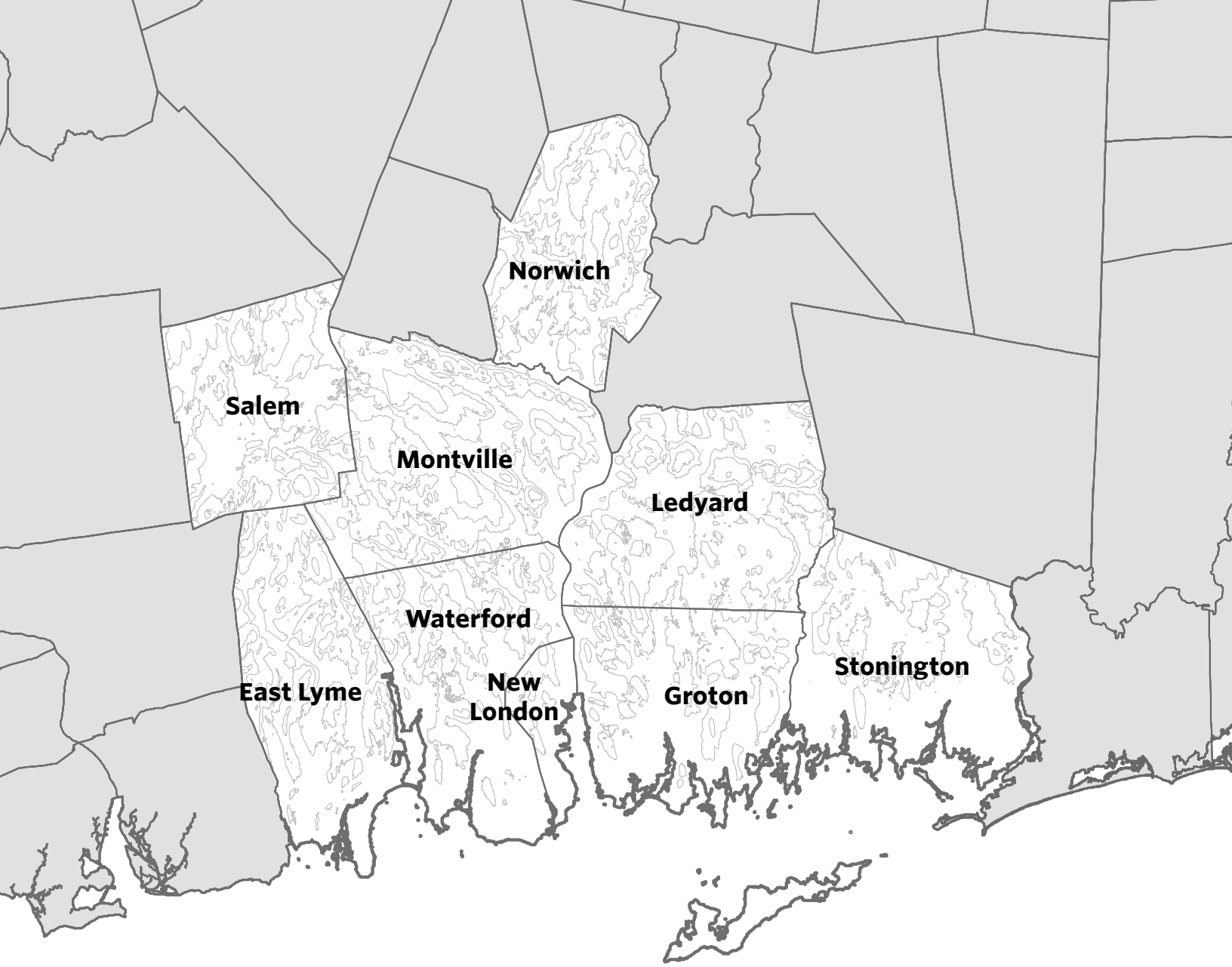

SOUTHEASTERN CONNECTICUT Regional Resilience GUIDEBOOK

Southeastern Connecticut Council of Governments | The Nature Conservancy | Southeastern Connecticut Enterprise Region

Southeastern Connecticut Regional Resilience Guidebook

Acknowledgments

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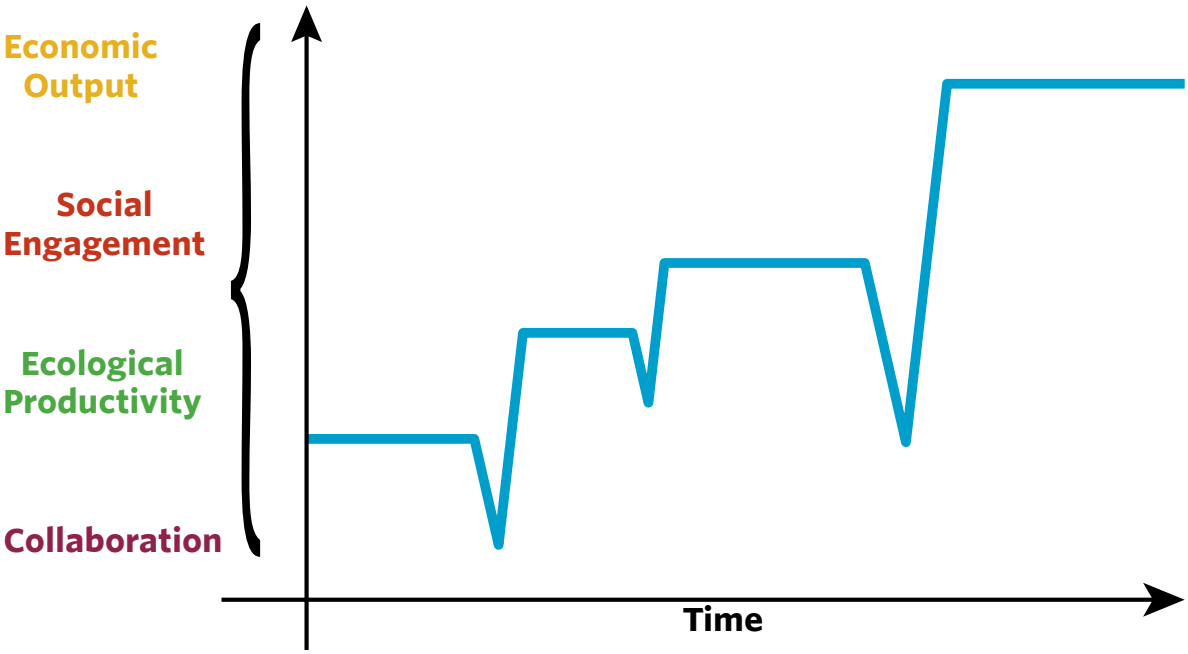
Table of Contents

What is Regional Resilience?

Resilience is a broad concept that describes the ability of a system to absorb, bounce back, and learn from disturbances. In recent years, the term has been increasingly applied to human communities as they prepare for extreme weather events, a changing climate, and uncertain economic, social, and political circumstances.

Resilience describes the ability of a system to become stronger after a disturbance. In engineering, resilience is often compared with strength or durability, which merely measure the ability of a system to accept stress without breaking. Resilient systems on the other hand are able to absorb, bounce back, and even learn from these stresses. Take the instance of different forms of storm protection. Seawalls and levees may have high durability and strength and can be quite effective at holding back floodwaters up to a point. However, these systems are static and will not respond on their own to environmental changes such as changing river courses, eroding coastlines, or rising sea levels. Contrast these systems with coastal ecosystems such as salt marshes and oyster reefs. As these natural systems are confronted with storm surge or sea level rise, they will regenerate and evolve to better respond to future disturbances.

Human communities can exhibit resilience in the same way as ecosystems. Think of a bedroom community where people rarely interact with their neighbors and everyone shops at big box stores. If there were to be a large scale disaster to hit this community, many residents may move somewhere else as there is little about their community that they cannot find elsewhere. In this instance, the community "system" has reached a breaking point and will not be able to reform around its previous existence and purpose. Contrast the bedroom community with a tight-knit, resilient neighborhood where everyone knows everyone else and people work, shop, and recreate near where they live. A storm hitting this area may actually strengthen the bonds of community as people are driven to help their neighbors recover and work with leaders to ensure that the right infrastructure and communication channels are in place to reduce harm from a later event.



Whether an ecosystem, an economy, or a human community, a resilient system is able to absorb disturbances such as a storm or massive layoffs and rebuild stronger than it was before the event.

Communities within a geographic region often share similar threats, vulnerabilities, and strengths. While resilience at the level of a neighborhood or town is often best defined by interactions amongst residents and perhaps a handful of community concerns, regional resilience is largely determined by communication amongst leadership as well as a complex web of infrastructural, economic, and environmental systems that may face a number of threats simultaneously.

While jurisdictional boundaries between municipalities may be helpful for isolating and addressing some local issues, they may actually create a hindrance when attempting to address large-scale shared challenges such as loss of major industries, flooding along a shared coast or river, or jump-starting a renewable energy sector.

ANDREW BENSON, TNC

At a series of workshops during the Fall of 2016, participants from a wide range of professions and communities in Southeastern Connecticut came together to discuss what greater resilience looks like for the region.

For a region to function as a resilient whole, individual leaders at the community scale must have a broad regional awareness of diverse and interrelated sectors including water infrastructure, food provisions, ecosystem services, transportation networks, energy production and distribution, and economic development. With this shared awareness, communities will be able to more readily identify shared challenges and mutually beneficial solutions across a region.

Regional Collaboration in Southeastern Connecticut

The communities in Southeastern Connecticut already exhibit strong regional action in some arenas and have a number of institutional bodies in place to facilitate a regional approach to planning. The Southeastern Connecticut Council of Governments (SCCOG) along with its sister organization the Southeastern Connecticut Enterprise Region (SeCTer) help coordinate much of the planning on a regional scale. Important regional planning documents produced by these two organizations include:

- Regional Plan of Conservation and Development
- Comprehensive Economic Development Strategy
- Multi-Jurisdictional Hazard Mitigation Plan
- Long Range Transportation Plan.

Other important efforts that constitute more regional scale planning efforts in Southeastern Connecticut include:

- Water supply infrastructure planning through the Eastern Water Utility Coordinating Commission (WUCC)
- Emergency preparedness training and mutual aid agreements between municipalities, CT Department of Emergency Services & Public Protection, Division of Emergency Management & Homeland Security (DEMHS) Region 4 Regional Emergency Planning Team

Geologic Context

The combined effects of landform and sea levels creates patterns of flood vulnerabilities in north-south coastal valleys and safety on the adjoining ridges.

As the Atlantic Ocean formed and the continental plates pulled apart, a series of north-south valleys and adjoining ridges formed across modern day Connecticut including the Housatonic, Connecticut, and Thames River Valleys. During the Wisconsin glaciation, ice extended roughly 4 to 25 miles south of New London County where it deposited the rocks and sediment that now form parts of Long Island and Fishers Island. Today, both of these islands act to an extent as Connecticut's natural breakwaters, reducing wave energies generated by wind fetch across the Atlantic Ocean.

As the glaciers retreated, meltwaters rushed into Connecticut's north-south valleys depositing more sediment on top of the bedrock and flowing into a large freshwater lake contained where today's Long Island Sound now resides. Because of the hardness of the underlying bedrock (a remnant of the African continent as it split apart from present day North America), the buildup of sediment did not reach the rates of other areas along the Connecticut coast and eastern seaboard. Additionally, the barrier formed by Long Island prevented further sediment from washing in from the Atlantic. This relative lack of sediment is both a blessing and curse for the region. Because the region lacked low-lying plains found in other parts of the state, much of the development over the past couple hundred years occurred on the well protected, rocky ridges. This creates fewer vulnerable communities relative to the rest of the state. However, the communities and infrastructure that did crop up in flood prone areas often lacks the natural infrastructure such as salt marshes, oyster reefs, and eelgrass beds to lessen the impact of extreme weather.

ALEX756, WIKIMEDIA COMMONS

Separating tectonic plates created a series of rocky ridges and low-lying coastal estuaries along Connecticut's coast. Salt marshes (such as the one above at the mouth of Bride Brook in Niantic) developed upon layers of sediment, washed down from the north.

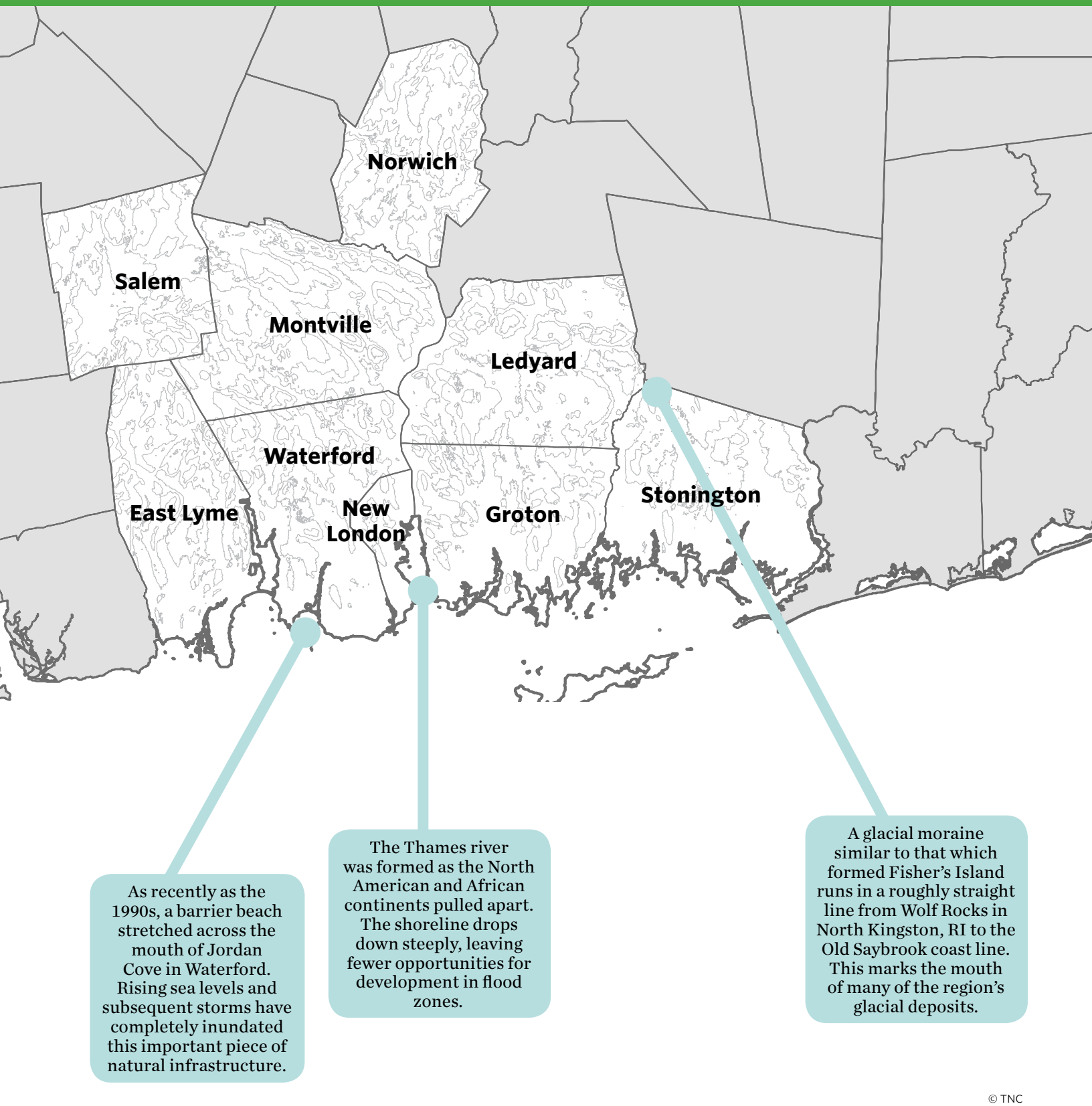
2 Million Years Ago
Pangaea begins to break apart forming rifts in the rock including today's Thames River Valley

ca. 20,000 BC
Maximum extent of Wisconsin Glacier across Long Island Sound

ca. 8,240 BC
Earliest evidence of human settlements in Connecticut

ca. 4,000 BC
Sea Level 35 feet lower than present level

ca. 2,000 BC
Connecticut climate stabilizes


Norwich
Salem
Montville
Ledyard
Waterford
East Lyme
New London
Groton
Stonington
As recently as the 1990s, a barrier beach stretched across the mouth of Jordan Cove in Waterford. Rising sea levels and subsequent storms have completely inundated this important piece of natural infrastructure.
The Thames river was formed as the North American and African continents pulled apart. The shoreline drops down steeply, leaving fewer opportunities for development in flood zones.
A glacial moraine similar to that which formed Fisher's Island runs in a roughly straight line from Wolf Rocks in North Kingston, RI to the Old Saybrook coast line. This marks the mouth of many of the region's glacial deposits.

Recent Climate History

The damages caused by past storms offer cautionary tales and reflect the realities of living near the coast.

While the memories of Irene and Sandy remain vivid in the minds of many present-day residents, perhaps the most noteworthy extreme weather event in Connecticut's recent history is the Great New England Hurricane of 1938. The eye of this storm traveled up the Connecticut River Valley downing trees as far north as Vermont. Southeastern Connecticut lay at the eastern edge of the storm's vortex and received some of the strongest winds and highest waves. This event brought down the rail line and a number of other pieces of critical infrastructure in the region.

While Tropical Storm Sandy did create flooding along the coast in New London County, the storm's most damaging energy dissipated before reaching the region. Tropical Storm Irene on the other hand was a shorter lived storm that did not have time to cause as much destructive force along the southeastern coast.

An important aspect of climate is the effects that global temperatures have on sea level. Over the course of geologic time, the sea level has ranged from below the floor of Long Island Sound to many miles inland in Connecticut.* Since 1938, the mean sea level as measured at the New London tide gauge has risen at a rate of roughly 2.55mm/year. If this current trend were to continue, this would amount to roughly 0.84 feet in 100 years. However, climate scientists project that climate change may in fact accelerate, leading to sea levels perhaps six feet higher by century's end.

US ARMY AIR CORPS

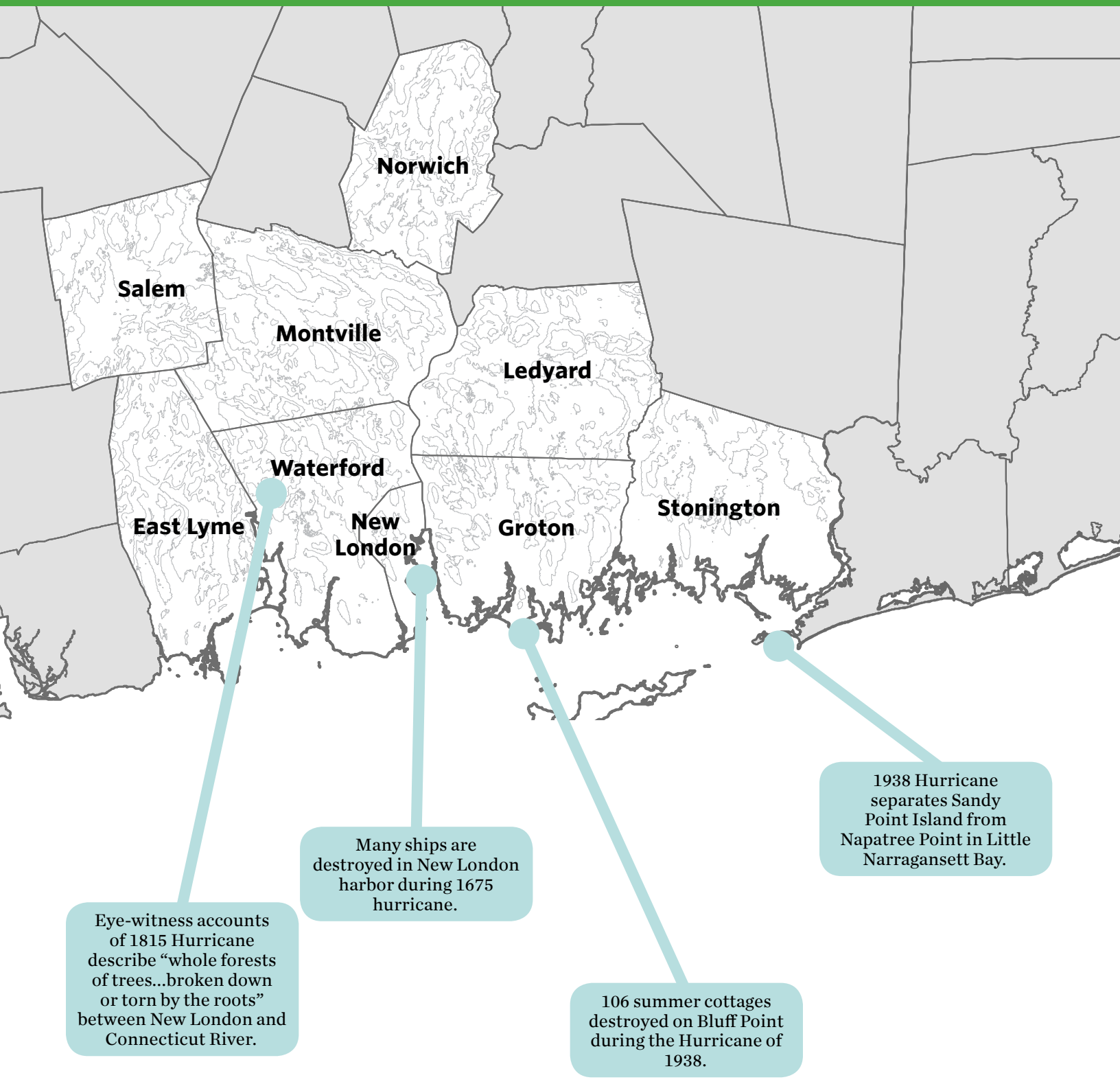
The Hurricane of 1938 was the most severe storm to hit New England in modern memory. During this event, floodwaters reached up to Bank Street in downtown New London and decimated parts of Fort Trumbull (above).

1638
"Triple storms" raise tides in Narragansett Bay by 14-15 feet.

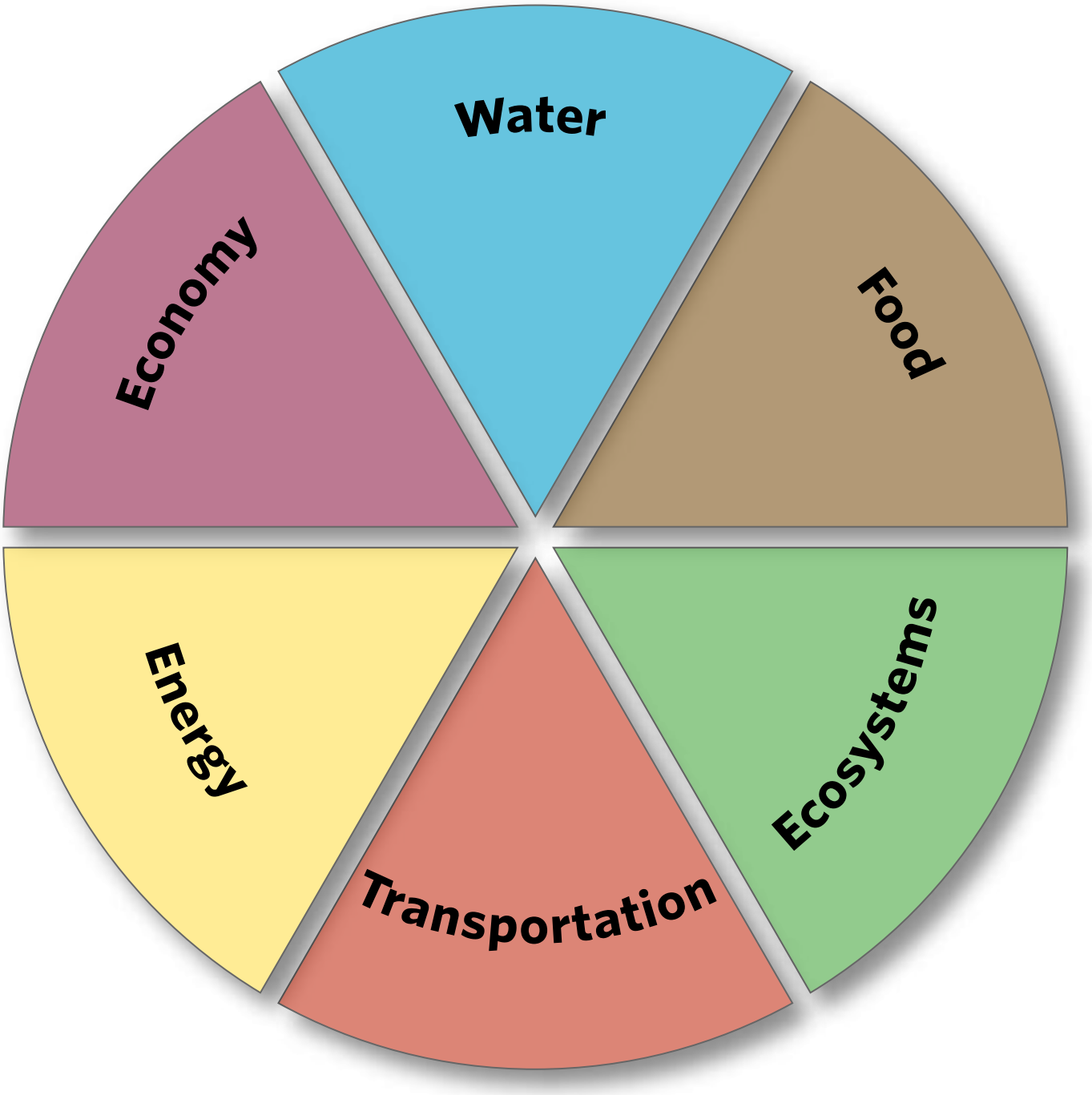
1770
A storm with barometric pressure comparable to 1938 Hurricane drives two vessels ashore in New London harbor

1938
Great New England Hurricane brings gusts of up to 70 mph to New London and floods the waterfront up to Bank Street

2012
Tropical Storm Sandy, considered a near miss for Connecticut, severely damages property on Long Island



*For more information regarding Connecticut’s coastal geology and climate history, refer to *A Moveable Shore: The Fate of the Connecticut Coast* (Kent and Patton, 1992)


Water
Food
Ecosystems
Transportation
Energy
Economy

Planning Sectors

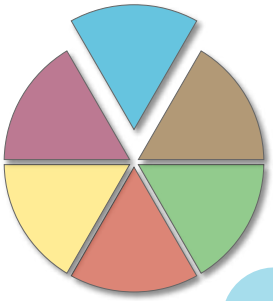
During the fall of 2016, a group of over fifty professionals came together for a structured dialogue about the implications of extreme weather, climate change, and shifting social and economic conditions in Southeastern Connecticut. The participants hailed from the fields of land-use planning, economic development, environmental management, public health, social services, transportation, energy, food policy, and emergency management. In these dialogues, participants generated lists of the top challenges posed to and solutions for taking action to ensure regional resilience. Challenges and solutions emerged through the individual and collective discovery across six planning sectors on the opposite page. As anticipated, many of the challenges and solutions overlap between these sectors, reinforcing the reality that true regional resilience will ensure that all of these sectors are comprehensively integrated and addressed.

Water

Natural and managed flows of water in Southeastern Connecticut provide communities with resources for drinking, plumbing, and irrigation and are a key factor in sustaining all of the region's ecosystems. Flooding can cause disruption in the routine and critical activities of communities and water can carry unwanted pollutants into ecosystems, fisheries, and aquifers.

Challenges

- **Impacts of nonpoint source pollution on the health of the region's surface and ground water**
- **Insufficient capacity of aging and outdated stormwater systems to handle current and future precipitation and sea level rise**
- **Important infrastructure vulnerable to storm surge, riverine flooding, and sea level rise**
- **Rising sea level intruding into aquifers, drinking wells, and septic systems**
- **Lack of clear policies in place to equitably manage water shortages across industry, agriculture, and ecosystems**



Solutions

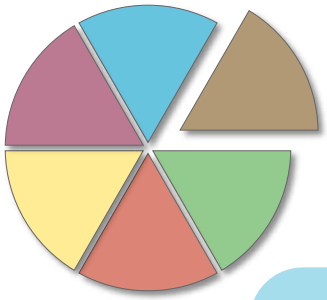
- **Assess current public and private water supply and distribution capacity**
- **Build upon past projects and foster future opportunities across the region to utilize green infrastructure and improve gray infrastructure to enhance capture and infiltration of runoff**
- **Develop a regionally specific decision support process to help municipalities assess and plan for flooding, efficient water use/reuse, and nonpoint source pollutions, simultaneously**

Food

While there is a resurgence of interest in farming and local food, there appears to be a shortage of infrastructure to support these farmers, their business operations, and their access to a broad, regional customer base.

Challenges

- **Regulatory hurdles faced by producers; particularly new, smaller scale enterprises**
- **Limited processing infrastructure for producers and distributors**
- **Competition for farmland with other, more profitable land-uses such as development**
- **Limited food access for some communities; particularly in parts of Groton and Norwich**
- **Uncertain future environmental conditions present challenges to local and regional agriculture**



Solutions

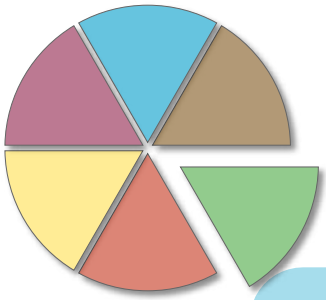
- **Explore cooperative funding, sourcing, and distribution models to meet demands for local foods among area residents, schools, and other institutions**
- **Scope feasibility of large scale municipal composting, regional processing facility, and cooperative distribution system**
- **Look to streamline regulatory requirements across multiple state agencies**
- **Create greater housing opportunities in currently developed areas and take steps to promote agricultural careers among the next generation**
- **Explore ways to accommodate the uncertainty of future environmental conditions in farm planning**
- **Reduce flood risk to farmers through dam removal, soil erosion control measures, and watershed management**
- **Conduct a food-shed mapping effort across the region to determine sources and quantities of locally produced food**

Ecosystems

The ecosystem services in Southeastern Connecticut help to provide the clean air and water, healthy soils, flood control, and wind protection for the region's towns and cities.

Challenges

- **Effects of reduced water quantity and quality on natural resources and the derived services and co-benefits for residents**
- **Reduction in ecosystem services such as coastal and riverine flood protection and water purification in forested watersheds**
- **Lack of ecosystem service value integration in existing and future development projects**
- **Need to integrate natural resources and green infrastructure to redefine smart, balanced, and resilient development**



Solutions

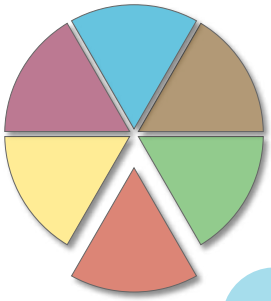
- **Strengthen collaborative leadership that champions benefits of ecosystem services from municipal to regional scale**
- **Catalogue financial mechanisms and incentives for property owners to maintain and enhance natural infrastructure and associated services**
- **Monetize services provided by natural assets when making economic growth and development decisions across the region**
- **Define ways to incorporate ecosystem services directly into permitting requirements for MS4 and other initiatives**
- **Integrate natural infrastructure into zoning codes to reduce conflicts between development and community resilience**
- **Conduct outreach and education for residents and business owners on where and what natural alternatives could be considered alongside standard hard engineering approaches**

Transportation

The presence of a few key industries has blessed Southeastern Connecticut with access to a variety of forms of large scale transportation. Despite these assets, there is plenty of room to improve the capacity and sustainability of the region's transportation system and to prepare infrastructure for higher sea levels, flooding, and heat waves.

Challenges

- **Flood vulnerability to critical transportation centers such as New London**
- **Primary arterial roads are vulnerable to flooding, tree falls, and ice impacts**
- **Unreliable emergency transportation for transit-dependent communities to shelters and employment centers**
- **Aging infrastructure including roads, rail, and bridges**



Solutions

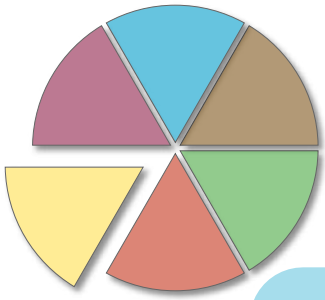
- **Prioritize state and local funding for infrastructure improvements that contribute to overall community resilience**
- **Collaborate on largest regional transportation vulnerabilities and share planning, engineering, and monetary resources across municipalities to enhance regional resilience**
- **Integrate green infrastructure and natural assets into transportation upgrades and retrofits through design standards and codes**
- **Establish mutual aid agreements with nearby urban centers (Hartford, Worcester) to reduce risk to transit-dependent residents during emergencies**

Energy

The list of activities that are reliant on the regional energy system is extensive. Without a reliable source of energy and an efficient means to distribute it, many businesses would shut down, community services would collapse, food would spoil, and residents would go cold in the winter.

Challenges

- **Preparedness and capacity to recover from flooding and high wind events**
- **Communications disconnect between energy consumers and providers leading to potential misunderstandings**
- **Uncertainty surrounding the future of local energy production and supply may hinder further investment in local energy resilience infrastructure such as solar and micro-grid technology**



Solutions

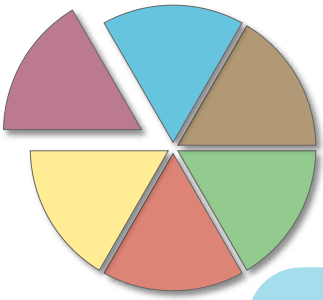
- **Identify steps to further strengthen and possibly redesign the distribution system in partnership with municipalities**
- **Improve communications among stakeholders within the energy system**
- **Target and incentivize consumer behavior to improve overall regional energy resilience**
- **Routinely update state building codes with energy efficiency standards**
- **Update existing response plans with a specific emphasis on speeding up the recovery of energy infrastructure**

Economy

The economy is based on connections and dependencies across all planning sectors. As a result, damage to one part of the region can quickly compound, leading to region-wide failures.

Challenges

- **Short and long-term effects of flooding and power outages on business continuity and economic recovery**
- **Post-storm complications limit access to food, transportation, and shelter particularly in lower income neighborhoods**
- **Limited preparedness training for municipalities and social service organizations**
- **Effects of coastal hazards on municipal grand list - vulnerability of tax base**
- **Negative effects of natural resource degradation on economy, especially tourist sector**



Solutions

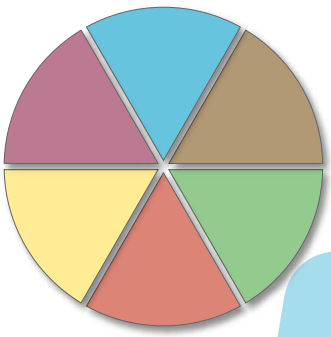
- **Conduct fiscal impact study of extreme weather and sea level rise scenarios to strengthen commitments from community leaders and elected officials**
- **Improve coordination of disaster recovery between public and private stakeholders**
- **Reduce long-term over-reliance on high-value, residential property for tax revenue**
- **Prioritize compact mixed use areas by infilling downtown and village centers outside of flood hazard areas**
- **General diversification of the economy to increase collective revenue streams and reduce the demands on local ecosystems**

Cross-Sector Resilience

The following challenges and solutions represent those areas where multiple planning sectors are directly affected by the physical impacts of extreme weather and climate change. Addressing these issues will have broad reaching benefits across planning sectors and will likely require collaboration across municipalities, professions, and organizations from local to regional scales.

Challenges

- **Rising sea level intrusion into aquifers, drinking wells, and septic systems**
- **Effects of drought on water quantity and quality for natural resources and the derived services and co-benefits for residents**
- **Flood vulnerability of critical transportation centers such as New London**
- **Preparedness and capacity to recover quickly from flooding and high wind events**
- **Short and long-term effects of flooding and power outages on business continuity and economic recovery**



Solutions

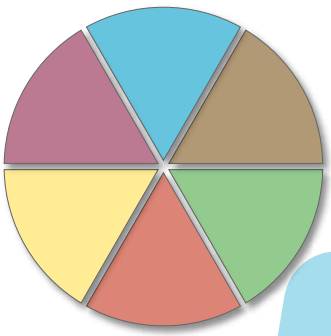
- **Develop a regionally specific decision support process to help municipalities assess and plan for flooding, efficient use/reuse, and nonpoint source pollution, simultaneously**
- **Integrate natural infrastructure into zoning codes to reduce conflicts between development and community resilience**
- **Collaborate on largest regional transportation vulnerabilities and share planning, engineering, and monetary resources across municipalities to enhance regional resilience**
- **Conduct fiscal impact study of extreme weather, drought, and sea level rise scenarios to strengthen commitments from community leaders and elected officials**

Cross-Sector Resilience

Some challenges and solutions that cross planning sectors concern regional support systems that must become more resilient regardless of future climate conditions. Committing the resources and time to addressing these systemic challenges will buffer the region's communities from greater costs and enhance future stability and vibrancy.

Challenges

- **Insufficient capacity of aging and outdated stormwater systems to handle current and future precipitation and sea level rise**
- **Limited processing infrastructure for food producers and distributors**
- **Lack of ecosystem service value integration in existing and future development projects**
- **Aging infrastructure including roads, rail, bridges, and other public infrastructure**
- **Uncertainty surrounding the future of local energy production and supply may hinder further investment in local energy resilience infrastructure such as solar and micro-grid technology**



Solutions

- **Build upon past projects and foster future opportunities across the region to utilize green infrastructure and improve gray infrastructure to enhance capture and infiltration of runoff**
- **Conduct a food-shed mapping effort across the region to determine sources and quantities of locally produced food**
- **Monetize services provided by natural assets when making economic growth and development decisions across the region**
- **Prioritize state and local funding for infrastructure improvements that contribute to overall community resilience across the region**
- **Identify steps to further strengthen and possibly redesign energy distribution system through partnerships across multiple municipalities**

Resilience Planning

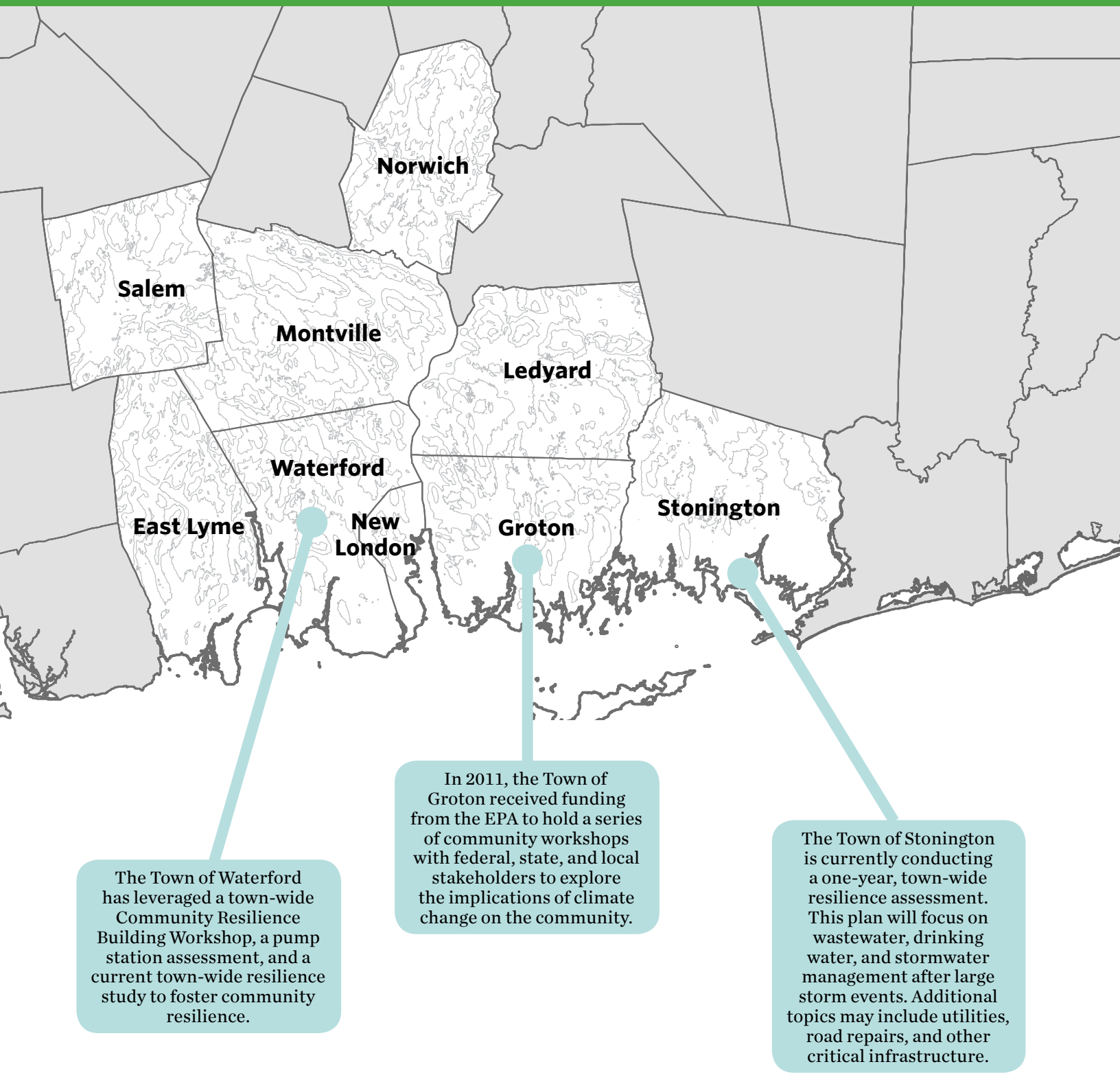
Several municipalities in the region have already begun planning for sea level rise and extreme weather in their communities. These actions benefit not just individual municipalities, but ultimately the region as a whole.

Adapting to extreme weather and a changing climate does not happen overnight. However, the sooner municipalities plan for and move beyond action, the better off they will be in the long run. In 2011, The Nature Conservancy's Coastal Resilience program got the ball rolling with a four-town, Community Resilience Building Workshop to address individual and common vulnerabilities and strengths and priority actions. In that same year, the Town of Groton ran a process in collaboration with the CT DEEP, and the ICLEI. Since then, East Lyme, Stonington, and Waterford have worked with consultants and TNC to assess their vulnerabilities and think through next steps.

At the state level, resilience efforts of this kind have been explicitly encouraged via state-wide impact assessments and action planning as part of the 2011 Connecticut Climate Change Preparedness Plan. A number of recommendations in the plan are relevant to this Southeastern Connecticut Regional Resilience Guidebook and warrant periodic review.

ADAM WHELCHEL, TNC

A few municipalities in Southeastern Connecticut have convened climate adaptation workshops. At this Community Resilience Building Workshop in Waterford (2015), brought to the town by The Nature Conservancy, municipal planners and officials came to a consensus on their biggest vulnerabilities and strengths along with top priority actions for the community to address over time.


Norwich
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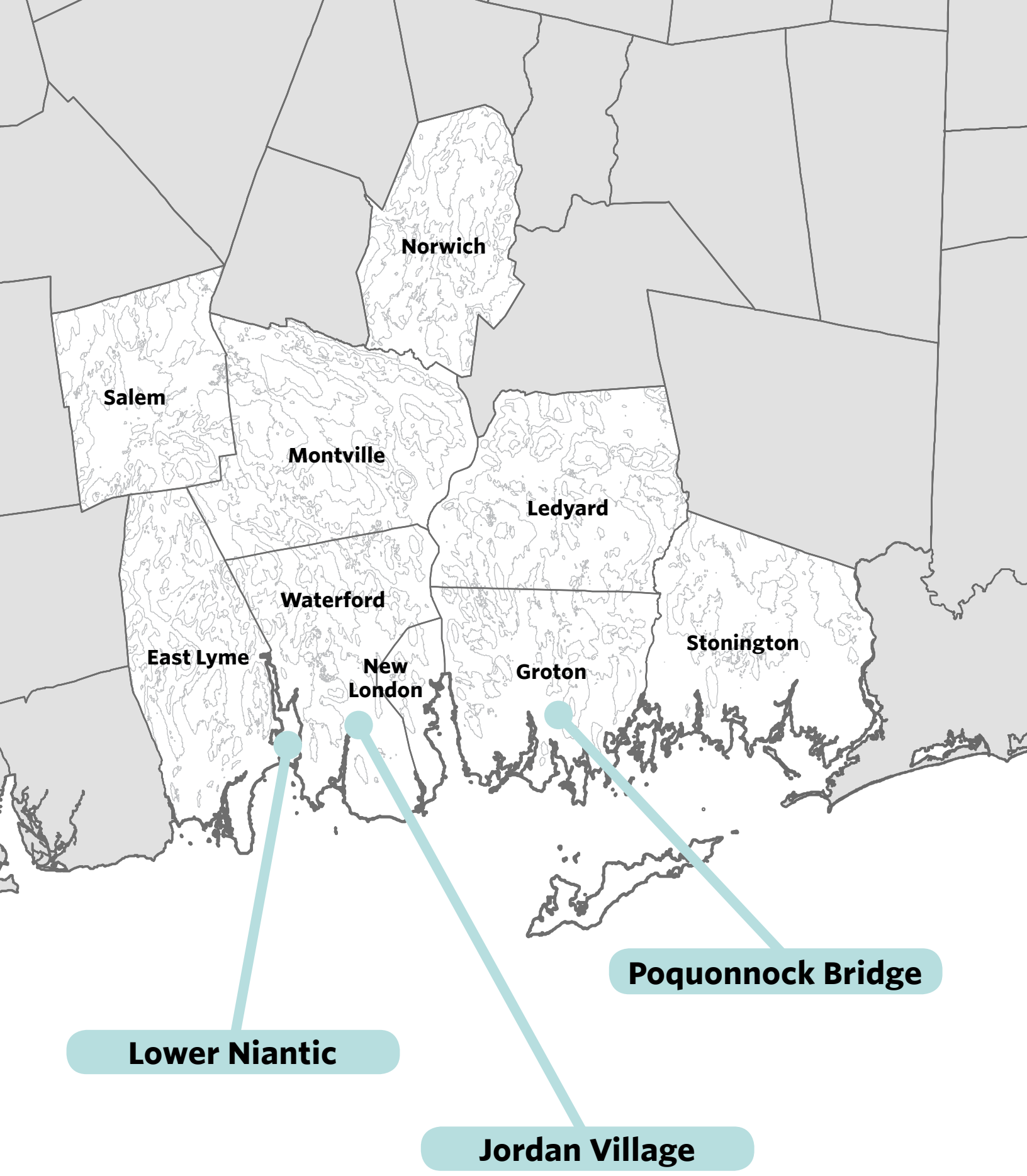
East Lyme
New London
Groton
Stonington
The Town of Waterford has leveraged a town-wide Community Resilience Building Workshop, a pump station assessment, and a current town-wide resilience study to foster community resilience.
In 2011, the Town of Groton received funding from the EPA to hold a series of community workshops with federal, state, and local stakeholders to explore the implications of climate change on the community.
The Town of Stonington is currently conducting a one-year, town-wide resilience assessment. This plan will focus on wastewater, drinking water, and stormwater management after large storm events. Additional topics may include utilities, road repairs, and other critical infrastructure.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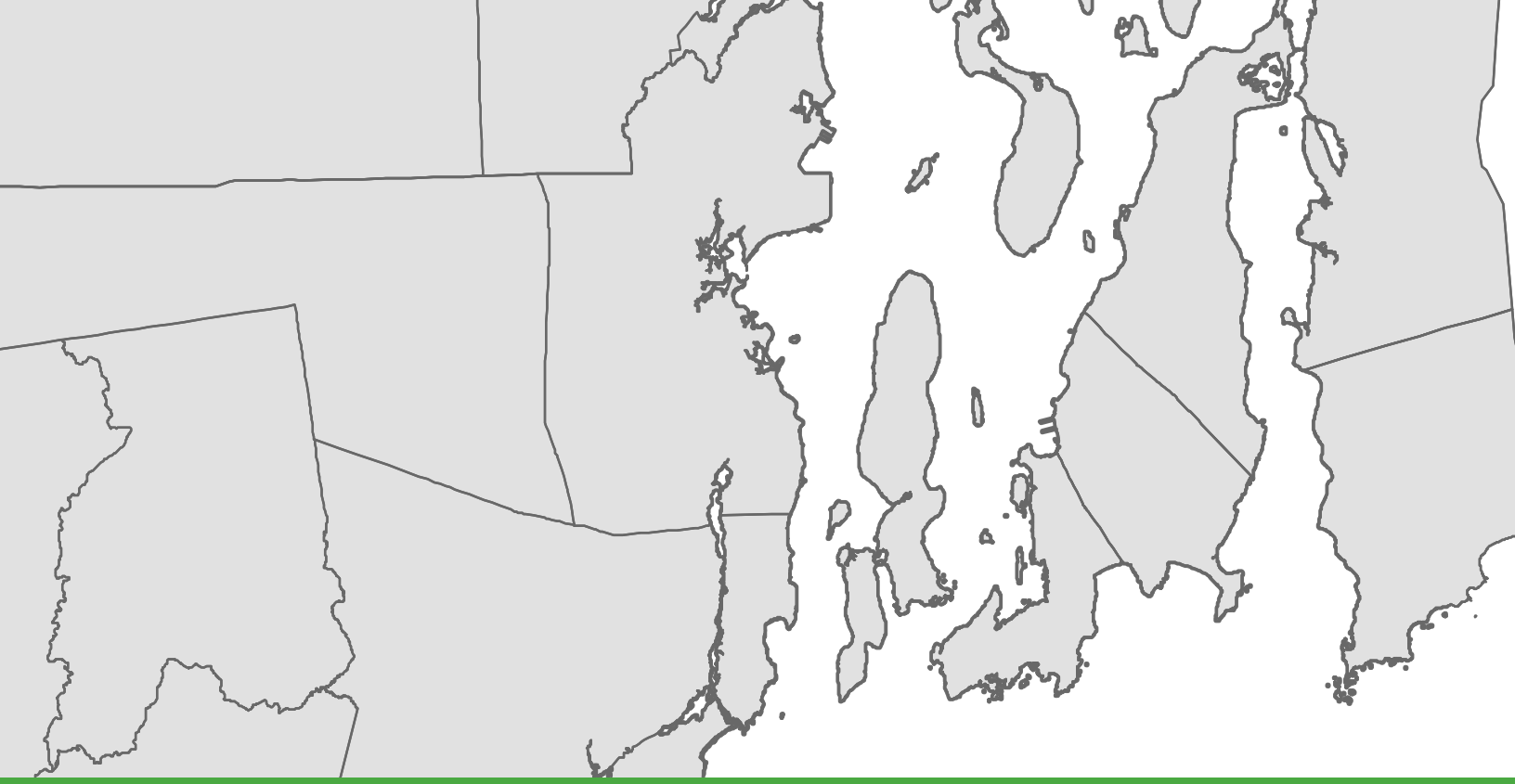
Lower Niantic
Jordan Village

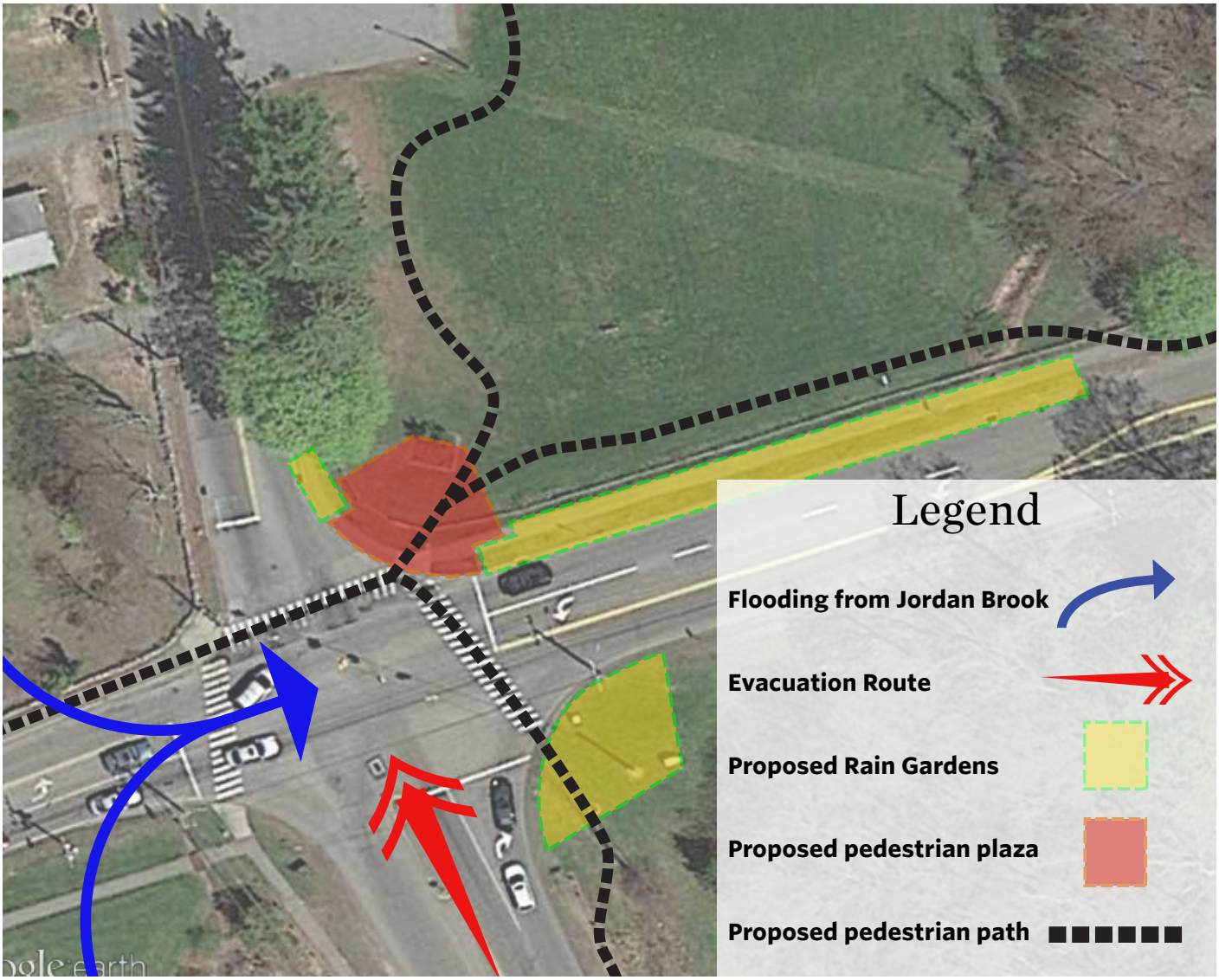


Sample Projects

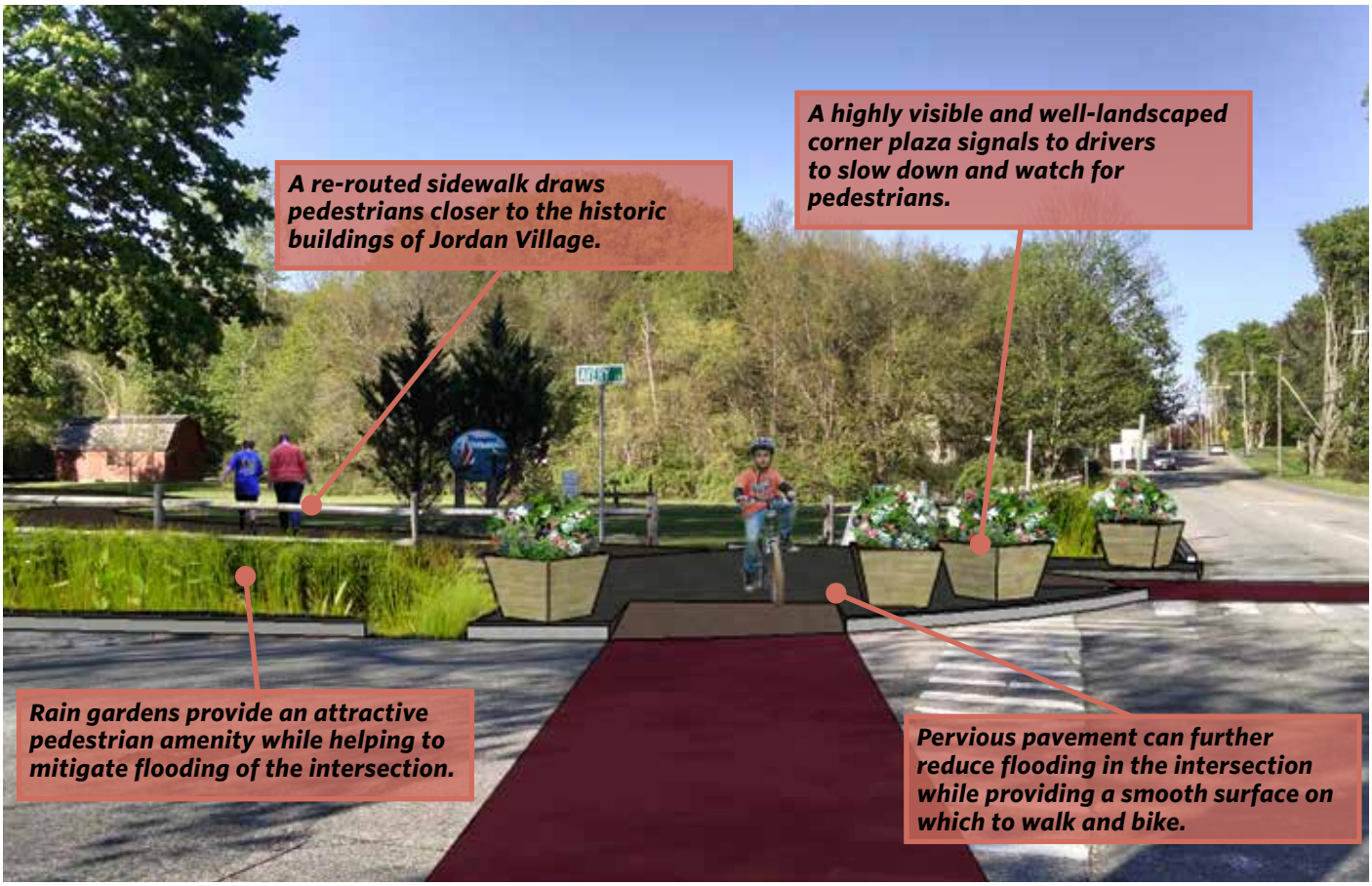
In this section, the reader will find three conceptual project designs at three nested and progressive scales: neighborhood, municipal, and multi-municipal. The intent is to guide the reader from the local to regional solutions through a suite of actionable scales for resilience. These are by no means the only solutions but represent strategies for how municipalities and regional planning partnerships might approach the challenges of sea level rise and extreme weather as well as socio-economic growth and longer-term stability.

Jordan Village

Sitting within the floodplain of the lower Jordan Brook, the intersection of Rope Ferry Road and Great Neck Road is vulnerable to both flooding from the river as well as to coastal storm surge from Long Island Sound. A thoughtful redesign of the intersection could help increase flood storage capacity, while improving the pedestrian experience.



Using rain gardens, the community of Waterford can reduce flooding at one of its most important intersections.



While fully securing this evacuation route will take a number of different tactics, agencies, and organizations working in tandem, there are important steps that the Town and its citizens can take immediately to begin reducing their vulnerability. Rain gardens can increase the water storage capacity of the landscape surrounding the intersection and all the waterways that drain into it. This will help to divert floodwater away from the intersection and allow it time to infiltrate into the soil before causing a problem for traffic.

These "green infrastructure" strategies for reducing flooding can be designed to enhance the pedestrian experience of the area. Building off the concepts developed in the Waterford Town Center Vision and Strategic Plan, the rendering above depicts a re-routed pedestrian path through the Jordan Village Green. This alignment distances pedestrians from the traffic of Route 1, further promotes the historic barn and houses as destination points, and opens up possibilities for integrating into a larger multi-use greenway through and to the north of the Civic Triangle. Attractive rain gardens can fill in the space left by the removal of the existing sidewalk.

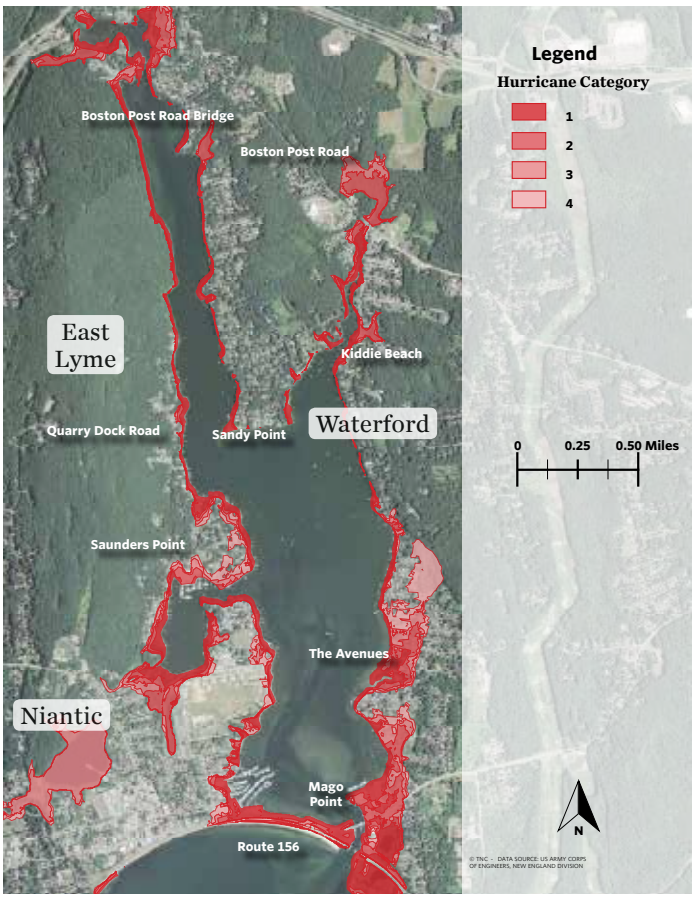
With further input from all relevant stakeholders, it is likely that Jordan Village Green can continue to fulfill its current uses while accommodating increased pedestrian traffic and improved flood mitigation.

Lower Niantic

© TNC

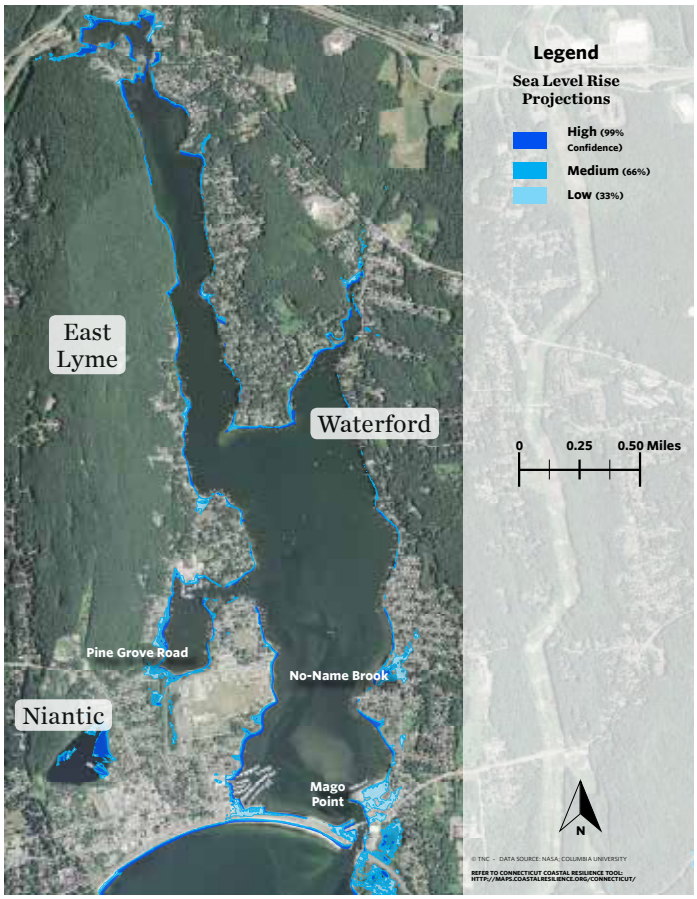
Analysis

When identifying areas for natural infrastructure solutions, it is important for stakeholders to build a clear understanding of the physical, natural, and human dimensions of a region. This project is focused on building resilience to the shoreline communities and infrastructure around the Lower Niantic River.



© TNC - DATA SOURCE: FEMA

Hurricane model's such as NOAA's SLOSH can be easily viewed through online mapping portals and individual data layers can be downloaded for the Connecticut shoreline. These models help decision makers understand what areas are most vulnerable to flooding.*

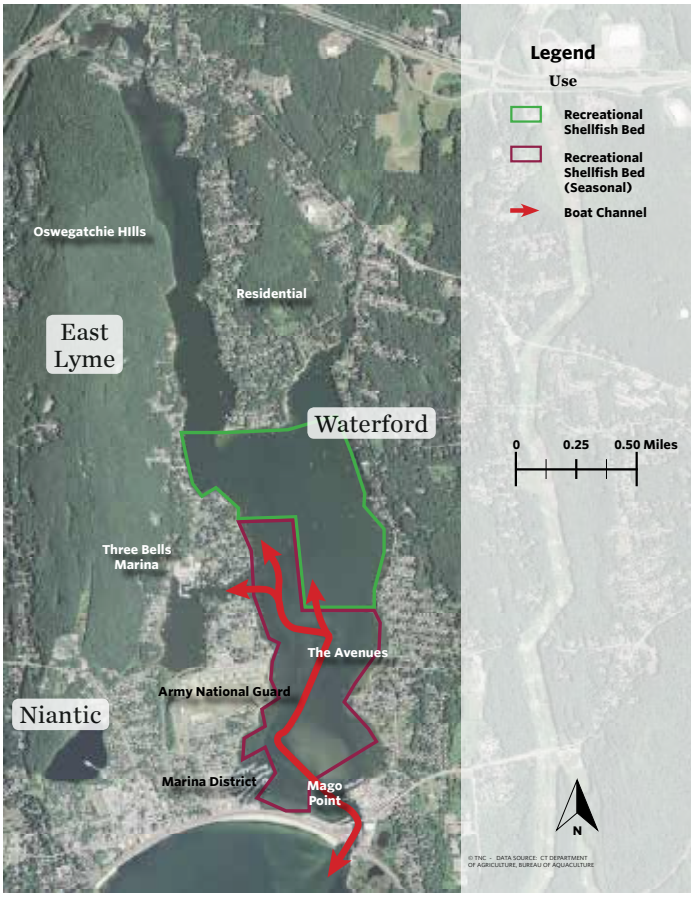


© TNC - DATA SOURCE: NASA

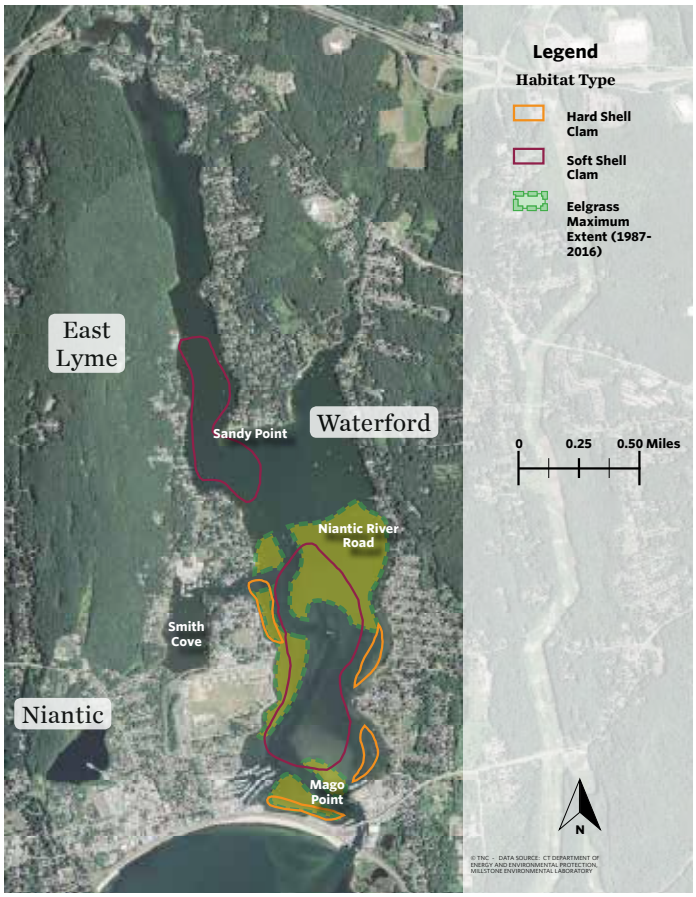
Sea level rise models can be projected out at varying time frames to help communities understand where long term retreat or heavy flood protection may be required.

*For town and region-wide resources, refer to Connecticut Coastal Resilience Tool: http://maps.coastalresilience.org/connecticut/

Despite the somewhat sheltered coastal geography of the Lower Niantic, the region is not immune to the implications of rising sea levels and more intense storms. Many of the homes and infrastructure on the river are built directly adjacent to the water with few natural buffers to protect from destructive waves. Furthermore, runoff-cased erosion undermines the structural integrity of storm protection systems such as seawalls on the landward side.



Mapping the land and water uses and the general circulation of people and vehicles around a region helps to ensure that projects are beneficial and, where appropriate, do not interfere with existing uses.

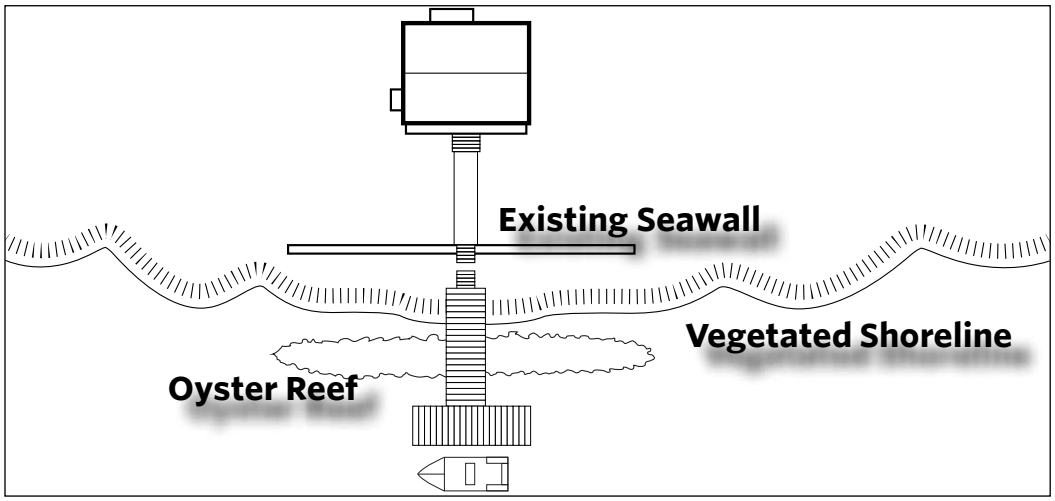


Many communities along the Connecticut coast have mapped threatened or economically important ecological resources such as shellfish beds, salt marsh, and eelgrass populations. Natural infrastructure projects should pay attention to these locations as both areas to avoid disturbing and indicators of the aquatic health.

Lower Niantic

Design

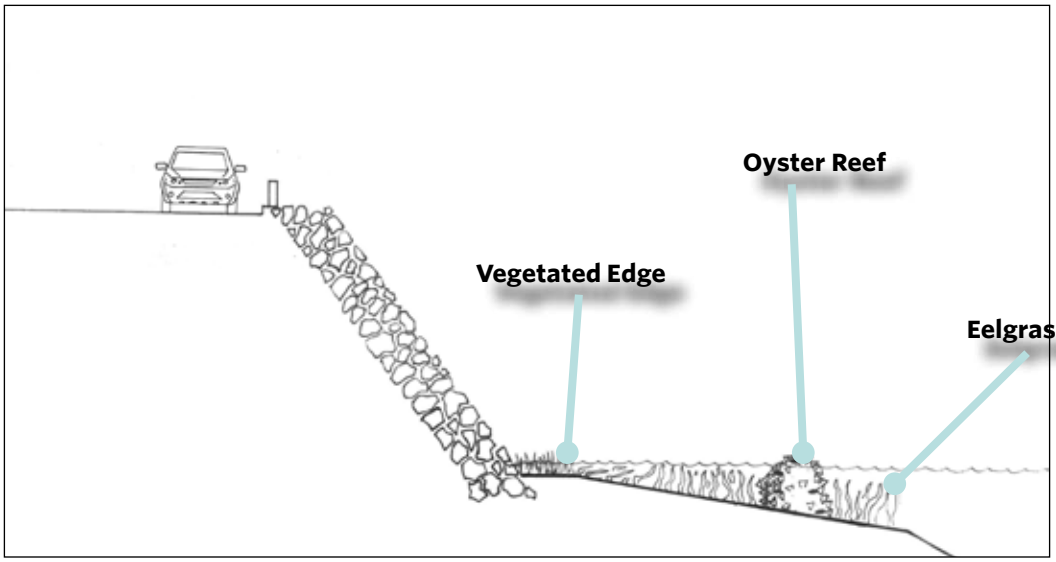
Design alternatives and renderings can help landowners and other stakeholders more fully comprehend their options and the implications of those options. This process can also help to surface previously unforeseen challenges such as how to integrate shoreline restoration with existing coastal infrastructure including seawalls and boat docks.



© TNC

Many property owners in the Lower Niantic highly value access to their personal boats. While in some instances boat mooring structures can be a challenge to restoration, existing shorefront configurations can often be retrofitted with natural infrastructure elements in ways that protect a homeowner's property while simultaneously contributing to the health of the whole ecosystem. To the left is just one example of how a homeowner can build resilience for themselves and for their neighbors.

New and existing infrastructure around the river represents significant civic investments. While these projects are often engineered to very high standards, all coastal structures are at risk from catastrophic coastal events and structural degradation as sediment is eroded from beneath their footings and pounded by storm surge. An oyster reef and enhanced vegetation provides multiple lines of defense to the vulnerable Niantic River Road seawall, as illustrated in this example.



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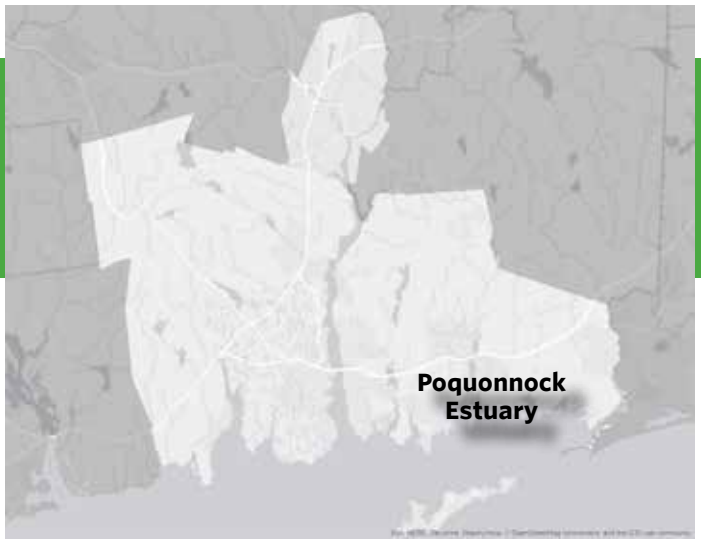
As sea level rises in the coming decades, salt marsh habitat will continue to decrease unless allowances are made for salt water to advance into upland areas which includes developed areas. Mago Point represents a significant opportunity to expand the amount of salt marsh habitat in the river by strategically channeling through new and existing development, as conceptually depicted here.

Poquonnock Bridge



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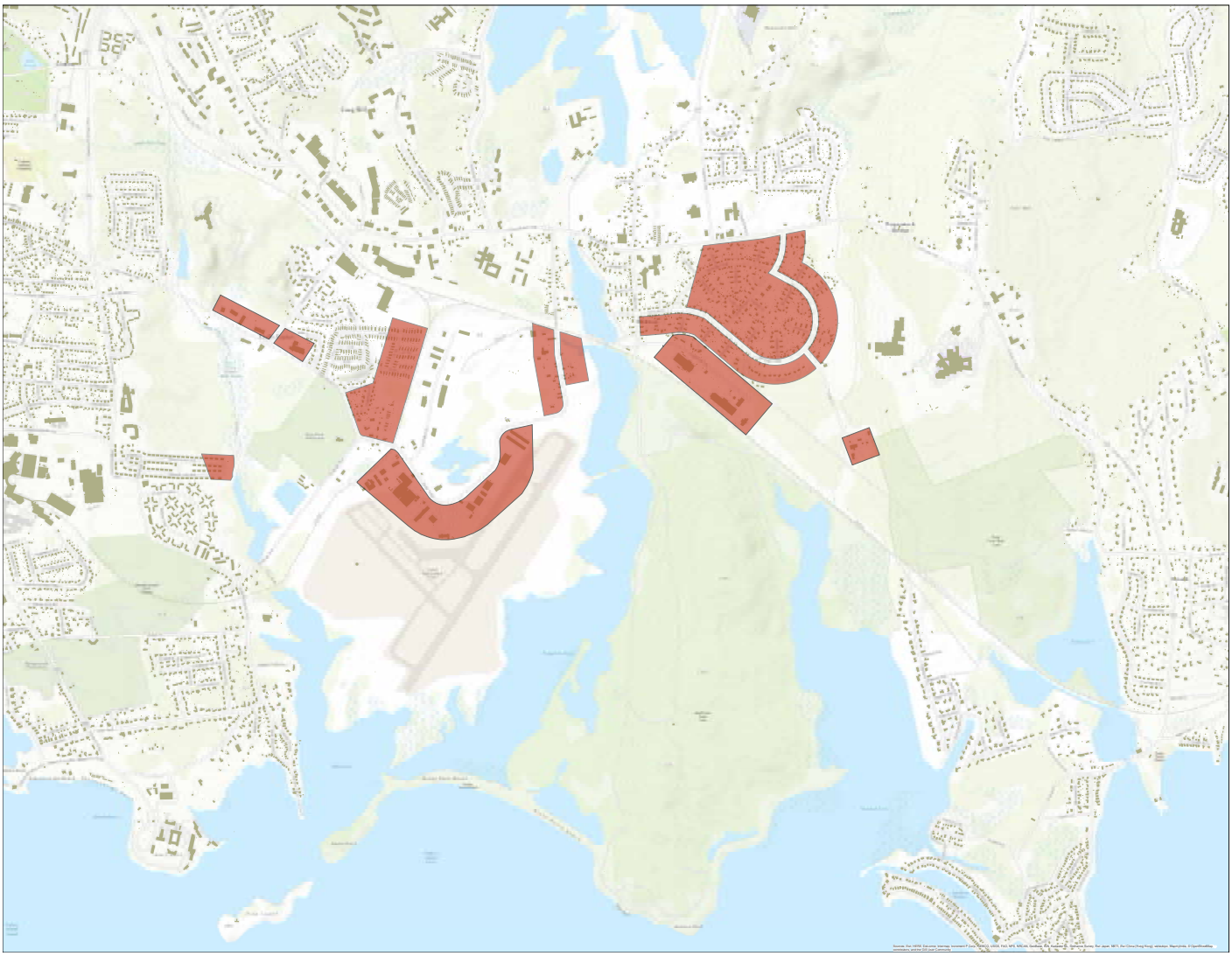
Analysis

As one of the largest areas of flood vulnerability on the Connecticut coast the Poquonnock Estuary and floodplains, contain an airport, two water treatment facilities, a major regional road, a rail line, municipal buildings, and multiple residential neighborhoods.

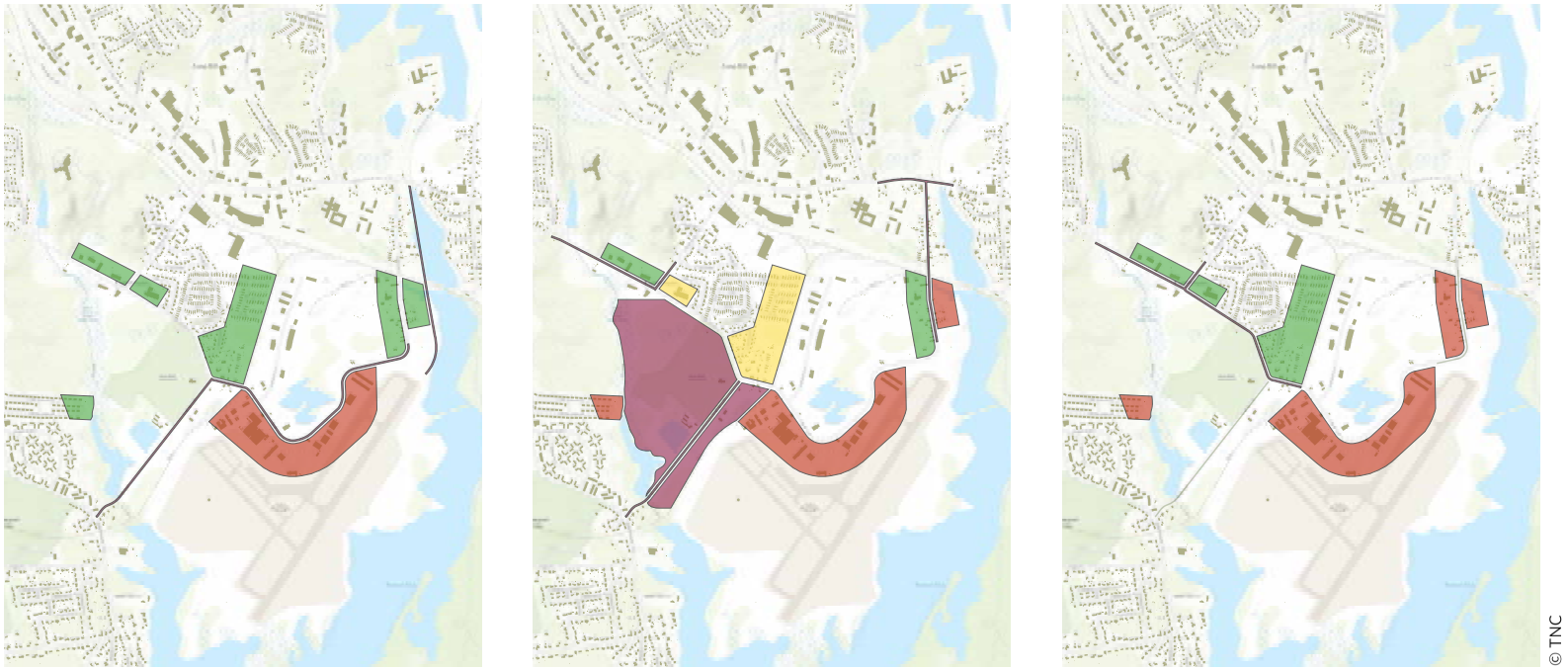
Bubble diagrams such as the one below help synthesize the particular conditions and vulnerabilities of the region. With the information displayed in this way, options may become more apparent to planners and these choices may be able to be better communicated to the general public.



© TNC

Design

A high-level planning process can help to determine the role that the lands and waters in the Poquonnock Estuary can play in local and regional community resilience building and help multiple stakeholders find common ground. By being flexible in sketching out alternative approaches early on, decision makers can surface complex challenges and nuanced opportunities resulting in greater confidence in their final strategies to increase community resilience.

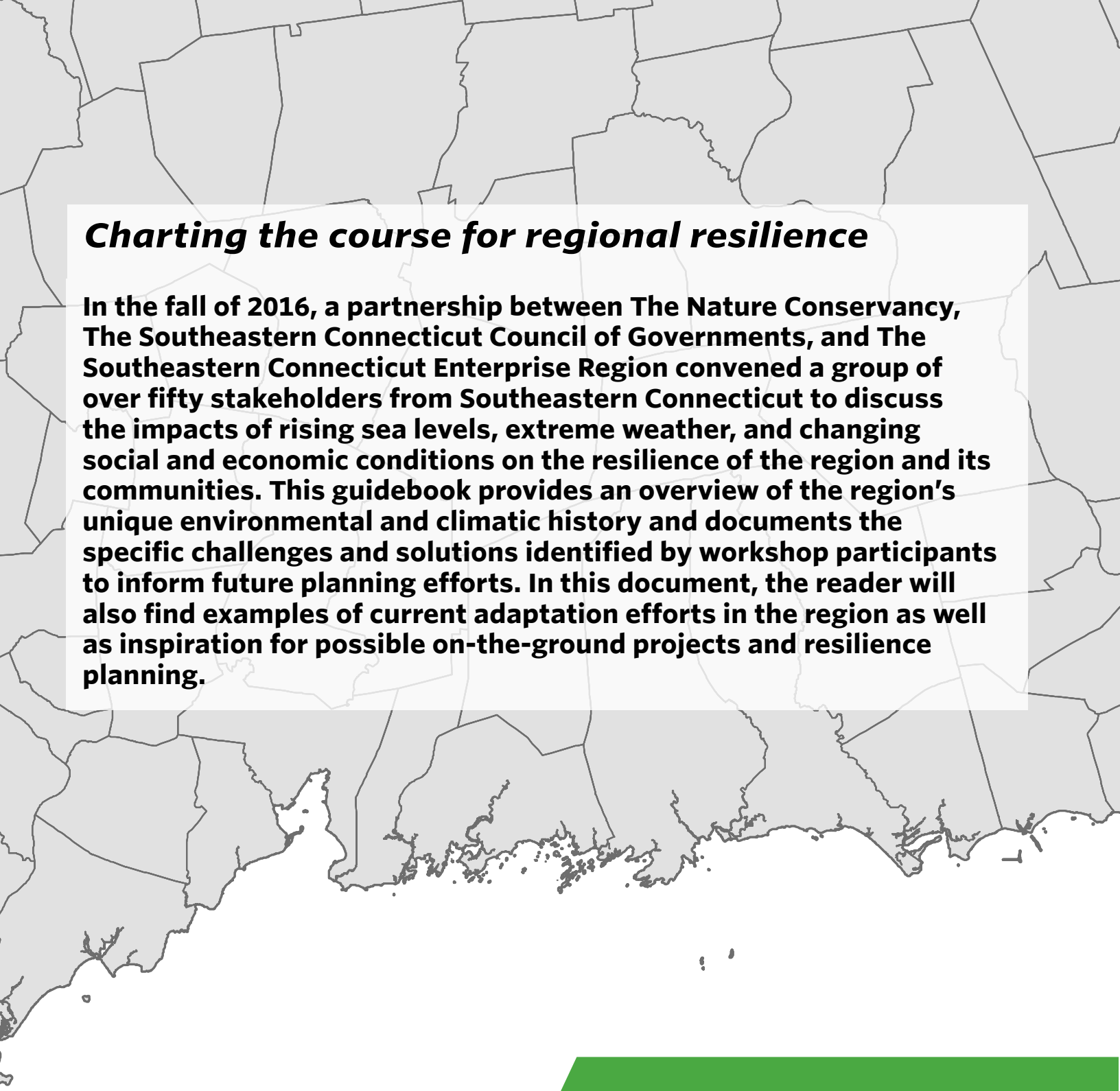


Conceptual design alternatives can help to move thinking about adaptation strategies forward while encouraging stakeholders to become more clear about their priorities.

Conclusion

Southeastern Connecticut is a collection of communities each with its own individual identity and history. However, the fate of each community is closely tied to the social, environmental, and economic health of the whole region. Therefore, the challenges facing Southeastern Connecticut are best tackled collectively with multiple towns, organizations, associations, foundations, and businesses working together across the region. Our sincere hope is that this regional resilience building process and guidebook helps communities secure greater clarity on the common challenges they face while providing a positive vision for continued dialogue, resource sharing, and collaborative leadership needed to create a truly resilient region.

CARY WHITE, TNC



Charting the course for regional resilience

In the fall of 2016, a partnership between The Nature Conservancy, The Southeastern Connecticut Council of Governments, and The Southeastern Connecticut Enterprise Region convened a group of over fifty stakeholders from Southeastern Connecticut to discuss the impacts of rising sea levels, extreme weather, and changing social and economic conditions on the resilience of the region and its communities. This guidebook provides an overview of the region's unique environmental and climatic history and documents the specific challenges and solutions identified by workshop participants to inform future planning efforts. In this document, the reader will also find examples of current adaptation efforts in the region as well as inspiration for possible on-the-ground projects and resilience planning.

SCCOG
Southeastern Connecticut Council of Governments

SECTER

The Nature Conservancy
Protecting nature. Preserving life.