. Economic Resilience Assessment and Plan for Coastal York County).



Map 16. Kennebunk water mains located in areas vulnerable to storm surge from the 1% annual chance (i.e. 100-year) event plus 1.6 feet and 3.0 feet of sea level rise. (Source: SMPDC, 2022. Economic Resilience Assessment and Plan for Coastal York County).

## Impacts to the Natural Environment

### Beach Erosion

Rising seas and coastal storms threaten local beaches and dune systems through erosion and flooding. Hardened coastal structures, like seawalls, roads, and homes, prevent beach systems from migrating inland as ocean levels increase. Additionally, how beaches will fare with increased sea level is related to sediment supply, both sources and volumes of the supply. Sand and gravel for beaches can come from rivers, eroding bluffs, the offshore seafloor, or marine shells. Shorelines that have been engineered to prevent erosion, protect property, and stabilize the shoreline offer reduced sediment supply to beaches.

- With 1.6 ft of sea level rise, Kennebunk's dry beach width (distance from the mean high water to seawall or dune edge) is projected to decrease by 2.6 acres, or by almost 60%. With 3.9 feet of sea level rise, the dry beach width is projected to decrease by almost 90%<sup>33</sup>.
- Sea level rise is expected to lead to loss of coastal habitat. Along Kennebunk's coast, loss of dry beach will impact local species, including piping plovers and other shorebirds that use the beach for nesting.
- Monitoring data from the Maine Geological Survey conducted as part of the Maine Beach Mapping Program show that most of Kennebunk's beaches have been relatively stable in terms of their width over the past several years (2016 – 2020). However, Parsons Beach at the outlet of the Mousam River and Crescent Surf Beach spit at the mouth of the Little River have experienced erosion at the rate of between roughly 0.5 ft and 3.75 feet per year between 2016 and 2020.



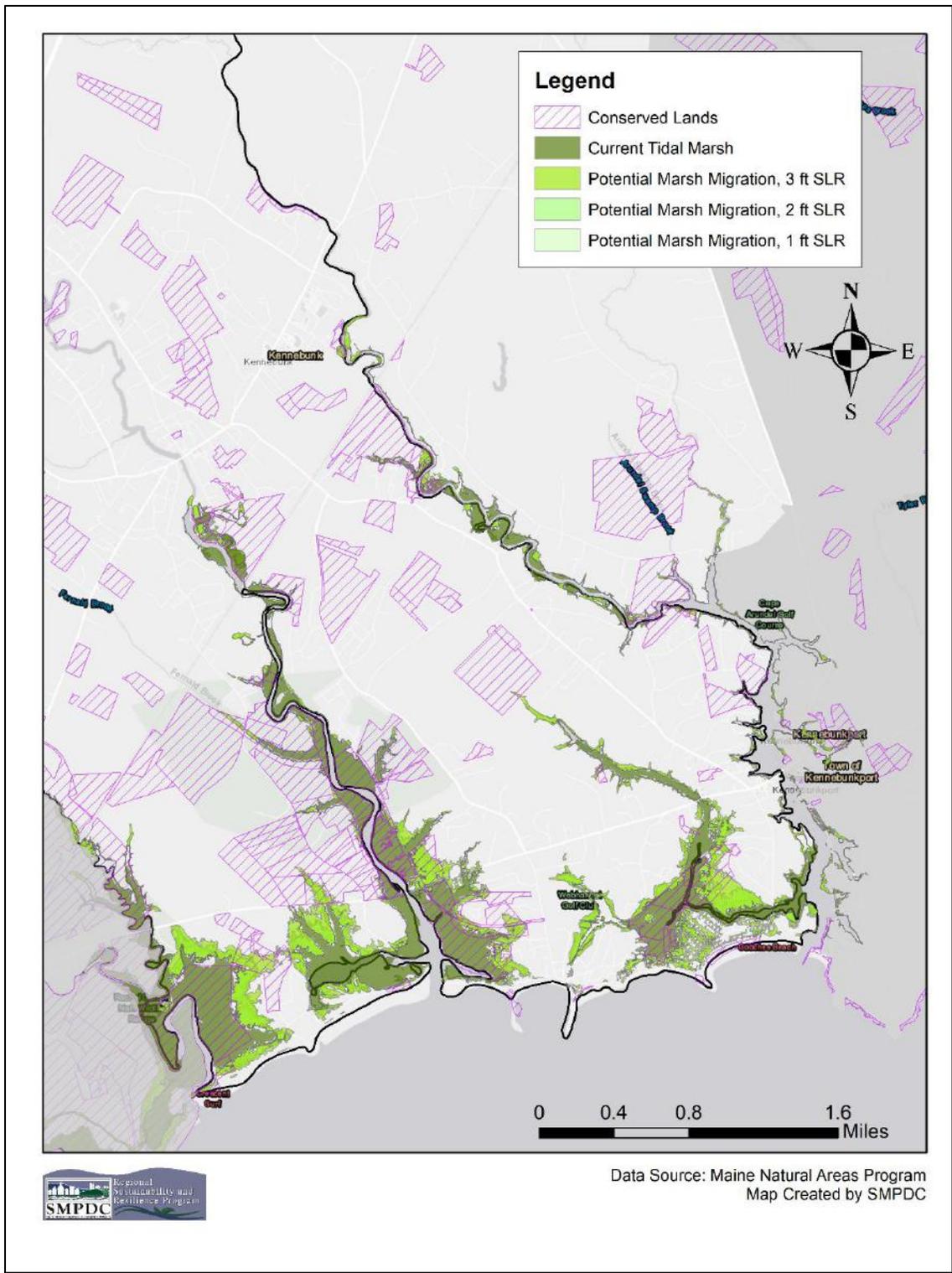
Map X: Mapped shoreline change along Kennebunk. This map shows the rate of beach change, in feet per year, from data collected from 2016 through 2020. A positive value (green lines) represents a rate of beach growth, while a negative value (yellow/orange/red lines) represents a rate of beach loss. (Source: Maine Geological Survey. Maine Beach Mapping Program. Maine Beach Mapping viewer)

<sup>33</sup> Maine Geological survey. 2021. Unpublished analysis of the impact of sea level rise on dry beach width of Maine's sandy beaches.

## Marsh Migration

While sea level rise threatens inundation of the beach system, it also has the potential to facilitate the landward expansion, or migration, of tidal marshes. However, this landward migration can only occur if saltmarshes are healthy and there are not physical barriers, such as stonewalls, roads, or buildings, that inhibit marsh movement. The Maine Natural Areas Program (MNAP) has mapped areas that could support marsh migration with future sea level rise (Map 17). Protecting these areas will be crucial for ensuring the long-term viability of local tidal marshes, which provide tremendous natural benefits and services including wildlife habitat, flood control, water quality protection, and carbon sequestration.

- Areas along **Back Creek Lake** (near the mouth of the Mousam River behind Parsons Beach), **Little River, Kennebunk River, and Mousam River**, especially near the Route 9 crossing are identified as being able to support future marsh migration. Significant portions of land adjacent to the tidal rivers have been conserved, which can help to ensure that future development won't impact migrating marshes in those areas.
- The residential and undeveloped areas around **Gooch's Creek** and its tributaries are also mapped future marsh migration areas, overlapping with existing yards of homes between Gooch's and Middle Beaches and the pond. There is very little existing conserved land in that area.



Map 17. Existing conserved lands (purple) and areas that could support future migration of existing tidal marshes with future sea level rise. The areas are non-tidal lands within existing tidal estuaries that could be inundated and facilitate the development of new areas of tidal marsh if sea level rises by 1, 2, or 3.3 feet above current highest annual tide (HAT). (Source: Maine Natural Areas Program. Sea level rise scenarios are from the Maine Geological Survey.)

# Extreme Temperatures & Air Quality

## Key Takeaways

- Maine's average annual temperature has increased by 3.2°F since 1895 and could warm an additional 2-4°F by 2050.
- Southern Maine is expected to experience almost 3 times more 'extreme heat' days by the 2050s, from 4 days per year currently to 13.
- Exposure to extreme heat is a significant public health concern and can be especially dangerous for older adults, infants, people with existing health conditions, and those who have limited access to air conditioning.
- Extreme heat will exacerbate the impacts of urban 'heat islands', the locations of which overlap with areas of socially vulnerable populations in Kennebunk, such as in the downtown area.
- There are fewer days with below-freezing temperatures and snow cover, leading to an increase in pest outbreaks and prevalence vector-borne diseases like Lyme disease.

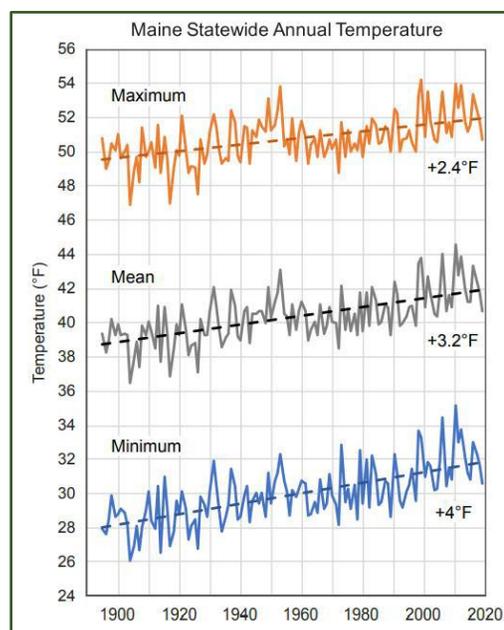


Figure 3. Maximum, mean, and minimum statewide annual temperatures from 1895 to 2019. (Source: MCC STS. 2020.)

## Background Information, Trends, & Projections

Climate change is causing increased temperatures and more frequent extreme temperature occurrences. In Maine, the average annual statewide temperature has increased by 3.2°F since 1895<sup>34</sup> (Figure 3). Winters are warming faster than other seasons, and coastal areas have warmed more than the interior of the State. Climate models project that Maine could warm an additional 2 to 4°F by 2050 and up to 10 °F by 2100 depending on global greenhouse gas emissions. Extreme heat days are expected to be 2 to 4 times more frequent in Maine by 2050, increasing the likelihood of heatwaves. Southern Maine is expected to experience almost 3 times more 'extreme heat' days, up to roughly 13 days per year, where the heat index (a combination of temperature and relative humidity that approximates the 'felt' temperature) exceeds 95°F, as the early 2000s (Map 18)<sup>35</sup>. In addition to extreme heat, there is research showing that more short-term temperature variability and volatility may be happening as a result of climate change.

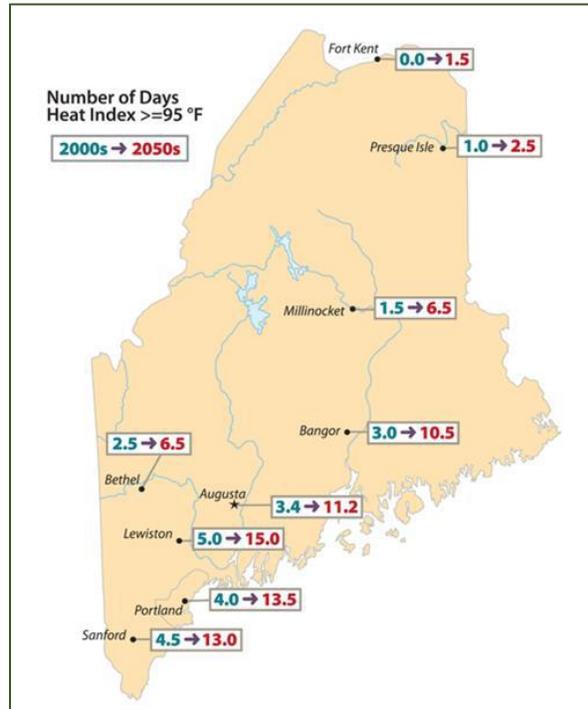
<sup>34</sup> MCC STS. 2020. Scientific Assessment of Climate Change and Its Effects in Maine. A Report by the Scientific and Technical Subcommittee (STS) of the Maine Climate Council (MCC). Augusta, Maine. 370 pp.

<sup>35</sup> Fernandez, I.J., Schmitt, C.V., Birkel, S.D., Stancioff, E., Pershing, A.J., Kelley, J.T., Runge, J.A., Jacobson, G.L. & Mayewski, P.A. (2015). Maine's Climate Future: 2015 Update. Orono, ME: University of Maine.

Five of the ten warmest years on record have occurred within the past ten years, based on average annual temperatures from National Weather Service (NWS) data collected between 1989 and January of 2023 in Kennebunkport, the NWS data collection station closest to Kennebunk (Table 8). The warmest average monthly temperatures for the summer months (June, July, and August) have also occurred within the past ten years and have been 3.1 – 4.3°F warmer than the monthly mean temperature (Table 9). 2023 was the warmest January on record, with an average temperature of 31.9°, which is 8.5° warmer than the January mean temperature.

Table 8. The top ten warmest years based on average annual air temperatures measured in Kennebunkport (the closest station to Kennebunk), 1989 – January 2023. (Source: National Weather Service).

	Year	Average Annual Temperature (°F)
1	1989	49.9°
2	1998	49.0°
3	2021	47.8°
4	2010	47.7°
5	2012	47.6°
6	2020	47.2°
7	1999	47.0°
8	2006	47.0°
9	2022	46.8°
10	2016	46.7°
<b>1989-2023 Average</b>		45.3°



Map 18. Average number of days when the heat index is greater than or equal to 95°F at selected sites for 2000 - 2004 and 2050 - 2054. Predicted values derived from a 48-km downscale simulation of one ensemble member of the CCSM3 model for the IPCC A2 emissions scenario. Source: Fernandez et al. (2015). (Figure from MCC STS. 2020.)

Table 9. Years with the warmest average monthly temperature during the summer months compared with the mean monthly temperatures for those months measured in Kennebunkport (the closest station to Kennebunk), 1989 – January 2023. (Source: National Weather Service.)

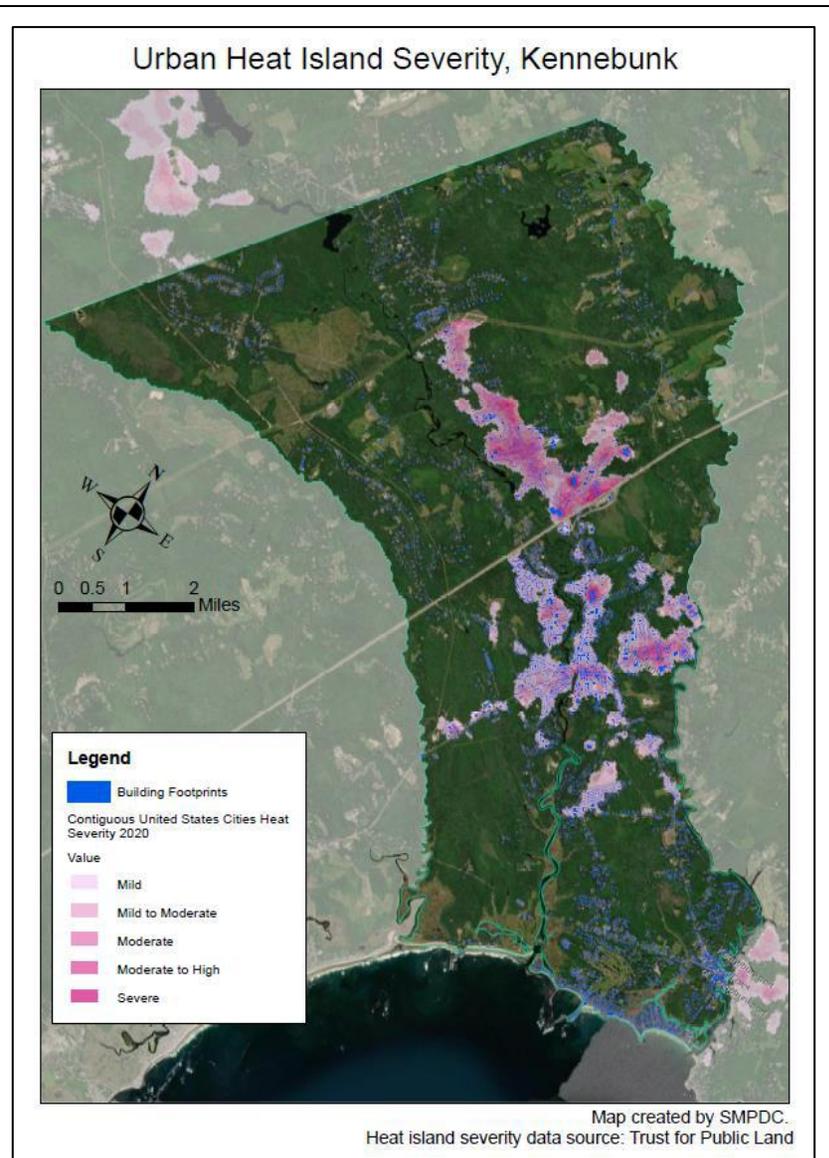
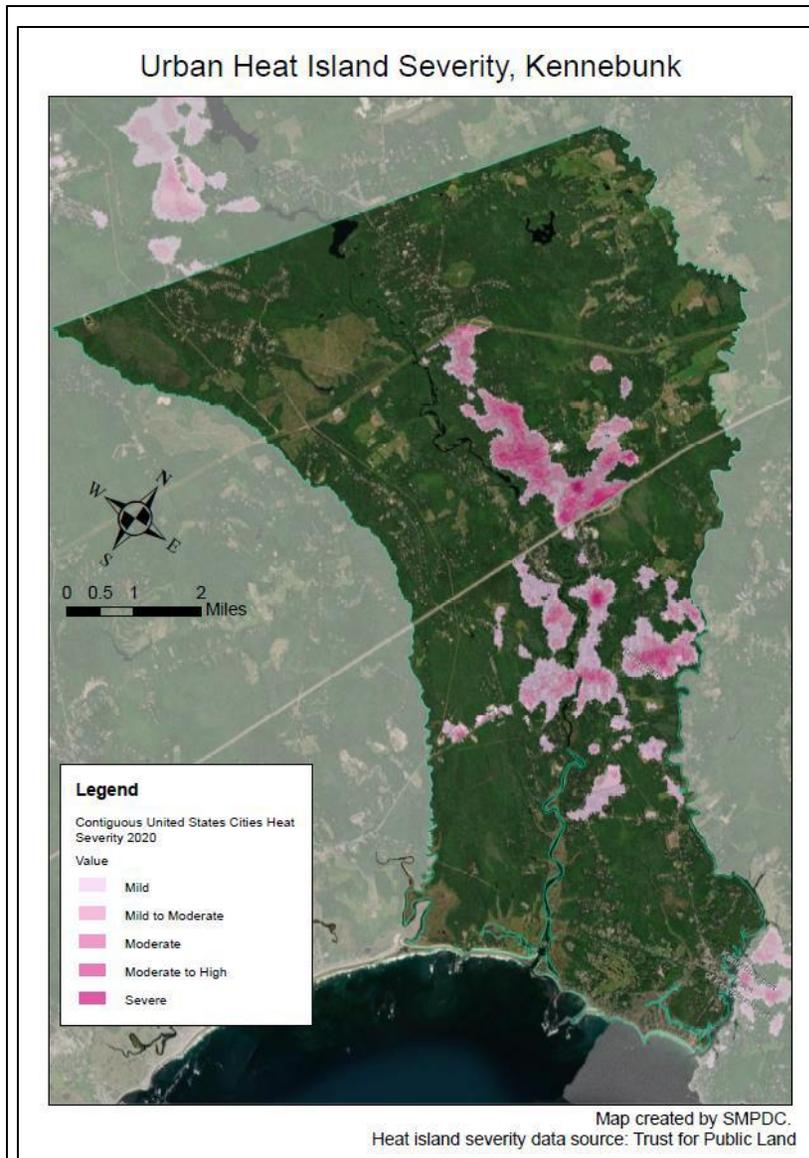
Month	Year	Average Temperature (°F)	Mean Temperature (°F), 1989 - 2022	Difference Between Mean and Average of Warmest Month
June	2021	65.7°	61.6°	+4.1°
July	2013	70.5°	67.4°	+3.1°
August	2018	70.4°	66.1°	+4.3°

### Urban Heat Islands

Extreme heat days in Maine will exacerbate the severity and impacts of “heat islands”, or areas with a lot of impervious surfaces, such as buildings and pavement, that absorb and re-emit heat. The Trust for Public Land notes that extreme heat exacerbated by urban heat islands can lead to increased respiratory difficulties, heat exhaustion, and heat stroke.

The two maps below show areas in Kennebunk that are hotter than the average temperature for the community as a whole (Map 19). The map on the right shows the location of building footprints in relation to heat islands. The maps show the relative heat severity measured on a scale of 1 to 5, with 1 being a relatively mild heat area (slightly above the mean for the town), and 5 being a severe heat area (significantly above the mean for the town). (*Heat island temperature data: 30-meter resolution based on data derived from Landsat 8 imagery band 10 (ground-level thermal sensor) from the summers of 2019 and 2020.*)

In Kennebunk, areas east of the Mousam River along Alfred Road between I-95 and the northern border of town, and the Route 1 corridor are mapped as having elevated ground temperatures in relation to the rest of the community. The Alfred Road and Route 1 corridor near the border Arundel are mapped as having moderate to severe heat severity and also have elevated social vulnerability due to a relatively large percentage of households in that area having annual income levels below state and county median incomes, and also a large percent of the population over the age of 65 and living alone. The Alfred Road area has a lower concentration of buildings compared with some non-urban heat island areas of town but has moderate to severe heat island severity. Knowing where areas of high heat are located can inform mitigation and adaptation strategies.



Map 19. Urban heat island severity (left) overlaid with building footprints (right). (Data source: heat island severity data, Trust for Public Land; building footprints, Microsoft)

## Public Health Impacts

Extreme heat is one of the most significant impacts of climate change on human health and is the leading cause of weather-related deaths across the United States. Exposure to extreme heat has been linked with a wide range of health issues, including heatstroke, heat exhaustion, impacts on kidney function, dehydration, fetal health, mental health, and exacerbation of pre-existing health conditions (34). Extreme heat is also linked with increased deaths and emergency department visits. From 2011 to 2015 and 2017 to 2019, York County had the second highest number of annual emergency department visits for heat-related illness across Maine, with Cumberland County seeing the highest numbers<sup>36</sup>. Figure 4 shows peak emergency department visits for heat-related illnesses to hospitals in York County between 2018 and 2023, the years for which monthly data is available.

Residents of cooler climates, like Maine, are less physiologically adapted to extreme heat exposure, and experience disproportionate health effects on hot days when compared to residents of warmer climates. Additionally, the prevalence of air conditioning, one of the most effective tools for preventing heat illness, is significantly lower in Maine than in the rest of the region and the country<sup>37</sup>. Certain populations, including older adults, infants, pregnant women, and people who have chronic diseases or who are sick already may feel much worse or have serious problems in extreme heat. Further, people with limited access to air conditioning, outdoor laborers, and unhoused populations are also more vulnerable to the impacts of extreme heat. A survey conducted by the Maine Behavior Risk Factor Surveillance System found that in 2014, 70.8% of homes in York County had some form of air conditioning, the highest percentage of all Maine counties. However, as noted above, York County also had the second highest number of heat illness emergency department visits.

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<sup>36</sup> Maine Health Data Organization (MHDO). Data analyzed and display prepared by the Environmental Public Health Tracking Program. Data updated: 06/2021.

<sup>37</sup> MCC STS. 2020. Scientific Assessment of Climate Change and Its Effects in Maine. A Report by the Scientific and Technical Subcommittee (STS) of the Maine Climate Council (MCC). Augusta, Maine. 370 pp.

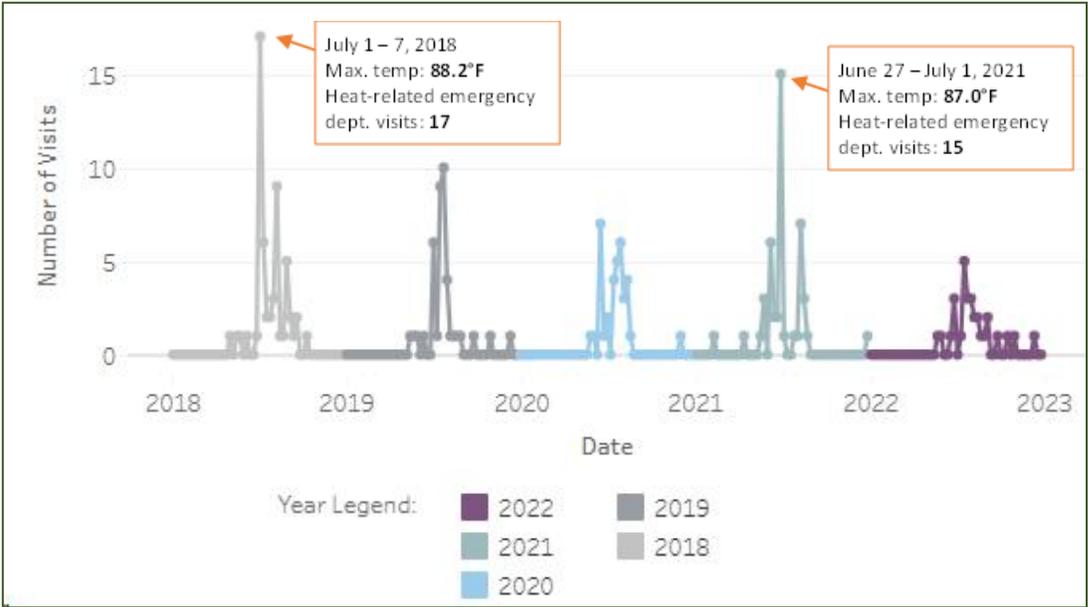


Figure 4. Number of heat illness visits to emergency departments in York County from 2018 to 2023. (Source: Maine Center for Disease Control and Prevention, Maine Tracking Network.)

Climate change can impact air quality and lead to worsening air pollution. Atmospheric warming associated with climate change has the potential to increase ground-level ozone in many regions, which may cause public health issues and present challenges for compliance with the ozone standards in the future. The impact of climate change on other air pollutants, such as particulate matter, is less certain, but research is underway to address these uncertainties.<sup>38</sup> Figure 5 shows the number of days in York County with an 8-hour average ozone concentration that exceeded the National Ambient Air Quality Standard of 0.070 ppm, established December 28, 2015. Previous standards were set at .075 ppm from 2008-2015 and .080 prior to 2008. Research for this assessment could find no cause of the relatively high number of exceedances between 2001 and 2007. An analysis by the Maine Department of Environmental Protection affirmatively demonstrates that Maine emissions are insignificant contributors to non-attainment of ozone for the 8-hour ozone air quality standards<sup>39</sup>. Regardless of the cause, individuals with existing health conditions, older populations, and children are especially vulnerable to poor air quality.

<sup>38</sup> US Environmental Protection Agency. Air Quality and Climate Change Research webpage.

<sup>39</sup> State of Maine Clean Air Act Section 176A(a)(2) Petition. 2020.

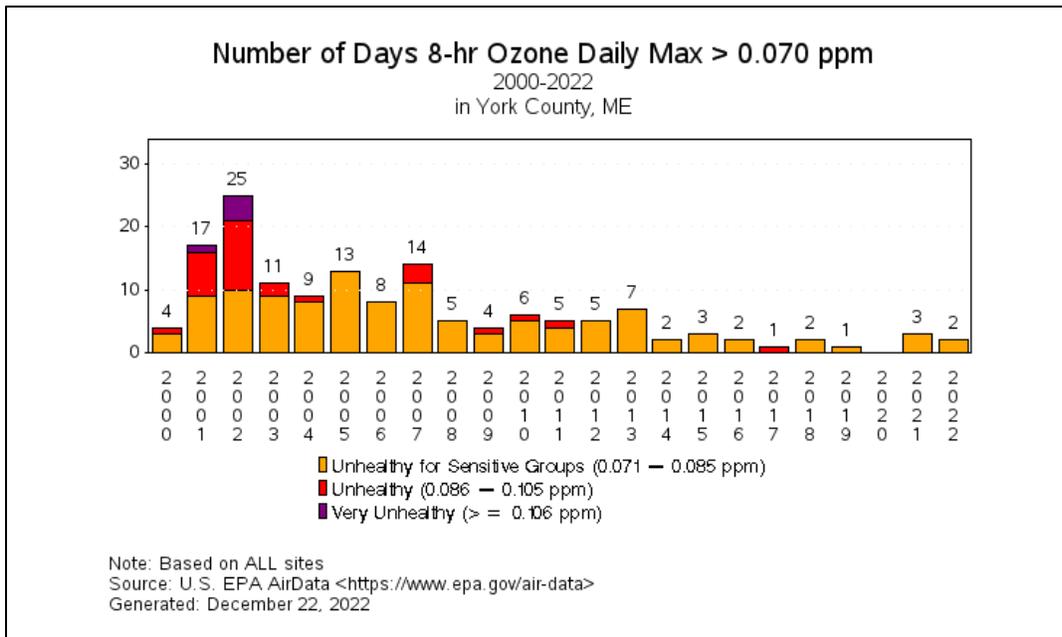


Figure 5. Number of days during which the 8-hour average ozone concentration exceeded national air quality standards. (Source: US EPA AirData portal)

The prevalence of tickborne diseases, including Lyme, anaplasmosis, and babesiosis, has increased in York County in recent years. Figure 6 shows that rates of all three diseases have increased since 2001. Figure 6 shows the incidence rate (per 100,000 people) of confirmed and probable cases of tickborne disease in Kennebunk. Between 2016 and 2020, Kennebunk had the eighth highest rate of babesiosis and fifth lowest rate of anaplasmosis of all York County communities.

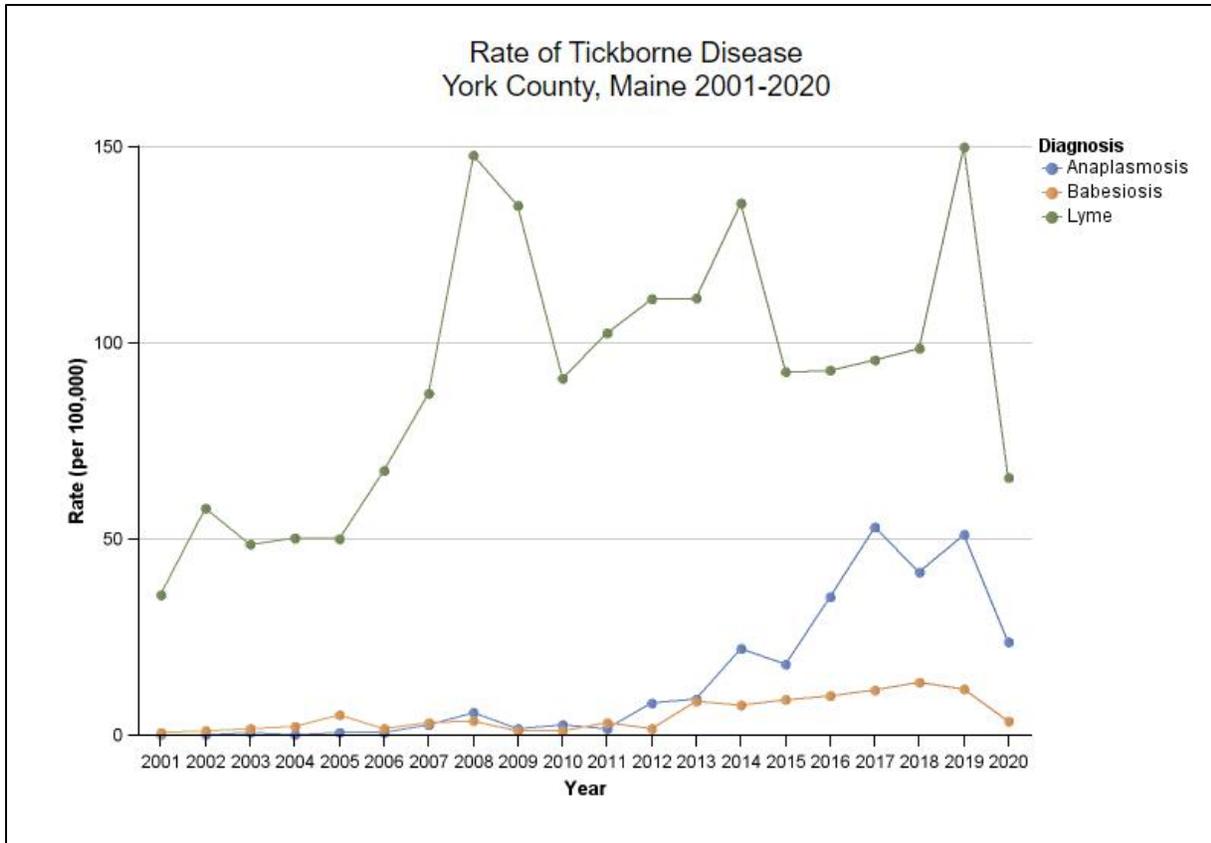


Figure 6. Annual incidence rate (per 100,000 people) of confirmed and probable cases of tickborne diseases of the population in York County. Maine CDC’s Infectious Disease Program obtained these data through notifiable conditions surveillance based upon reports from healthcare providers, laboratories, and other healthcare partners. (Data Source: Maine CDC’s Infectious Disease Program collected and analyzed population data from the U.S. Census Bureau to calculate state and county rates of tickborne disease. Maine CDC used population data from Maine CDC Data, Research, and Vital Statistics (DRVS) to calculate town-level rates of tickborne disease. The Maine Environmental Public Health Tracking Program prepared the data display. Data updated: 05/2021. Display updated: 05/2021.

Table 10. Rate and number of confirmed and probable cases of tick-borne disease in Kennebunk, 2016 -2020. (Source: Maine Center for Disease Control and Prevention. Infection Disease Program. Maine Tracking Network Data Portal.)

Rate and Number of Tickborne Diseases in Kennebunk, 2016 - 2020			
	Anaplasmosis	Babesiosis	Lyme
<b>Confirmed and probably cases</b>	8	8	53
<b>Rate (per 100,000 people)</b>	12.5	12.5	82.6

## Impacts to the Natural Environment

Increasing and shifting temperatures will impact the natural environment and Maine's wildlife and vegetation. Shorter winters, less snow, a rapid expansion of pests (e.g., winter ticks), presence of parasites previously only found further south, heat stress, more frequent and higher flooding of tidal marshes, invasive species, and changes in available prey species all threaten local species and natural areas. Increasing temperatures impact biodiversity and affect ranges where species can live. Scientists predict that 34%–58% of species will go extinct given current climate change scenarios if they are unable to disperse to new locations, while 11–33% will still go extinct even if they can disperse to future areas that are within their current climatic niche (34).

While Maine's growing season has lengthened overall due to warming temperatures, some years have seen killing frosts in late spring and early fall. It is uncertain whether such events will become more or less frequent in the future, but the trend of longer growing seasons and warmer falls is expected to continue. Climate model projections indicate that in the future, it is likely that increased evaporation will dry surface soil layers, particularly in the warm season<sup>40</sup>. These changes will impact local agricultural activities as well as home gardeners.

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<sup>40</sup> MCC STS. 2020. Scientific Assessment of Climate Change and Its Effects in Maine. A Report by the Scientific and Technical Subcommittee (STS) of the Maine Climate Council (MCC). Augusta, Maine. 370 pp.

# Drought & Wildfires

## Key Takeaways

- Despite wetter conditions overall, changing precipitation patterns caused by climate change have contributed to the emergence of drought conditions in southern Maine in recent years.
  - There have been 4 periods of severe to extreme drought in York County since 2000, 3 of which have occurred in the last 7 years.
- Average annual snowfall across the state has decreased about 2 inches since 1895 because more precipitation is falling as rain rather than snow. Lower spring snowpack reduces aquifer recharge, contributing to the emergence of drought.
  - Since 2017 maximum monthly snowfall amounts recorded in West Kennebunk have declined steadily compared to the previous 2 decades.
- Communities supplied by groundwater wells, rivers, or smaller lakes are at greater risk of water quantity and quality impacts from drought.
  - In the last decade the Kennebunk, Kennebunkport, and Wells Water District (KKWWD), which manages Kennebunk's public water supply, has experienced water quantity challenges due to increasing customer demand.
  - KKWWD now supplements the primary Branch Brook supply with several groundwater wells. These past challenges indicate potential vulnerability to lower water quantities during more frequent, prolonged, or intense droughts in the future.
  - There are 571 private wells in Kennebunk and groundwater levels were historically low during the most recent droughts.
  - During the 2020 and 2022 droughts 45 and 15 dry wells were reported in York County respectively.
- Wildfire risk may increase with more frequent, severe, and intense droughts, and though the likelihood of wildfires may remain low, such an event could have major impacts on the community.
  - In 2018 a major wildfire burned 60 acres near the Kennebunk and Sanford town line. This fire was not associated with a regional drought, but more wildfires have occurred across the State during drier years suggesting that more frequent, prolonged, or intense droughts in the future have the potential to increase wildfire risk in Kennebunk threatening public safety and the natural environment.

## Background Info, Trends, & Projections

Annual precipitation in York County has increased 6.9 inches since 1895 (see Extreme Storms & Precipitation) and is expected to continue to increase with climate change. Despite wetter conditions overall, changing precipitation patterns caused by climate change have contributed to the emergence of drought conditions in southern Maine in recent years.<sup>41</sup> During the winter, precipitation is increasingly falling as rain rather than snow. Average annual snowfall across the state has decreased about 2 inches since 1895, and reduced snowpack depth has been even more

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<sup>41</sup> ME Drought Task Force Report, 10/6/2022: <https://www.maine.gov/mema/hazards/drought-task-force>

pronounced in southern, coastal areas.<sup>42</sup> Spring snowmelt recharges freshwater aquifers, so less snowpack in the spring diminishes spring recharge and results in a lower water table. Low rainfall during the spring and summer, along with higher-than-average temperatures can further deplete the water table, increasing the risk of summer and fall droughts.<sup>43</sup>

In the last few years Maine has experienced some of the driest periods in over a century. The driest May to September period since 1895 occurred during the 2020 drought, and September 2020 was the driest month since 1895.<sup>44</sup> In York County there have been four periods of severe to extreme drought since 2000, which occurred during the summer and fall months of 2001-2002, 2016, 2020, and 2022. There was also an extended period of moderate drought in 2015 (Figure 7).

- 2001-2002: 73%-100% of the county was in a severe drought for 28 weeks from the end of October to May 2002
- 2016: 67%-100% of the county was in a severe for 22 weeks from August to December, and 95% of the county was in an extreme drought for 4 weeks from the end of September to mid-October
- 2020: 74%-100% of the county was in a severe drought for 12 weeks from September to December, and 70%-76% of the county was in an extreme drought for 6 weeks from late September to the end of October
- 2022: 66% of the county was in a severe drought for 4 weeks in August

As part of the Maine Cooperative Snow Survey, snowpack depth data have been collected at a survey site in West Kennebunk since 1950 and reported to the Maine Geological Survey. Due to a 14-year gap between 1975 and 1990, we have focused on data from 1990 to the present (Figure 8).

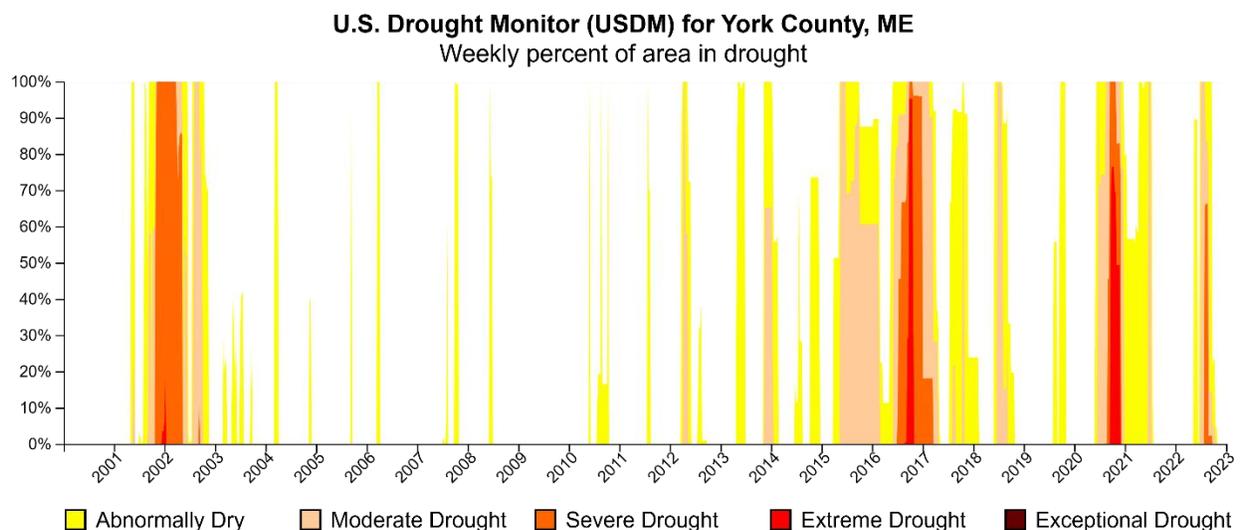


Figure 7. Drought conditions in York County from 2000 to 2022. Four severe to extreme droughts have occurred over the last 20 years and have been more frequent in the past decade. Data source: [U.S Drought Monitor](https://www.drought.gov/).

<sup>42</sup> University of Maine, Maine's Climate Future, 2020: <https://climatechange.umaine.edu/climate-matters/maines-climate-future/>

<sup>43</sup> ME Drought Task Force Report, 10/6/2022: <https://www.maine.gov/mema/hazards/drought-task-force>

<sup>44</sup> ME Climate Council, Maine Climate Science Update 2021: <http://climatecouncil.maine.gov/reports>

## Maine Cooperative Snow Survey West Kennebunk Survey Site

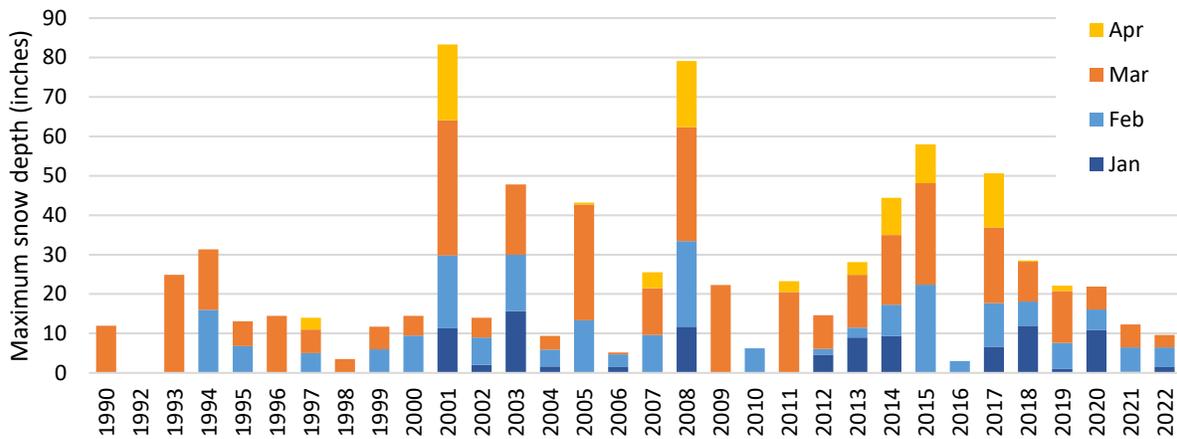


Figure 8. Maximum snow depth at Saco Tannery Survey Site, 1990-2022. Data source: Maine Geological Survey Cooperative Snow Survey

In the past 30 years, March has generally been the snowiest month in this region. Between 1990 and 2000, snow depths were relatively low. The greatest maximum monthly snow depths recorded at the site occurred between 2001 and 2008, and to a lesser extent between 2014 and 2017. In the last 5 years recorded snow depths have declined steadily compared to the previous 2 decades.

Combined snowfall amounts in Kennebunk during the winters of 2020-21 and 2021-22 were about 2 to 4 feet less than the previous 30 years, based on data from the Maine Drought Task Force. The snowfall deficit over these two winters resulted in reduced spring snowpack depth and aquifer recharge and contributed to the emergence of a summer and fall drought in 2022.<sup>45</sup> As future precipitation patterns in southern Maine continue to shift towards more rain and less snow, the risk of drought will likely increase.

### Water Supply Impacts

Intense and prolonged droughts have the potential to diminish surface and groundwater supplies and degrade water quality.<sup>46</sup> Communities supplied by groundwater wells, rivers, or smaller lakes are at greater risk of water quantity and quality impacts from drought.<sup>47</sup> The Town of Kennebunk is serviced by the Kennebunk, Kennebunkport, and Wells Water District (KKWWD) and Branch Brook is the primary source of Kennebunk’s public water supply.

### Water Quantity

Over the last 20 years KKWWD has seen a substantial increase in customers’ water demands, partly because of a large influx of seasonal residents in the summertime. Branch Brook alone cannot meet peak summer demand, so KKWWD supplements the Branch Brook supply using

<sup>45</sup> ME Drought Task Force Report, 10/6/2022: <https://www.maine.gov/mema/hazards/drought-task-force>

<sup>46</sup> ME Climate Council, Maine Climate Science Update 2021: <http://climatecouncil.maine.gov/reports>

<sup>47</sup> Casco Bay Estuary Partnership, Climate Trends in Casco Bay, 2015: <https://www.cascobayestuary.org/publication/climate-trends-in-the-casco-bay-region/>

several groundwater wells. The district also has an agreement with neighboring water utilities in Biddeford and York to purchase additional water supplies if necessary. In the future, more frequent, prolonged, or intense droughts have the potential to exacerbate KKWWD’s existing water quantity issues.<sup>48</sup>

The United States Geological Survey (USGS) monitors daily streamflow conditions in Branch Brook. Since 2008, the lowest streamflows were recorded in September 2016, September 2020, and August 2022, coinciding with the three most prolonged and intense droughts in the region since 2008.

Groundwater supplies can also be impacted by drought. The USGS monitors groundwater levels in York County at an index well in Sanford (Figure 9). Since 2000, the lowest recorded groundwater levels occurred in November 2002, October 2015, and October 2016, coinciding with the 2002 and 2016 severe droughts and the 2015 moderate drought. Groundwater levels were also low in October 2020, coinciding with the 2020 drought.

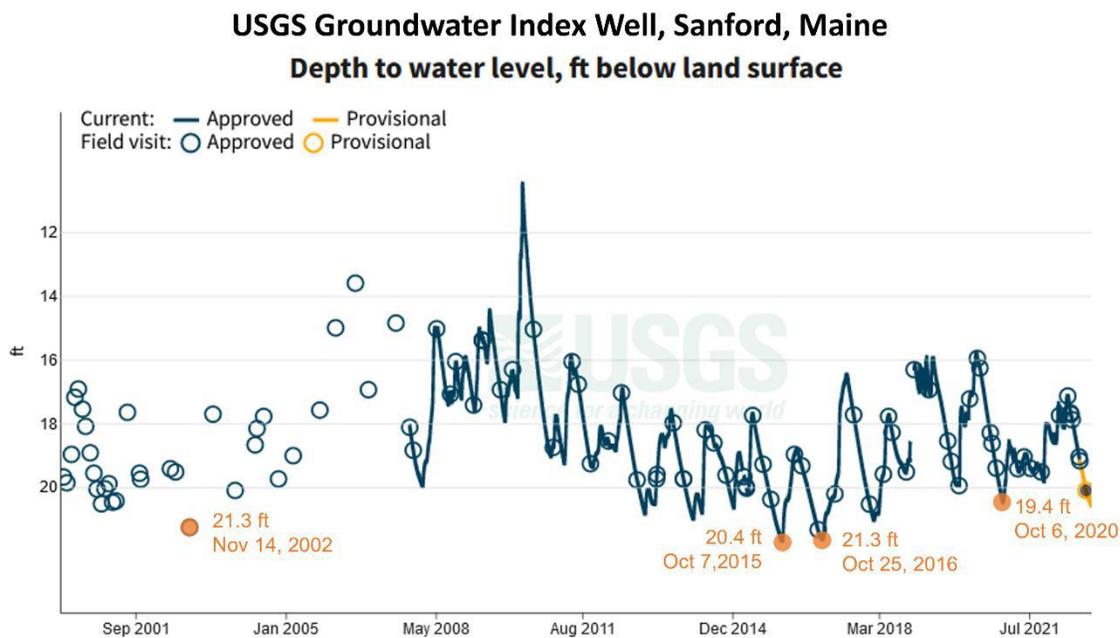


Figure 9. Groundwater levels in York County measured at an index well in Sanford, 2001-2021. Data source: United States Geological Survey

In addition to the groundwater wells that KKWWD uses to supplement surface water supplies from Branch Brook, there are a total of 571 private wells in Kennebunk (383 wells have location data and are displayed in Map 20), and 75% of these wells are for domestic use.

Since 2020, the Maine Drought Task Force has collected data about wells that run dry due to drought (Table 11). In 2020, 45 wells in York County ran dry compared to 2 in 2021, and 15 in 2022. Though these data are limited, they correlate with the intensity of the 2020 drought compared to

<sup>48</sup> Kennebunk, Kennebunkport, and Wells Water District: <https://www.kkw.org/about-us-2>

the 2022 drought. In the future, more frequent, prolonged, or intense droughts could pose a risk to KKWWD and the hundreds of homeowners and businesses in Kennebunk who rely on groundwater wells as their water source.

Table 11. Number of dry wells in York County in 2020, 2021, and 2022. Data source: Maine Emergency Management Agency

Maine Dry Well Survey			
Year	2020	2021	2022
York County	45	2	15

## Water Quality

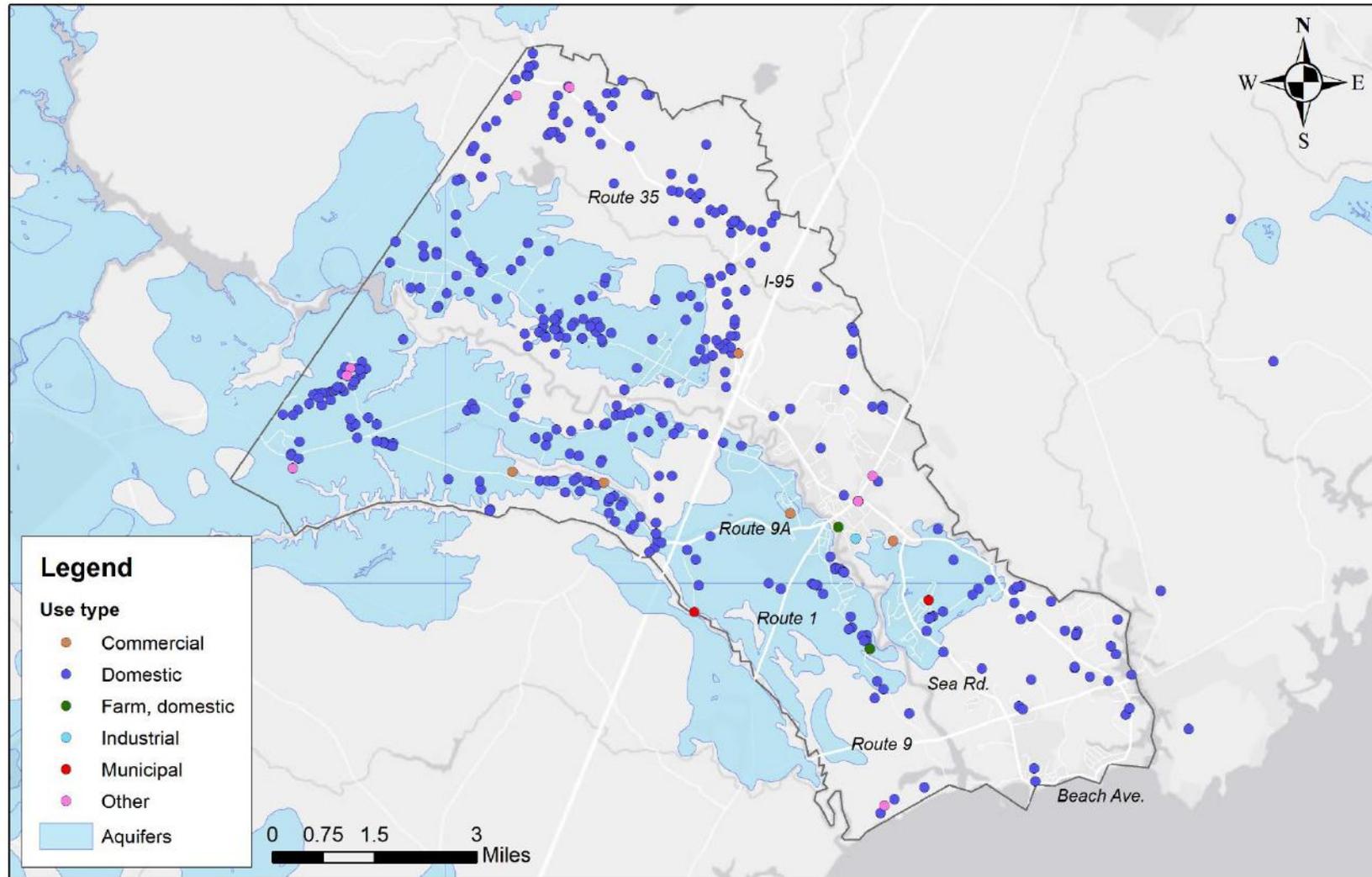
To date, it does not appear that KKWWD has experienced significant water quality issues because of drought.<sup>49</sup> However, water utilities in York County that rely on small surface water supplies have had drought related water quality issues. In the summer of 2022, the public water supply in Berwick, which is sourced by the Salmon Falls River, contained elevated levels of manganese due to low water levels, making it unsafe for children to drink.<sup>50</sup> In the future, more frequent, prolonged, or intense droughts have the potential to cause similar types of issues in Branch Brook.

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<sup>49</sup> EPA Safe Drinking Water Information System: [https://ordspub.epa.gov/ords/sfdw\\_pub/r/sfdw/sdwis\\_fed\\_reports\\_public/11?ireq\\_pwsid=ME0090760&clear=11,RIR](https://ordspub.epa.gov/ords/sfdw_pub/r/sfdw/sdwis_fed_reports_public/11?ireq_pwsid=ME0090760&clear=11,RIR)

<sup>50</sup> Maine Public, 8/4/2022: <https://www.mainepublic.org/environment-and-outdoors/2022-08-04/berwick-issues-drinking-water-advisory-due-to-ongoing-drought-conditions>

## Location of Aquifers and Private Wells Kennebunk



Data source: Maine Geological Survey  
Map created by SMPDC

Map 20. Location of aquifers and private wells in Kennebunk, and well use type. Data source: Maine Geological Survey

## Impacts to the Natural Environment

The environmental impacts of drought include:

Table 12. Environmental impacts of drought. Data source: 2018 York County Hazard Mitigation Plan, Pennsylvania

Damage to animal species	Damage to plant communities
<ul style="list-style-type: none"> <li>• lack of feed and drinking water</li> <li>• disease</li> <li>• loss of biodiversity</li> <li>• migration or concentration</li> <li>• degradation of fish and wildlife habitats</li> </ul>	<ul style="list-style-type: none"> <li>• loss of biodiversity</li> <li>• loss of trees from urban landscapes and wooded conservation areas</li> <li>• Increased number and severity of fires</li> <li>• Reduced soil quality</li> </ul>

Although wildfire risk may seem small in Maine compared to the western U.S., wildfires do occur and are often associated with periods of drought. In 1947, drought induced wildfires burned over 200,000 acres across the state.<sup>51</sup> The Maine Drought Task Force reported a higher number of wildfires in 2020, compared to 2021 and 2022, coinciding with the long, intense drought that summer and fall.<sup>52</sup>

Table 13. Number of wildfires statewide in 2020, 2021, and 2022. Data source: Maine Drought Task Force 10/6/2022 Report

Maine Wildfire Occurrences			
Year	2020	2021	2022
Annual total	1,154	650	624

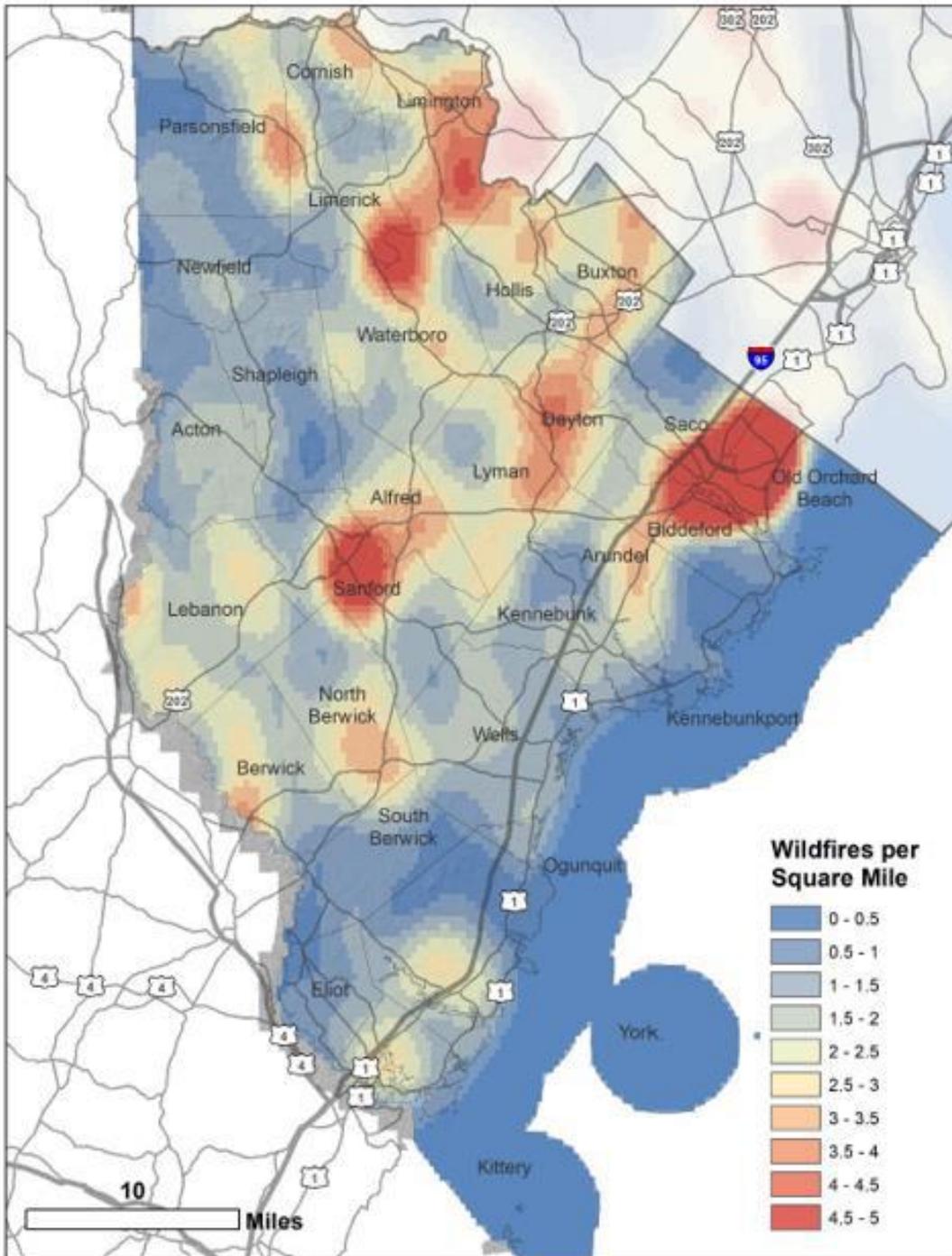
In Kennebunk, wildfire occurrences over the last several decades have been relatively low compared to the rest of the county (Map 21). However, in 2018 a major wildfire burned 60 acres near the Kennebunk and Sanford town line. This fire was not associated with a regional drought, but more frequent, prolonged, or intense droughts in the future have the potential to increase wildfire risk in Kennebunk, threatening public safety and the natural environment.<sup>53</sup>

<sup>51</sup> York County Emergency Management Agency, Hazard Mitigation Plan, 2022: <https://www.yorkcountymaine.gov/emergency-management>

<sup>52</sup> ME Drought Task Force Report, 10/6/2022: <https://www.maine.gov/mema/hazards/drought-task-force>

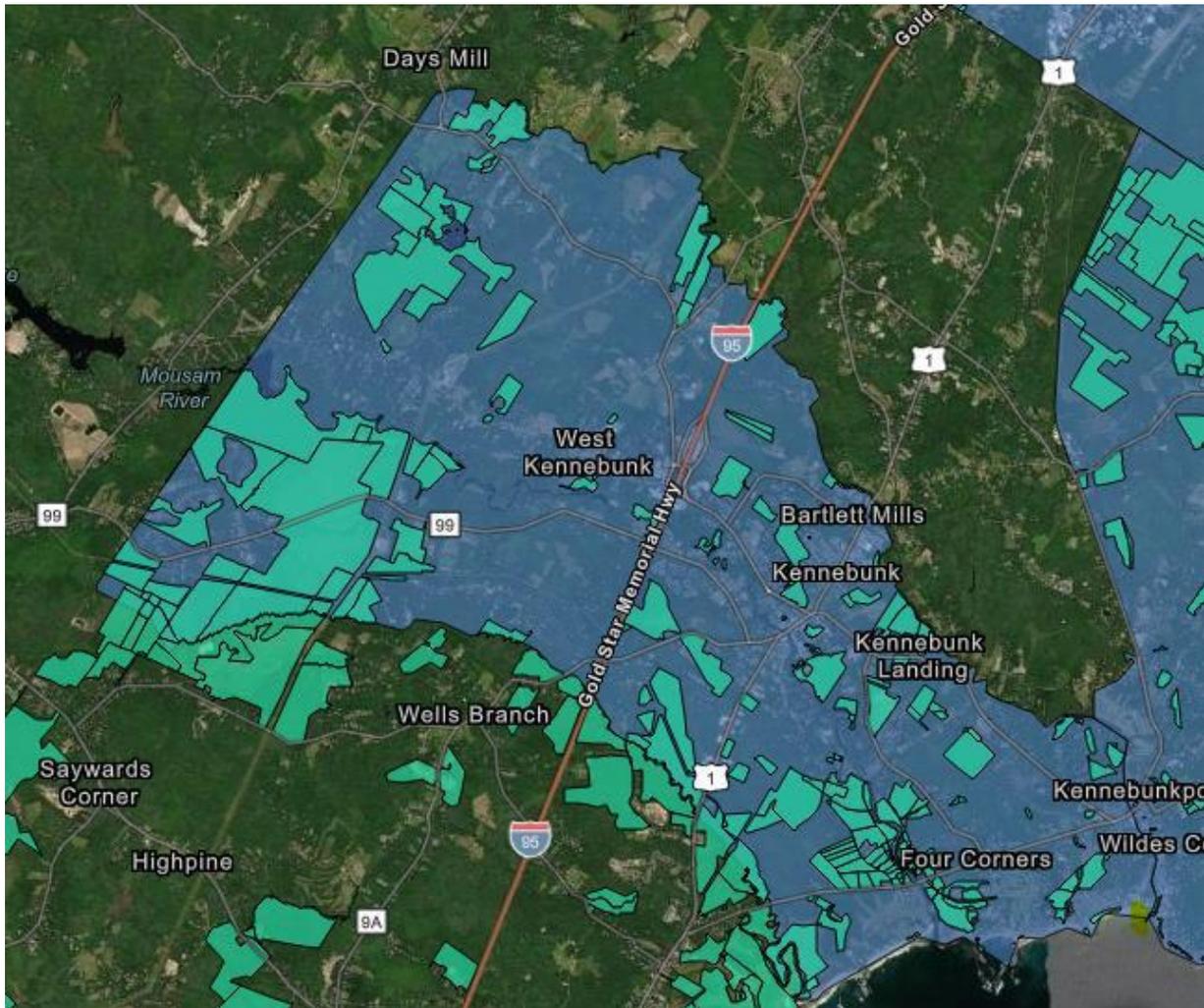
<sup>53</sup> <https://www.pressherald.com/2018/05/02/wildfire-burns-60-acres-along-kennebunk-sanford-line/>

# Wildfire Occurrences in York County 1992-2018



Map 21. Wildfire occurrence in York County per square mile, 1992-2018. Data source: York County Emergency Management Agency, Hazard Mitigation Plan, 2022: <https://www.yorkcountymaine.gov/emergency-management>

The Maine Natural Areas Program inventories land parcels owned by federal, state, municipal, and non-profit entities that have conservation easements. There are several large conservation areas in Kennebunk (Map 22) including the Kennebunk Wildlife Management Area and part of the Racheal Carson National Wildlife Refuge. There are also smaller pockets of conserved land managed by the Kennebunk Land Trust, including around Gooch's Creek. The marshes behind Libby Cove Beach and along the Mousam River, which are part of the National Wildlife Refuge, provide rich habitat for rare and endangered species and tidal waterfowl. The inland forested areas contain deer wintering areas, important river habitat, and freshwater wetlands. The Kennebunk Wildlife Management Area is an inland forest containing rare and endangered species habitat, important river and fish habitat, and freshwater wetlands. It is also a significant freshwater aquifer (Map 20). In the future, more frequent, prolonged, or intense droughts have the potential to damage these critical habitat areas.



Map 22. Conserved lands in Kennebunk are indicated by the green polygons. Data source: Maine Natural Areas Program. Map source: Climate Ready Coast Southern Maine

## Agricultural Impacts

Drought can impact agricultural operations due to shifts in the growing season, crop losses, and increased costs associated with irrigation. During the 2022 drought, the Maine Drought Task Force reported that farmers had to irrigate their crops, increasing their operational costs.<sup>54</sup> In both 2020 and 2022, the Farm Services Administration issued emergency declarations for York County as a result of prolonged, severe drought conditions.<sup>55</sup> Even if farmers have irrigation systems, water supply can still be an issue. The Maine Department of Environmental Protection restricts irrigation withdrawals when stream and river levels fall below a certain threshold.<sup>56</sup>

Kennebunk is known for its shipbuilding industry and iconic Lower Village, but the town has a rich agricultural heritage as well. There are a handful of operating farms and garden centers that grow a variety of products including vegetables, flowers, and Christmas trees, and raise animals such as alpacas. The Kennebunk Farmers Market operates from May to November and hosts vendors from across southern Maine. Neighboring Arundel has even more operating farms including dairy producers, organic fruit and vegetable growers, and more. In the future, more frequent, prolonged, or intense droughts have the potential to reduce local farmers' production, increase their costs, and disrupt local food systems in Kennebunk.

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<sup>54</sup> ME Drought Task Force Report, 8/4/2022: <https://www.maine.gov/mema/hazards/drought-task-force>

<sup>55</sup> Cumberland County Emergency Management Agency, Hazard Mitigation Plan, 2022: <https://www.cumberlandcounty.org/231/Hazard-Mitigation>

<sup>56</sup> Maine DEP Press Release: <https://www.maine.gov/dep/news/news.html?id=8535391>

# Changing Marine Conditions

## Key Takeaways

- In the last 40 years, ocean temperatures have risen faster in the Gulf of Maine than almost anywhere else in the world. Ocean temperatures will likely rise 1.5°F by 2050, and Maine’s marine ecosystem will resemble present day conditions in southern New England.
  - There are 35 commercial fishing licenses in Kennebunk. Individuals who rely on fishing for their livelihood are vulnerable to the economic impacts of changing marine conditions.
- Ocean and coastal acidification are expected to worsen due to higher amounts of carbon dioxide in the atmosphere and more frequent precipitation events.
- The dynamics of harmful algal blooms (HABs) in Maine have shifted in recent years and could continue to change in the future, posing new threats to public health.
- Eelgrass is an important nursery habitat for commercially important species and is an indicator species for overall ecosystem health.
  - There is an eelgrass bed located off Kennebunk Beach with sparser patches off Middle Beach and east of Lord’s Point.
  - Between 2010 and 2021, the extent and density of eelgrass habitat in Kennebunk expanded and increased.
  - In the future, pollution from stormwater runoff from more frequent and intense precipitation and increasing invasive species such as European green crabs have the potential to decimate eelgrass habitat, reducing the carbon sink and coastal resilience benefits this habitat provides.

## Background Info, Trends, & Projections

Southern Maine is located in the Gulf of Maine which stretches from Cape Cod to Nova Scotia. Since 1982, ocean temperatures in the Gulf of Maine have risen 96% faster than the rest of the world’s oceans due to rising air temperatures and shifting ocean currents caused by climate change.<sup>57</sup> Marine species’ ranges are shifting northward following colder ocean temperatures. Lobster stocks in Long Island Sound and southern New England have collapsed, and as ocean temperatures continue to warm, Maine’s lobster resource could be facing a similar future. Invasive species like European green crabs, Asian shore crabs, and tunicates have also proliferated in warmer waters. Future projections indicate that by 2050 ocean temperatures in Maine will likely rise 1.5°F, and the marine ecosystem will resemble present day conditions in southern New England.<sup>58</sup>

The oceans are also becoming more acidic. As carbon dioxide builds up in the atmosphere from the burning of fossil fuels, some of that carbon dioxide is absorbed into the ocean. Dissolved carbon dioxide changes the chemical composition of the water, making it more acidic. In coastal areas, ocean acidification is exacerbated by nutrient rich runoff which can trigger algal blooms. As

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<sup>57</sup> <https://www.gmri.org/stories/gulf-of-maine-warming-update-summer-2021/>

<sup>58</sup> University of Maine, Maine's Climate Future, 2020: <https://climatechange.umaine.edu/climate-matters/maines-climate-future/>

the blooms die off and decay, the water becomes more acidic. Ocean and coastal acidification primarily impact shellfish species like scallops, oysters, clams, and mussels all of which are commercially harvested in Maine. Both ocean and coastal acidification are expected to worsen in the future with increasing fossil fuel emissions and more frequent and intense rainfall events.<sup>59</sup>

It is also hypothesized that warming waters and shifting currents due to climate change are changing the dynamics of harmful algal blooms (HABs) in Maine. Every summer Maine experiences a “red tide” when a toxin producing phytoplankton species blooms. Shellfish become contaminated with the toxin and, when eaten, can cause Paralytic Shellfish Poisoning. In recent years Maine has experienced blooms of new HAB species that have different impacts on human health and the ecosystem. Currently it is unclear how HAB dynamics may shift with climate change, but coastal Maine communities face an uncertain future regarding the public health, economic, and ecosystem impacts of HABs.

### Habitat Shifts and Carbon Sinks

Eelgrass beds are critical marine habitat for commercially important species such as fish and shellfish. It is also vital to estuarine ecosystem functions because it provides nursery habitat for many species. Eelgrass is sensitive to sediment loading and pollutants often caused by inadequate stormwater and wastewater management. Invasive species including the European green crab and various tunicate species also decimate eelgrass habitat, uprooting plants and smothering growth. As a result, eelgrass habitat loss is generally indicative of poor watershed management practices and declining ecosystem health.<sup>60</sup>

Eelgrass habitat in southern Maine was most recently surveyed in 2021 by the Maine Department of Environmental Protection and was previously surveyed in 2010 by the Maine Department of Marine Resources. Based on these two surveys, there is an eelgrass bed located off Kennebunk Beach with sparser patches off Middle Beach and east of Lord’s Point (Map 23). Between 2010 and 2021, the extent and density of eelgrass habitat in Kennebunk expanded and increased.

In addition to poor water quality, invasive European green crabs can destroy eelgrass habitat. Substantial eelgrass habitat losses were observed in Casco Bay between 2012 and 2013 coinciding with a rapid increase in the green crab population.<sup>61</sup> The status of the green crab population in southern Maine is not as well understood but these data suggest that green crabs may not have been as much of a problem in Kennebunk as they have been in Casco Bay.

In the future, extreme precipitation events are expected to become more frequent and intense which will likely present new and increasing stormwater and wastewater management challenges, potentially threatening the health of Kennebunk’s eelgrass beds. Kennebunk Beach and Middle Beach also have a high degree of impervious surfaces (see Extreme Storms & Precipitation Map 10), which increases runoff during heavy rainfall events, further stressing eelgrass habitat.

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<sup>59</sup> ME Climate Council, Scientific Assessment of Climate Change and Its Effects in Maine, 2020: <http://climatecouncil.maine.gov/reports>

<sup>60</sup> Piscataqua Region Estuaries Partnership: <https://prepeestuaries.org/eelgrass/>

<sup>61</sup> Casco Bay Estuary Partnership, Eelgrass Beds Decline as Green Crab Numbers Explode, 2015: [https://www.cascobayestuary.org/wp-content/uploads/2015/10/Indicator\\_Eelgrass.pdf](https://www.cascobayestuary.org/wp-content/uploads/2015/10/Indicator_Eelgrass.pdf)

Additionally, warming ocean temperatures favor green crab population growth which may contribute to future eelgrass habitat loss.<sup>62</sup>

There is evidence that eelgrass beds can serve as carbon sinks, absorbing carbon dioxide from the water and locally reducing the influence of ocean and coastal acidification. The vegetation also stabilizes sediments and reduces wave action which has the potential to buffer coastlines against intense coastal storms. For these reasons, eelgrass habitat is not only important for the role it plays in ecosystem functions, but also for the climate mitigation and resilience benefits it provides. These valuable ecosystem services emphasize the importance of protecting this vulnerable habitat.<sup>63</sup>

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<sup>62</sup> ME Climate Council, Scientific Assessment of Climate Change and Its Effects in Maine, 2020: <http://climatecouncil.maine.gov/reports>

<sup>63</sup> ME Climate Council, Scientific Assessment of Climate Change and Its Effects in Maine, 2020: <http://climatecouncil.maine.gov/reports>

## Eelgrass Coverage and Extent, 2010 and 2021 Kennebunk



Data source: Maine Department of Marine Resources (2010),  
Maine Department of Environmental Protection (2021)  
Map created by SMPDC

Map 23. Distribution and coverage of eelgrass habitat in Kennebunk in 2010 and 2021 based on surveys conducted by the Maine Department of Marine Resources and the Maine Department of Environmental Protection. These data indicate the location of potential carbon sinks as well as marine ecosystem shifts over time.

## Economic Impacts

In 2022, there were a total of 35 commercial fishing licenses held in Kennebunk and 58 non-commercial licenses<sup>64</sup> (Table 14). The majority of these licenses are for harvesting lobster and crab or fish. Individuals who rely on these 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.

Table 14. Commercial and non-commercial fishing licenses in Kennebunk. Data source: Maine Department of Marine Resources.

Commercial and Non-Commercial Fishing Licenses	
Commercial	Number of Licenses
Lobster/crab	15
Fishing	14
Shellfish	1
Elver	2
Menhaden	2
Sea urchin	1
<i>Total</i>	35
Non-Commercial	
Saltwater fishing	37
Lobster/crab	21
<i>Total</i>	58

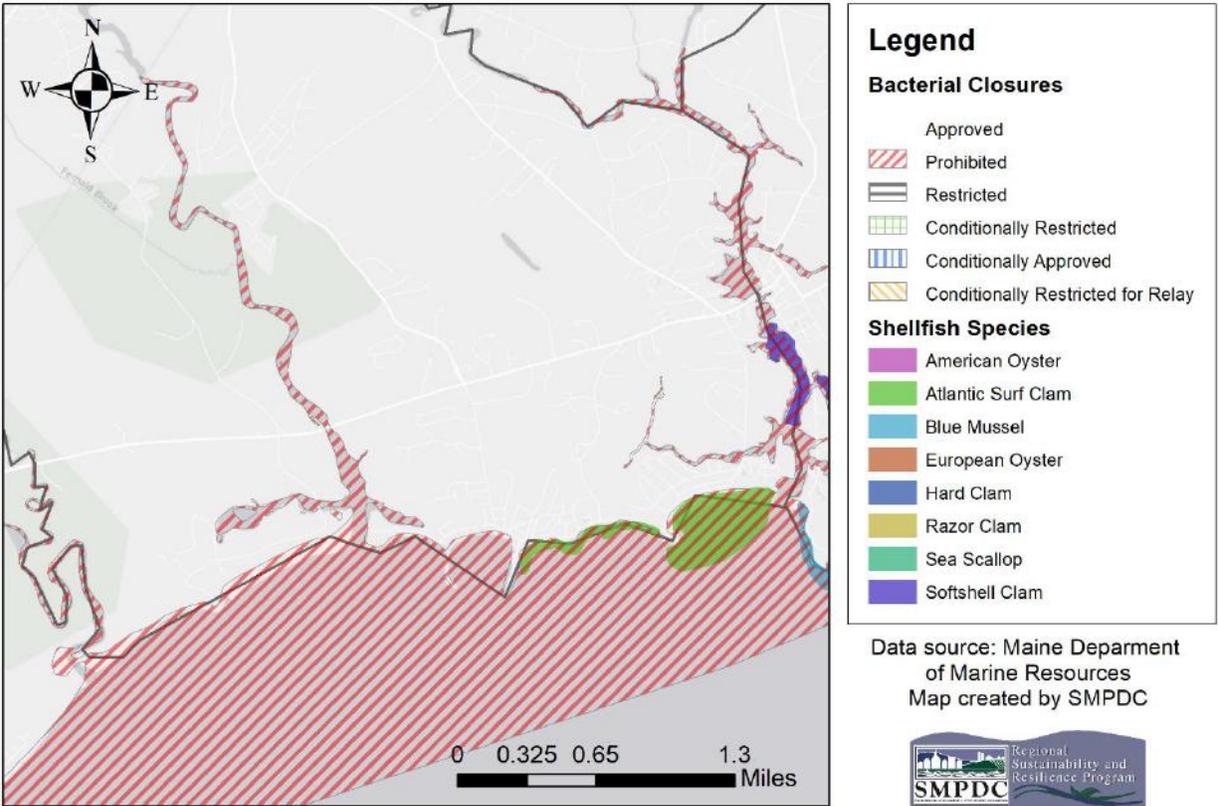
In 2010, the Maine Department of Marine Resources (DMR) conducted a survey of shellfish habitat across the state (Map 24). Based on that survey, there were several small pockets of softshell clams, blue mussels, and surf clams at the mouth of the Kennebunk River. Shellfish harvesting is prohibited along Kennebunk's coastline due to water pollution and discharges from the Kennebunk and Kennebunkport Wastewater Treatment Plants. There is only 1 commercial shellfish license holder in the town. The community is therefore less economically vulnerable to the impacts of climate change on shellfish species. However, warmer waters and ocean acidification have the potential to impact these species which are a critical part of the marine ecosystem.

In the last decade aquaculture has exploded in Maine, particularly in southern Maine where the impacts of the declining lobster fishery have been felt more acutely. Aquaculture is viewed as a more climate resilient alternative to wild harvest fisheries like lobster. Currently, there is no aquaculture activity in Kennebunk, but there are several oyster operations in neighboring Wells. Shellfish aquaculture opportunities are limited in Kennebunk because the coastline is closed to shellfish harvesting, but it could be suitable for kelp aquaculture.

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<sup>64</sup> Maine Department of Marine Resources. 2022 fishing license data.

# Shellfish Distribution and Harvesting Closures Kennebunk



Map 24. Distribution of shellfish species based on a survey conducted by the Maine Department of Marine Resources in 2010. Areas that are prohibited for shellfish harvesting are also indicated. Data source: Maine Department of Marine Resources.

# KENNEBUNK

## Baseline Greenhouse Gas Emissions & 2030 Forecast

### 2018 Baseline Greenhouse Gas Inventory

One of the first steps in developing emissions reduction goals, targets, and strategies is selecting a baseline year against which future greenhouse gas (GHG) emissions will be compared. For this climate action planning process, 2018 will serve as the baseline year. The baseline GHG inventory identifies the major sources of emissions in Kennebunk, enabling the town to identify areas to focus emissions reduction efforts, establish goals and track progress towards those goals, and facilitate decision-making about future policies and strategies.

#### Key Terms

- **Community-wide GHG Inventory:** Accounts for GHG emissions produced by Kennebunk's residents, workforce, visitors, and the economy. Municipal emissions are included in the community-wide inventory.
- **Municipal GHG Inventory:** Accounts for GHG emissions produced by the Town of Kennebunk's municipal operations which include municipal buildings, vehicles, and employee activities. Municipal GHG emissions are a component of community-wide emissions.
- **MTCO<sub>2e</sub>:** Metric tons (MT) of carbon dioxide equivalent (CO<sub>2e</sub>) is a metric used to compare the emissions from various GHGs based on their global-warming potential, by converting amounts of other GHGs to the equivalent amount of carbon dioxide with the same global warming potential.

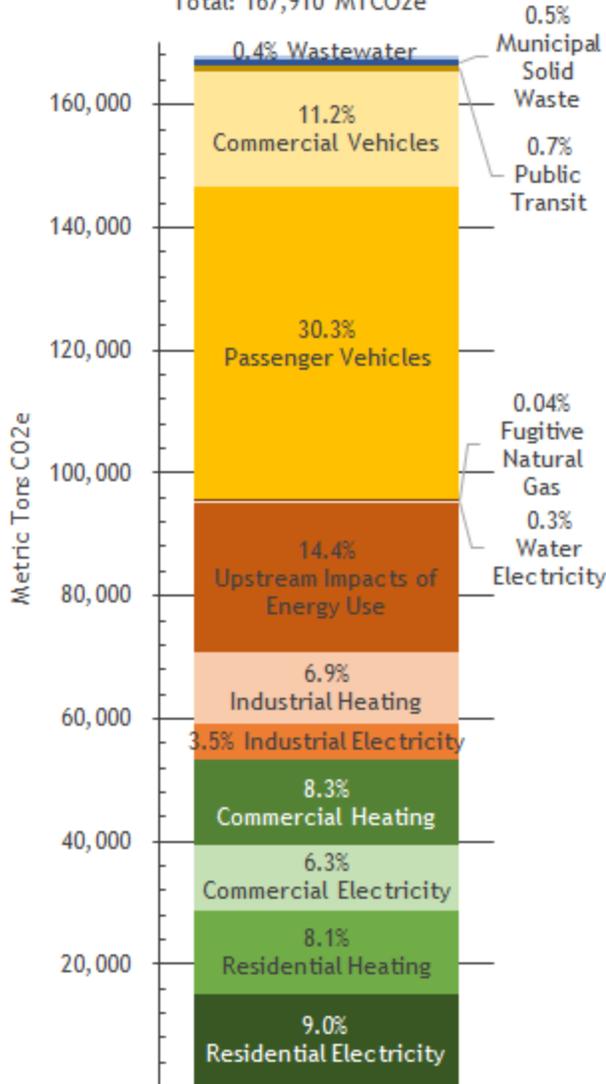
#### Emissions Sources

In Kennebunk, GHG emissions are produced by four sectors, each of which can be broken down into specific subsectors.

- **Transportation:** Includes emissions from all on-road transportation sources, including passenger vehicles, commercial vehicles, and public transit.
- **Heating & Electricity - Industrial:** Includes emissions from the generation of electricity that is used to power manufacturing, industrial, and municipal water facilities, the burning of fossil fuels used to heat those facilities, energy losses associated with electricity and natural gas distribution, and the indirect, upstream impacts of energy use.

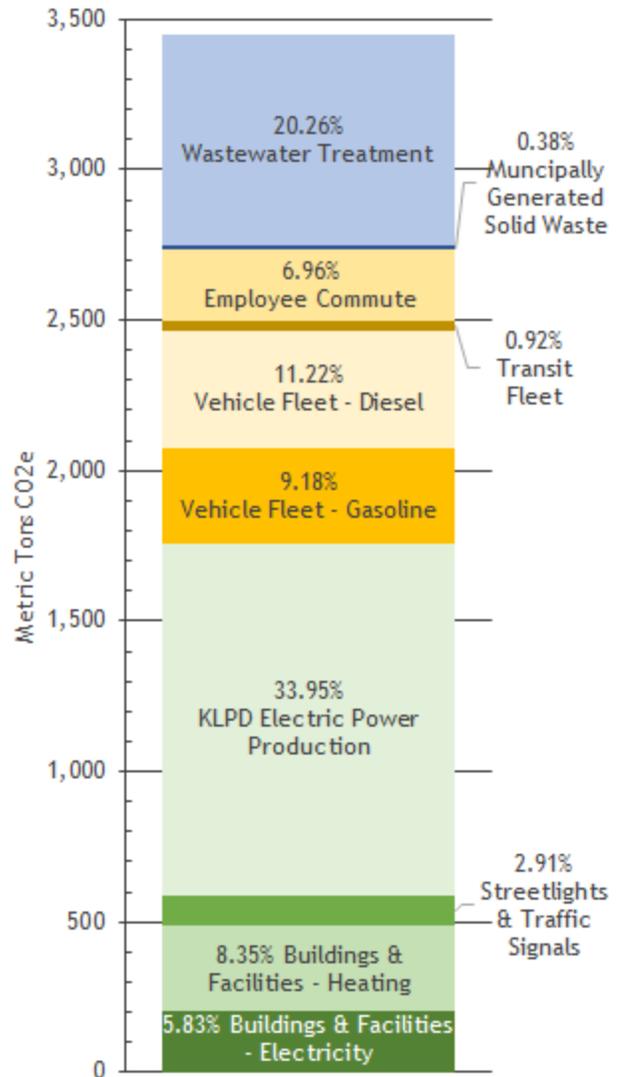
### Kennebunk 2018 Community GHG Emissions

Total: 167,910 MTCO<sub>2</sub>e



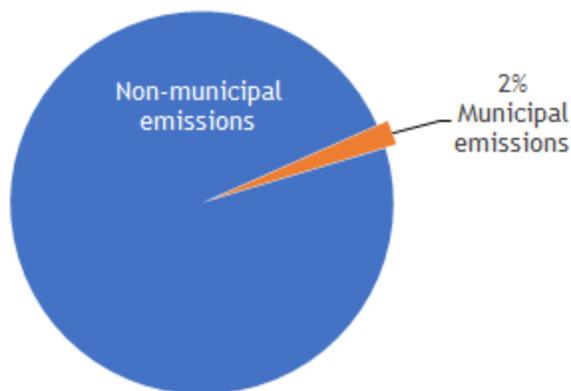
### Kennebunk 2018 Municipal GHG Emissions

Total: 3,446 MTCO<sub>2</sub>e



- *Heating & Electricity - Residential & Commercial:* Includes emissions from the generation of electricity that is used to power commercial and residential buildings and the burning of

### Breakdown of Kennebunk Community-wide Emissions



# Key Takeaways from the Greenhouse Gas Inventory

## Community-wide emissions trends

- The largest source (30.3%) of estimated community-wide GHG emissions is passenger vehicle fuel use by visitors and residents.
- 42.1% of estimated community-wide emissions are produced by the transportation sector, including passenger and commercial vehicle fuel use as well as public transit.
- 31.8% of estimated community-wide emissions are produced by combined heating and electricity consumption from the residential and commercial sectors, 16.4% are produced by combined heating from both sectors, and 15.3% by combined electricity consumption.
  - 77% of residential heating emissions are produced by burning fuel oil and the remaining 23% are produced by burning propane, wood, and natural gas.

## Municipal emissions trends

- Municipal GHG emissions are a small subset of community-wide emissions, accounting for 2% of estimated community-wide emissions.
- Strategies focused on reducing municipal emissions will have less impact than those focused on community-wide emissions, however, balancing feasibility and impact is an important part of strategy prioritization.
- There is great value in municipalities leading by example and adopting emissions reduction strategies that address the largest sources of municipal emissions (i.e. wastewater treatment, vehicle fleet, or building energy).
- The largest source (33.95%) of estimated municipal emissions is electricity generation supplied by the Kennebunk Light and Power District (KLPD).
- KLPD supplies the residents and business of Kennebunk with power from the New England electricity grid. The primary fuel source for New England electricity generation is natural gas, followed by nuclear power.

# Business as Usual Greenhouse Gas Emissions Forecast

ICELI USA developed the Business as Usual (BAU) forecast by projecting community-wide emissions in 2030 based on the 2018 baseline inventory and anticipated demographic and economic changes. The BAU forecast provides the basis for developing goals, strategies, and targets addressing emissions reductions. The forecast was developed for the primary sectors in the GHG inventory which include heating and electricity from the residential, commercial, and industrial sectors as well as transportation.

## Indicators for greenhouse gas emissions forecasting

For the purposes of ICLEI USA's initial analysis, 2030 community-wide and municipal emissions were estimated based on the following indicators. If Kennebunk is interested and has access to more localized data sources, ICLEI USA can refine the forecast further.

- ICLEI USA used the projected **annual population growth rate of 0.96% for Kennebunk** to estimate emissions trends in the residential, commercial and transportation sectors.
- Municipal GHG emissions will likely fall by 2030 due to more renewable energy on the electricity grid and more rigorous fuel efficiency standards for vehicles.
- GHG emissions from the New England electricity grid are expected to fall by 2030 because the states have adopted ambitious renewable energy targets and **Renewable Portfolio Standards (RPS)**<sup>1</sup>. ICLEI USA used Maine's RPS requirements to estimate 2030 electricity emissions.
- Emissions from vehicle fuel use are projected to decline as a result of the **Federal Corporate Average Fuel Economy (CAFE) standards** adopted by the Biden Administration, which will increase fuel efficiency 8% annually for model years 2024-2025 and 10% for model year 2026.

## Changes in emissions through 2030

Without taking any additional action at the community or municipal level, **Kennebunk's community-wide GHG emissions are expected to fall 28% by 2030** driven by 1) increasing renewable energy sources on the electricity grid as a result of state targets and RPSs, and 2) decreasing transportation emissions due to CAFE fuel efficiency standards and electric vehicle expansion. Market forces are also expected to contribute to an overall decline in GHG emissions globally. Emissions from the burning of fossil fuels to heat buildings in the residential and commercial sectors will likely stay relatively flat, with some efficiency improvements keeping pace with population growth.

# Overview of Climate Goals and Emissions Targets

Having established baseline emissions and projected BAU 2030 emissions, the next step is to identify specific goals and emissions reduction targets to include in the Climate Action Plan. Climate goals and emissions reduction targets provide a tangible objective to guide climate action and a benchmark to track progress. Goals and targets should have clear baseline and target dates. For

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<sup>1</sup> **Renewable Portfolio Standard (RPS)** is a state legislative mandate to increase production of electricity from renewable sources such as wind, solar, biomass and other alternatives to fossil and nuclear electric generation. Maine, Massachusetts, Vermont, Rhode Island, and Connecticut have all made commitments requiring that electricity suppliers produce 60%-100% of electricity from renewable sources by 2030.

example, the target could be a 60% reduction in emissions by 2030 compared to the 2018 baseline. Goals can reference carbon neutrality,<sup>2</sup> climate neutrality,<sup>3</sup> or net-zero.<sup>4</sup> Goals and targets can also specifically address the types of GHG gases (e.g. carbon dioxide, methane, etc.) or the sources of emissions (e.g. transportation or residential energy).

Globally, 195 countries, including the U.S., signed the Paris Agreement, committing to keep the rise in global temperatures below 2.7°F (1.5°C). The United Nations Intergovernmental Panel on Climate Change (IPCC) estimates that we must reduce global emissions by 50% by 2030 and achieve climate neutrality by 2050 to reach this goal. The U.S. and Maine have set national and state-wide climate goals and emissions reduction targets in an effort to uphold our Paris Agreement commitment.

### National targets

- Paris Agreement commitment to keep the rise in global temperatures below 2.7°F (1.5°C)
- Reduce GHG emissions to 50% below 2005 levels by 2030

### Maine targets

- 80% of electricity produced by renewables by 2030 (Maine RPS)
- 100% of electricity produced by renewables by 2050 (Maine RPS)
- Achieve carbon neutrality by 2045
- Reduce overall GHG emissions to 45% below 1990 levels by 2030 and 80% by 2050

Meeting national and state climate goals and reduction targets requires municipal and community action. Additionally, equitably reducing global emissions by 50% requires high-emitting, wealthy nations like the U.S. to reduce their emissions by more than 50%. ICLEI USA projects that U.S. industries, communities, and individuals need to reduce GHG emissions by 60-65% to equitably achieve the Paris Agreement goals. ICLEI USA analyzed 138 community GHG Inventories, demonstrating that it is possible for most U.S. communities to reduce per-capita emissions by 63% or more by 2030.<sup>5</sup>

To go above and beyond existing commitments, ***ICLEI USA suggests that Kennebunk could reduce community-wide GHG emissions 63% by 2030 by implementing ambitious but realistic emissions reduction strategies.*** Such an ambitious emissions reduction is achievable for Southern Maine communities. According to ICLEI USA's high-level analysis, a 63% reduction in emissions by 2030 could be met by:

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<sup>2</sup> **Carbon neutrality** is the net balance between activities that emit carbon dioxide and carbon sinks that absorb carbon dioxide from the atmosphere (e.g. soil formation, forests, eelgrass beds, saltmarshes).

<sup>3</sup> **Climate neutrality** refers to the emission and mitigation of all greenhouse gases (GHGs) – not just carbon dioxide. Much like carbon neutrality, climate neutrality can be achieved by emitting GHGs at an equal rate to their removal from the atmosphere.

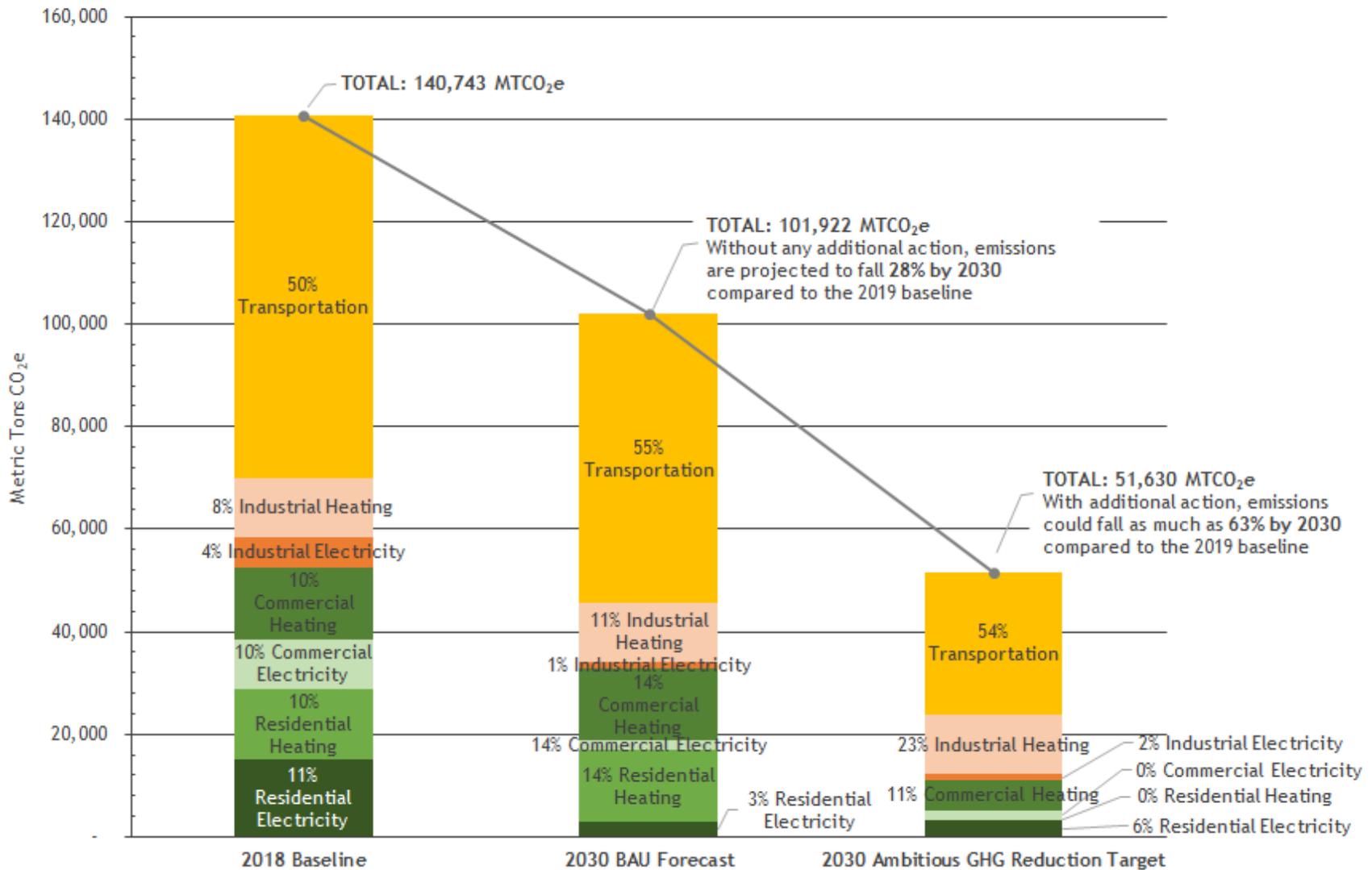
<sup>4</sup> **Net-zero** means cutting greenhouse gas emissions to as close to zero as possible, with any remaining emissions counterbalanced by carbon sinks such as soil formation, forests, and saltmarshes.

<sup>5</sup> **[Analysis of U.S. Local Government Science-Based Targets and Pathways to Achieve Them in the Race to Zero](#)**

- Reducing vehicle miles traveled (VMT) by 10%
- Increasing Electric Vehicle (EV) VMT to 45% of total VMT
- Increasing commercial and residential building energy efficiency for new and renovated buildings
- Increasing current residential and commercial building energy efficiency
- The electrification of current and new commercial and residential buildings

A more detailed analysis is presented in the [\*Appendix: High Impact Action Analysis Summary Report.\*](#)

## Kennebunk Primary Sectors 2030 GHG Emissions Forecast Under the Business as Usual (BAU) and Ambitious GHG Reduction Target Scenarios



# Municipal Strategies for Reducing Greenhouse Gas Emissions

Once goals and targets are established, the next step is to begin to identify strategies to reduce emissions. There are many strategies Kennebunk can use to reduce GHG emissions. The challenge is not figuring out what to do, but rather accelerating the change already taking place globally, nationally, and regionally to bring benefits to Kennebunk. Below are examples of strategies that are being employed in Maine and other communities to meet ambitious climate goals.

## Reducing vehicle miles traveled (VMT) - By promoting and facilitating transit systems as well as bicycle and pedestrian networks

- *Encourage residents and visitors to walk and bike.*
  - Tourism based economies like Kennebunk tend to have higher transportation emissions because visitor travel increases overall community VMT. [Ski towns in Colorado](#) have been at the forefront of this issue and have actively engaged businesses to help develop and implement critical strategies.
- *Adopt and implement a [Complete Streets Policy](#) and/or land use and development policies that reduce the need for driving and encourage the use of public transit, cycling, and walking.*
  - The City of Portsmouth has a [Complete Streets program](#) for all road upgrades.

## Electric vehicles (EV) - Support the electrification of the transportation system

- *Lead by example by electrifying the public fleet*
  - Beginning in 2035, [75% of school bus acquisitions by municipalities must be electric or zero emission school buses](#). Today, Maine municipalities can participate in the [EPA Clean School Bus Program](#). In 2022, Wells-Ogunquit, Dayton, and RSU 57 received a total of seventeen school bus rebates. Each school system is eligible for rebates up to \$375,000 per electric bus and \$20,000 of charging infrastructure per bus.
- *Adopt ordinances to require or encourage EV charging infrastructure, including at multifamily dwellings, businesses, and public parking areas.*
  - SMPDC's [Municipal Electric Vehicle Readiness Toolkit](#) includes a Model EV Infrastructure Ordinance that municipalities can adapt to meet their community's needs.

## Energy efficiency - Encourage and promote energy efficiency for residents and businesses

- *Support community weatherization programs to improve residential energy efficiency, particularly for low-income and vulnerable residents.*
  - Community groups and nonprofits like [WindowDressers](#) and [York County Community Action](#) offer programs to help homeowners increase energy efficiency.
- *Adopt 'stretch codes' setting higher standards for energy efficiency than IECC or MUBEC*

- Adopting municipal regulations such as the [State of Maine Energy Stretch Code \(IECC 2021\)](#) can help drive residential and commercial energy efficiency. The [Cities of Portland and South Portland](#) have both adopted the Maine Energy Stretch Code.

### **Electrify heating - Help residents and businesses reduce fuel oil dependence and high energy costs**

- *Encourage the adoption of heat pumps to reduce fossil fuel use in homes in businesses*
  - Efficiency Maine provides rebates for [heat pump](#) and [heat pump water heater](#) installation. Municipalities can educate residents and businesses about these opportunities, offer their own rebate programs ([like South Portland](#)), or implement a community bulk purchasing program with a vendor (such as [Portland's Electrify Everything Campaign](#)).

### **Renewable energy - Enable and support development of and access to zero carbon energy**

- *Adopt codes and permitting practices that support and incentivize renewable energy systems in the community*
  - The Town of Topsham joined [SolSmart](#), a technical assistance program that helps local governments make it faster, easier, and more affordable for residents and businesses to go solar. The town created an online permitting checklist and reviewed local zoning codes to identify restrictions that prohibit solar PV development.
  - [SolarAPP](#) (Solar Automated Permit Processing) is a no-cost software system from the National Renewable Energy Laboratory (NREL) to streamline rooftop solar permits. The city of San Jose, California increased approved permits by 600% when they switched to SolarAPP.
- *Develop renewable energy capacity targeting underutilized public properties*
  - The City of Sanford is using EPA Brownfields funds to clean up the [site of a circuit board recycling facility](#). Once decontaminated, the site will be turned into a solar farm.
- *Provide access to [Community solar](#) for businesses, and residents to reduce their monthly electricity bill and support more solar on the New England electricity grid.*
  - The solar energy generated by the City of Sanford's Brownfield solar farm will be applied to the [Virtual Sanford Renewable Energy Corridor](#). Energy that is created will be slated for use by developers in the downtown mill district, providing an additional incentive for redevelopment.

### **Reduce emissions AND increase community resilience**

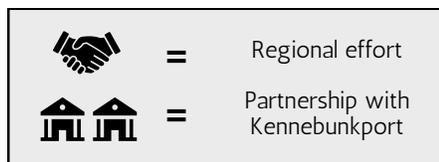
- Implement [solar + storage](#) located at key locations (community centers, schools, police and fire departments) to provide resilience to storms and emergency events that cause power outages.

- Increased energy efficiency in homes, particularly those of the most vulnerable residents, increases public health and residents' resilience to power outages, heat waves, and cold spells.
- Focus mixed use and transit oriented development in zones away from vulnerable areas to both reduce vehicle miles traveled and promote adaptation, especially when combined with conservation of ecosystems that increase resilience to flooding and sea level rise such as saltmarshes.

# Kennebunk CAP - 2025 Update

The Town of Kennebunk adopted the Kennebunk Climate Action Plan in May 2024. The plan outlines 22 comprehensive strategies across five categories that Kennebunk will implement to further reduce the community's greenhouse gas emissions and strengthen its ability to adapt and thrive.

## PROGRESS IN 2025



## BUILDINGS & ENERGY Making our buildings and energy systems resilient to climate change.



- Kennebunk is participating in the [Southern Maine Energy Navigator Pilot](#), which launched in May 2025. The town is coordinating with the Energy Navigators on outreach to community members. *Supports strategies B1 and B2.*
- The Town is continuing to make progress on energy efficiency measures for existing and new municipal buildings. *Supports strategy B1.*



- The Energy Efficiency and Sustainability Committee (EESC) has been coordinating with the local school district, RSU21, on solar opportunities for the school district. *Supports strategy B3.*
- Kennebunk received [SolSmart Bronze](#) designation in recognition of the Town's support for rooftop solar. *Supports strategy B3.*
- 11 permits were issued for solar systems between July 2024 to June 2025. *Supports strategy B3.*
- The Town received a Community Action Grant to install solar on the Waterhouse Center. *Supports strategy B3.*



- Southern Maine Planning and Development Commission (SMPDC) is leading the development of a [Regional Energy Resilience Plan](#) in coordination with Central Maine Power and Kennebunk Light and Power to address grid resilience issues. *Supports strategy B5.*



- In 2024 Maine passed a [new state law](#) requiring property owners to disclose flood risk to potential buyers. *Supports strategy B6.*

## TRANSPORTATION & INFRASTRUCTURE Making our transportation systems and infrastructure ready for climate change.



- Kennebunk is continuing to work with RideMaine and York County Community Action Corp. to expand access to and use of public transit services. *Supports strategy T1.*
- Bike and pedestrian impact fees are being assessed with building permits. *Supports strategy T2.*
- Kennebunk and other partners are creating a task force to identify connectivity of existing trails and potential opportunities for expanding the trail network. *Supports strategy T2.*
- The Town has identified additional locations for public EV charging stations and continues to explore opportunities for converting more fleet vehicles to EVs. *Supports strategies T3 and T4.*



- Kennebunk is working with the Kittery Area Comprehensive Transportation System and MDOT on improvements to the bridge on Parsons Beach road, taking into consideration climate vulnerabilities and Complete Street considerations. *Supports strategy T6.*

# PROGRESS IN 2025 - Continued

	=	Regional effort
	=	Partnership with Kennebunkport

## LAND USE & NATURAL ENVIRONMENT

Helping our environment respond to climate change.

- The Town currently regulates wetlands greater than 1 acre and passed a Wetland Mitigation Ordinance in 2022 to regulate impacts greater than 499 square feet. *Supports strategy L2*
- Kennebunk is continuing to promote and encourage "nature-based solutions", such as the restoration of sand dunes or wetlands, to protect shorelines and property from flooding and erosion. *Supports strategy LN2*
-  **The Town is partnering with the Town of Kennebunkport on a study of the Kennebunk River** to identify flood and sea level rise resilience options for both communities. *Supports strategy LN3.*

## HEALTH, SAFETY, & WELLBEING

Ensuring our community's resilience to climate change impacts.

-  SMPDC has increased coordination with York County Emergency Management Agency, meeting quarterly and helping co-host the York County Coastal Resilience Summit in 2024. *Supports strategy H1.*
- The Town of Kennebunk became an owner community of EcoMaine in 2025, which will reduce waste emissions and increase accuracy and transparency in waste management tracking.
- The EESC is exploring opportunities for offering composting services to community members. *Supports strategy H2.*
- **On May 27<sup>th</sup>, 2025 the Select Board approved a policy to eliminate the purchase of single-use plastics by the municipality.** *Supports strategy H3*

## LEADERSHIP AND CAPACITY

Ensuring our town has the resources and support to implement climate actions.

-  Kennebunk applied for and supported several grants for climate action, including a Community Action Grant and a grant from the Broadreach Fund. *Supports strategy LS1.*
- The Town continues to track municipal expenditures for larger storms and disaster declarations. *Supports strategy LS2.*
- **The Select Board established the Climate Action Committee** in Fall 2024 to facilitate the implementation of the CAP. *Supports strategy LS3.*
- The Climate Action Committee began conducting public outreach and education around the CAP and climate change in Kennebunk, including tabling efforts at the May Day Festival and a conservation commission event, Protecting Our Water in the Kennebunks. *Supports strategy LS4.*