



May 2019

- ✓ **Prepare**
- ✓ **Withstand**
- ✓ **Recover**
- ✓ **Adapt**

Resilient Historic Resources: Best Practices for Planners

Guidance for Connecticut municipalities in an era of climate change



**Resilient Historic Resources:
Best Practices for Planners**

Guidance for Connecticut municipalities in an era of climate change

R. Christopher Goodwin, Ph.D., R. Christopher Goodwin & Associates, Inc.

Scott R. Choquette, CFM, Dewberry

Noah Slovin, M.S., CFM, Milone & MacBroom

David Murphy, P.E., CFM, Milone & MacBroom

Staff, R. Christopher Goodwin & Associates, Inc.

Cover: Old Saybrook shoreline after Superstorm Sandy, November 2012. Credit: Marilee Caliendo/FEMA

Contents

LIST OF ABBREVIATIONS	iv
I. INTRODUCTION	1
II. PROJECT APPROACH	3
III. HAZARD MANAGEMENT IN CONNECTICUT	5
IV. RESILIENCE AND HISTORIC PRESERVATION: AN EVOLVING RELATIONSHIP	7
V. RESILIENCY AND PRESERVATION: KEY STEPS	8
A. Before Disaster: PREPARE	8
<i>Identify Historic Resources and Understand Significance.</i>	10
<i>Determine Vulnerabilities of Historic Resources Related to Natural Hazards.</i>	13
<i>Integrate Historic Preservation and Hazard Mitigation in Planning Documents</i>	14
BEST PRACTICE: GIS Mapping of Historic Resources within Hazard Overlays.	15
BEST PRACTICE: Incorporating Historic Preservation into Action Statements	16
BEST PRACTICE: Conduct Public Outreach in your Community.	17
BEST PRACTICE: Be Aware of Developments in Climate Science, Draw Planning Insights from the Work of Others.	18
B. During Disaster: WITHSTAND.	19
BEST PRACTICE: Hard Shoreline Protection and Impacts to Historic Properties	21
C. Post-Disaster: RECOVER	22
BEST PRACTICE: Building Elevation and Impact on Historic Properties.	25
BEST PRACTICE: Historic Resources, Flood Hazard Requirements, and Variances	27
BEST PRACTICE: Historic District Overlay Zones and Village Districts	28
D. Future Disaster: ADAPT	30
BEST PRACTICE: West Haven Coastal Resilience Plan	34
BEST PRACTICE: Sea Level Rise Analysis.	35
CONCLUSION	36
SELECTED ANNOTATED REFERENCES AND ADDITIONAL RESOURCES	38
SELECTED HISTORIC PRESERVATION CONTACTS	50
APPENDIX I. Recommendations for Integrating Historic Preservation at the Local Level	51
APPENDIX II-A. Best Practices Before Disaster: PREPARE.	52
APPENDIX II-B. Best Practices During Disaster: WITHSTAND	56
APPENDIX II-C. Best Practices Post Disaster: RECOVER	58
APPENDIX II-D. Best Practices Future Disaster: ADAPT	59

LIST OF ABBREVIATIONS

BOS—Board of Selectmen
CFR—Code of Federal Regulations
CHC—Connecticut Historical Commission
CIRCA—Connecticut Institute for Resiliency and Climate Adaptation
CLEAR—University of Connecticut Center for Land Use Education and Research
CLG—Certified Local Government
COG—Council of Government
CRP—Coastal Resilience Plan
CSRHP—Connecticut State Register of Historic Places
DECD—Department of Community and Economic Development
DEEP—Department of Energy and Environmental Protection
DESPP—Department of Emergency Services and Public Protection
DOD—Department of Defense
DOI—U.S. Department of the Interior
EM—Emergency Management
EMC—Emergency Management Director/Department
EMD—Emergency Management Department
EOP—Emergency Operations Plans
FEMA—Federal Emergency Management Agency
GIS—Geographic Information System
HDC—Historic District Commission
HMP—Hazard Mitigation Plan
HUD—Housing and Urban Development
ICC—Increased Cost of Compliance
IPCC—Intergovernmental Panel on Climate Change
MDA—Mississippi Development Authority
NFIP—National Flood Insurance Program
NHPA—National Historic Preservation Act
NOAA—National Oceanic and Atmospheric Administration
NPS—National Park Service
NRHP (or NR)—National Register of Historic Places
PC—Planning Commission
POCD—Plan of Conservation and Development
P&Z—Planning and Zoning
SAFR—State Agencies Fostering Resilience
SFHA—Special Flood Hazard Area
SHPO—State Historic Preservation Office
ZC—Zoning Commission



Fayerweather Island Light (1823, NR), in Bridgeport's Seaside Park, received historic preservation funding under the SHPO's Hurricane Sandy grant program. Credit: Frank Kronenberger/Kronenberger & Sons Restoration, Inc.

I. INTRODUCTION

Connecticut's historic resources are community assets that tie us to our shared past—the tangible evidence of history on the land. They shape our state's identity and our identities as citizens. They contribute to quality of life and give Connecticut its unique sense of place. They are powerful economic engines, used and enjoyed by residents and visitors alike. And they are building blocks of environmental sustainability.

These assets include buildings, sites, structures, districts, and objects that possess historic significance and integrity, as well as historic landscapes and archaeological sites. Such properties are recognized through local designation, through listing in the State and National Registers of Historic Places, and by inclusion among our nation's National Historic Landmarks.

These irreplaceable historic resources are at ever greater risk from hazards such as severe storms, sea level rise, and other effects of climate change. In the four coastal counties of Fairfield, New Haven, Middlesex, and New London, for example, more than 4,200 of the approximately 36,000 designated historic buildings—11.6 percent of the historic building inventory—are in federally designated flood hazard areas. This count does not include additional historic resources such as cemeteries, landscapes, and archaeological sites (both terrestrial and underwater).

Historic Properties at Risk
More than 4,200 designated historic buildings in the state's coastal counties are in flood hazard zones.

This Best Practices Guide is a reference for integrating preservation into local resilience planning, with the aim of ensuring that historic resources are considered in all phases of hazard management. It presents a step-by-step methodology for achieving this objective, following the four key steps in hazard management:

- Prepare
- Withstand
- Recover
- Adapt

It also includes summary information on historic preservation programs that can support local efforts.

Environmental changes, more frequent storm events, and sea level rise will affect our state's historic communities. Innovative, proactive, and comprehensive planning will be required to meet the challenges. The framework presented in this guide can help planners and preservation advocates navigate the complex array of policies, programs, and regulations related to hazard mitigation and historic preservation.



The New Haven Green (1638) is a National Historic Landmark and the centerpiece of the Nine Square Plan of New Haven, a National Planning Landmark. Credit: Douglas Royalty/SHPO.

II. PROJECT APPROACH

This “best practices” guide was designed by Connecticut’s State Historic Preservation Office (SHPO), an office of the Department of Economic and Community Development (DECD), to assist town planners, historic district commissions, and local preservation advocates in developing tools to help preserve the state’s character-defining historic properties. The guide offers brief discussions about, and links to further information on, identifying historic properties and defining their historic significance. In addition, it offers tips on assessing and mitigating threats to historic properties from natural hazards. The guide also provides recommendations for incorporating historic resource preservation into hazard mitigation plans and other planning documents. Following the steps outlined in this guide will ensure that these irreplaceable resources have the best opportunities to survive for posterity.

The guide was developed by the project team of R. Christopher Goodwin & Associates (RCG&A), a cultural resources firm based in Frederick, Maryland; Dewberry, a civil engineering firm headquartered in Fairfax, Virginia; and Milone & MacBroom, an environmental business with offices in New York and all New England states. These firms combined their expertise to support the SHPO’s resiliency planning objectives developed under the agency’s Hurricane Sandy program. R. Christopher Goodwin, president of RCG&A, was the project manager.

This guidance document is one part of a progressive program of data collection, mapping, audits of existing plans, and outreach to planning officials in the four counties affected by Superstorm Sandy. The team used this approach to encourage the integration of historic preservation into state, regional, and local planning initiatives, by assessing risks to historic resources; developing mitigation plans for coastal Connecticut counties; conducting historic preservation outreach to coastal communities' planning departments; and building partnerships with municipalities as well as emergency management personnel. This overall effort is described in detail in a companion report, *Historic Preservation and Resiliency Planning in Connecticut*, which is available from the SHPO at its website (<https://portal.ct.gov/DECD/Services/Historic-Preservation>).

Although the work completed under the SHPO's Hurricane Sandy program was limited to the state's coastal counties, the methodology and many of the insights in this guide are applicable to communities throughout Connecticut. **The guide is designed for state and local planners but is widely applicable to other parties whose interests and/or responsibilities include oversight of historic resources** such as historic preservation consultants and advocates, historic district commissioners, emergency managers, and floodplain managers, among others who might find this work relevant.

The information in this guide, along with that in the *Historic Preservation and Resiliency Planning in Connecticut* report, will be used by the SHPO as well as regional and local officials in resiliency planning efforts. The hope is that it will inform stakeholders about the importance of preserving Connecticut's past and integrating preservation into emergency management. Designed for education and policymaking, this guide aims to provide insight to owners of historic properties as well as planners and preservationists.

Development of this guide was supported by the Emergency Supplemental Historic Preservation Fund of the National Park Service, U.S. Department of the Interior, through a disaster relief and recovery grant awarded to the Connecticut SHPO after Superstorm Sandy. Any opinions, findings, and conclusions or recommendations expressed herein are those of the authors and do not necessarily reflect the views of the Department of the Interior.



A FEMA employee surveys damage in Milford after Superstorm Sandy. FEMA has coordinated with state and local agencies on disaster response since 1979. Credit: Robert Rose/FEMA.

III. HAZARD MANAGEMENT IN CONNECTICUT

Connecticut has a long history of vulnerability to natural hazards. Notable storms range from the hurricanes of 1936, 1938, and 1955 to the more recent Hurricane Irene (2011) and Superstorm Sandy (2012), and from the Blizzard of 1978 to Winter Storm Nemo in 2013. The Connecticut State Hazard Mitigation Plan identifies and quantifies risks for hazards to which Connecticut has been exposed historically, including hurricane winds, flooding, severe winter weather, wildfires, tornadoes, and earthquakes.

Prior to establishment of the Federal Emergency Management Agency (FEMA) in 1979, federal responses to disasters were on a case-by-case basis. No one agency was in charge of the responses, and when the federal government did decide to intervene, the National Guard was enlisted to help with disaster relief and recovery. In 1917 the government recognized the need for better-coordinated responses, but even the War Department’s issuance of a special regulation that year did not bring sufficient order to the system. Rather, the first semblance of a national response program was the Federal Disaster Relief Act of 1950, followed by the National Flood Insurance Act of 1968. (See “Best Practice: Historic Resources, Flood Hazard Requirements, and Variances,” p. 27.)

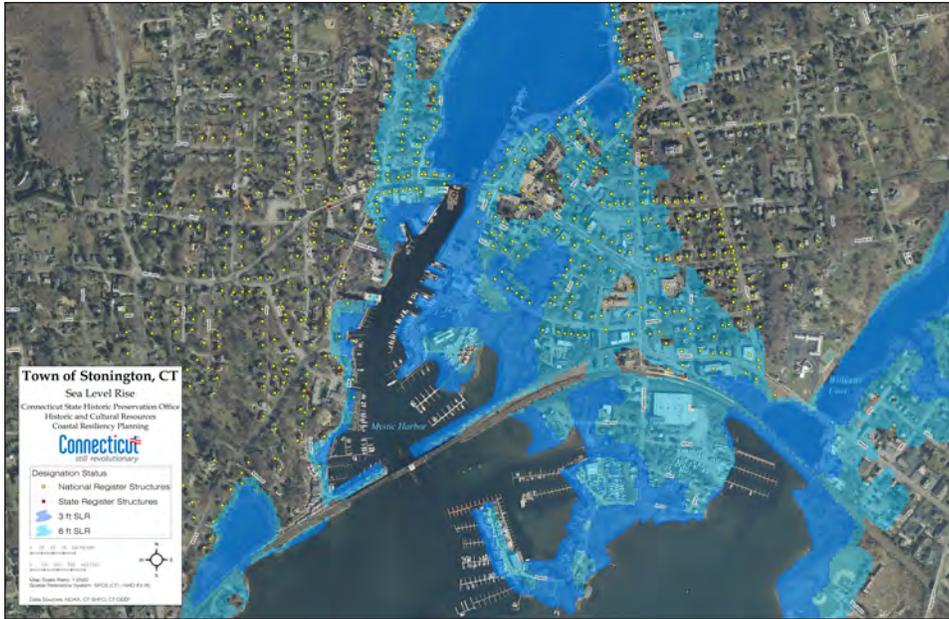
In the twentieth century, Connecticut passed laws to improve disaster preparedness, especially after the 1938 New England hurricane. In 1939 the state legislature established the Connecticut Development Commission. Among the commission’s duties was helping local governments strengthen their disaster preparedness and response plans through planning and zoning initiatives. In 1947 the state created a local planning initiative called the Regional Planning Authority, meant generally to improve local planning for two or more contiguous

Flood Help and Information

The National Flood Insurance Program was created by Congress in 1968 to provide affordable flood insurance to property owners and to encourage communities to build responsibly in flood-prone areas. Municipalities work with state-licensed insurers to provide FEMA-approved coverage for property owners. For more information, go to <https://www.fema.gov/media-library/assets/documents/272>.

towns, and indirectly to coordinate flood-control efforts. The later-created Regional Council of Elected Officials (established in 1965 and given expanded powers in 1971) assumed the duties of the Regional Planning Authority in most Connecticut towns. In 1955 the governor appointed a Flood Recovery Committee to develop a program of immediate and long-range infrastructure rehabilitation in the state.

FEMA's establishment in 1979 marked a turning point in federal emergency response coordination. FEMA combined the roles and responsibilities of existing agencies or divisions of larger government administrations into a single agency. The agency coordinates its responses with local government agencies in every state, as well as agencies in every state that manage emergencies as state-level equivalents of FEMA. Connecticut's equivalent agency is the Department of Emergency Services and Public Protection (DESPP), which helped coordinate the state's response to Superstorm Sandy and participated in the development of the State Natural Hazard Mitigation Plan (NHMP), originally drafted in 2014 and recently revised to include proactive measures that go beyond the reactive measures described in the original report.



GIS overlay maps can help planners and stakeholders understand the effects of hazards such as flooding and sea level rise on historic resources. Credit: Dewberry/R. Christopher Goodwin & Associates, Inc.

IV. RESILIENCE AND HISTORIC PRESERVATION: AN EVOLVING RELATIONSHIP

Resilience and historic preservation are compatible planning concepts that share similar objectives for the social, economic, and environmental well-being of a community. Community resilience has been defined as “the capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment” (NPS *Coastal Adaptation Strategies Handbook* 2016). Historic preservation is the process of applying measures to sustain the existing form, integrity, and materials of a historic property (NPS *Four Approaches to the Treatment of Historic Properties: Preservation*). Studies by such agencies and preservation advocates as the Advisory Council on Historic Preservation and the National Trust for Historic Preservation repeatedly have demonstrated that **preservation contributes to a strong sense of community identity, positively affects property values, supports place-based economic development, and is environmentally sensitive in its use of existing built resources.**

Intersecting Goals

Few Connecticut communities have formally recognized the nexus between resilience and historic preservation.

Safeguarding the historic character of Connecticut’s communities addresses resilience and preservation goals. Preservation supports a town’s identity and its “brand.” Resilience supports the preservation of that identity through proactive planning to prepare, withstand, recover, and adapt from potentially catastrophic events. While many communities recognize the importance of historic properties through local ordinances, local historic districts, and preservation guidelines, few formally recognize the nexus between resilience and preservation. Historic properties are among the community assets that should be considered and integrated into resiliency planning.



Cypress Cemetery, Old Saybrook (NR), has been in continuous use since the seventeenth century. Credit: R. Christopher Goodwin & Associates, Inc.

More on Prepare Phase

Appendix II-A, “Best Practices Before Disaster: PREPARE,” is a detailed guide to resources, actions, agencies, funding sources, and other useful information related to emergency preparation and historic preservation.

V. RESILIENCY AND PRESERVATION: KEY STEPS

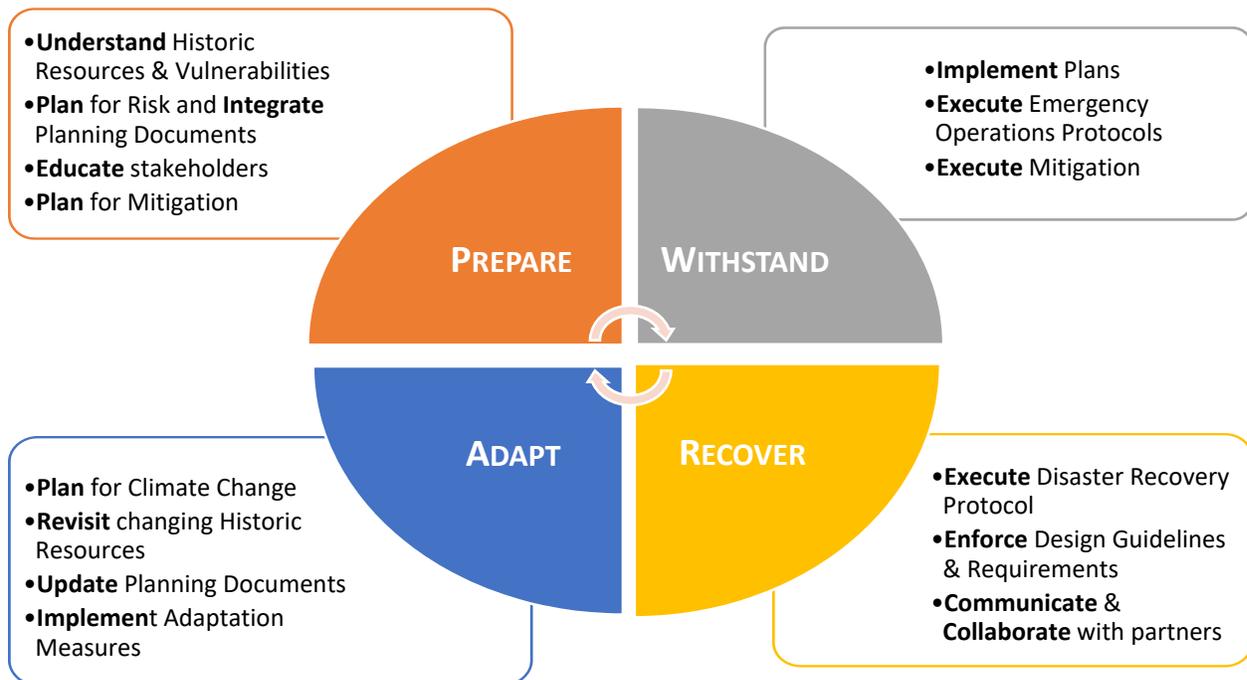
The resilience and preservation of historic resources are best managed through proactive consideration and planning on all levels, from individual property owners and managers to local and state government planners. A proactive approach requires a basic knowledge of the qualities that make historic properties significant, and recognition that planning must consider such resources. Interested and responsible parties involved in resiliency planning on all levels also should seek technical assistance from the professional preservation community.

A. Before Disaster: PREPARE

Key steps in preparation are:

- Identify historic resources at risk and understand the qualities that make them significant.
- Determine vulnerabilities of those resources.
- Understand the hazards they face.
- Incorporate historic resource information into planning documents.
- Integrate historic preservation and hazard mitigation goals in planning documents.

Resilience for Historic Resources Is Achieved Through Four Key Steps:



This guide uses the four steps as a framework for incorporating historic preservation into resilience planning. The steps are summarized below, with best practices suggested within each section.

Identify Historic Resources and Understand Significance

The first step in integrating historic properties in resilience planning is knowledge of the resource base. Information on previously identified historic properties is available on local, state, and national levels.

Local Level

Local planning offices often maintain inventory data on a community's individual historic assets and those within local historic districts. This inventory likely includes data from the Statewide Historic Resource Inventory (HRI) as well as from other sources. The HRI is an ongoing SHPO program that documents historic resources throughout the state. As part of its mission to provide leadership, oversight, education, and guidance in historic preservation, the SHPO administers programs for the identification, evaluation, and treatment of historic properties.

State and National Levels

Historic resources often are recognized officially through listing in the State Register of Historic Places, the National Register of Historic Places, or both. The SHPO administers both programs in Connecticut. On the national level, the NPS maintains data on designated properties through the National Register and National Historic Landmark programs. These data are available through NPS and through the SHPO. Note that National Register listing (or eligibility for listing) has been a requirement for recovery grant assistance for historic properties through the SHPO and NPS after previous hazard events.

All historic resources in your community may not have been documented in previous work. Existing inventory data, while extensive, is not comprehensive. The SHPO can provide insights into the adequacy of past historic resource identification efforts in your area. The agency also offers Survey and Planning Grants for a variety of historic preservation planning efforts. Even in cases where comprehensive data exist for the hazard zones currently defined for your area, maintaining a complete and up-to-date inventory of your community's historic resources is recommended to enable informed resilience planning. Take advantage of local expertise in history and architectural history to identify data gaps and prioritize objectives. Historical societies and local historic district commissions are among the groups with expertise that can contribute to a community's understanding of its historic assets.

On both the national and state levels, historically significant resources are recognized by being nominated to the National Register of Historic Places (NRHP) or the state-level version thereof, the Connecticut State Register of Historic Places (SRHP). To be listed in one of the registers, a resource must qualify as significant under the established eligibility criteria.

The criteria of significance for inclusion in the NRHP, and explanations for applying them, may be found in the free online bulletins published by the National Park Service: https://www.nps.gov/nr/publications/bulletins/nrb15/nrb15_2.htm. The NRHP criteria for listing a property specify that "The quality

Finding Historic Properties

You can quickly search for State and National Register properties at the SHPO's Historic Property Database (Data are currently available only for coastal counties.)

Go to https://portal.ct.gov/DECD/Content/Historic-Preservation/03_Technical_Assistance_Research/Research/Historic-Property-Database.

of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

- A. That are associated with events that have made a significant contribution to the the broad patterns of our history; or
- B. That are associated with the lives of significant persons in our past; or
- C. That embody the distinctive characteristics of a type, period, or method construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- D. That have yielded or may be likely to yield, information important in history or prehistory.

The SRHP and NRHP criteria for significance differ slightly. Resources listed in or eligible for listing in the State Register, however, may not necessarily meet the National Park Service’s criteria for integrity as required for listing in the NR.

The criteria for significance and instructions on how to nominate a property to the SRHP may be found at the SHPO’s website:

https://portal.ct.gov/DECD/Content/Historic-Preservation/01_Programs_Services/Historic-Designations/State-Registry-of-Historic-Places.

Historic Resources and Vulnerabilities

Each class of resource in your community should be analyzed for vulnerabilities, focusing on the qualities of significance and integrity that make them important. This analysis should emphasize preservation of the character-defining features identified in survey and registration data for the properties. Municipal planning and zoning departments and historic district/historic properties commissions should consider amending their zoning and subdivision regulations to allow municipalities to require archaeological and historic surveys prior to approvals for work. These agencies also should consider supporting the amendment of historic property redevelopment and reuse regulations to ensure that properties maintain their character-defining features.

To implement these procedures, **municipalities should consider designating persons or departments whose job includes assessment of historic resources during and after a disaster.** Formal designations, such as National and State Register nominations, may help in prioritizing the importance of the historic property. In addition, listing or eligibility for listing in the National Register of Historic Places affords consideration of the effects of state and federal undertakings under the Connecticut Environmental Policy Act and/or Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA). The SHPO is a mandated review agency in the former, and the SHPO is a required participant in the latter. Local governments must be invited to participate as consulting parties on the effects of federal undertakings on historic properties under the Section 106 process. Dual

participation in Section 106 may provide additional opportunities for collaboration on local preservation objectives between the SHPO and municipal planners.

Planners are increasingly focusing on calculating the potential economic losses to properties. FEMA has developed a software tool to help calculate impacts from floods and other types of natural disasters. The program, HAZUS, models physical damage to properties and is a key tool for GIS specialists, planners, and other government officials. The program is a generalized one, not developed specifically for historic resources. The software does not take into account special design features, construction methods, or materials that may help define the historic character of properties. **After a disaster, repairs to historic structures should follow the Secretary of the Interior's Standards for the Treatment of Historic Properties.** Doing so may require more expensive materials and construction methods, and therefore some mathematical operator, a multiplying factor or exponent, should be used when employing HAZUS to estimate the cost of reconstructing historic structures.



Data on historic resources often were lacking or incomplete in areas that suffered damage from Superstorm Sandy. Credit: Marilee Caliendo/FEMA.

Determine Vulnerabilities of Historic Resources Related to Natural Hazards

Historic properties encompass a variety of resource types, from historic buildings, to engineered structures, to cultural and designed landscapes, to terrestrial and underwater archaeological sites. Each resource category is associated with specific vulnerabilities related to natural hazards. For example, buildings and structures are vulnerable to structural damage related to increased precipitation and snow loads. Designed landscapes may experience increased tree fall resulting from saturated ground conditions. Increased erosion of archaeological sites can be anticipated during periods of heavy rainfall following dry periods.

While resilience planning frequently focuses on planning and response to storm events, keep in mind that other natural hazards associated with climate change have the potential to adversely affect historic properties. These include climate-change-related effects such as sea level rise and environmental shifts such as temperature change and increasing precipitation. The former may threaten the physical integrity of a resource, while the latter may affect how buildings respond to their environment through seasonal expansion and contraction of materials over the years. Currently defined flood hazard zones in Connecticut do not account for projected hazards from sea level rise.

Assessment Funding

The SHPO's Survey and Planning Grant program funds historic resource inventory assessments, feasibility studies, and other preservation planning projects. See https://portal.ct.gov/DECD/Content/Historic-Preservation/02_Review_Funding_Opportunities/Grant-Opportunities/survey-and-Planning-Grants.



Coastal Connecticut's archaeological resources are vulnerable to environmental changes such as sea level rise, erosion, and subsidence. Credit: R. Christopher Goodwin & Associates, Inc.

Integrate Historic Preservation and Hazard Mitigation in Planning Documents

Section 106 Demystified

Municipal P&Z offices should keep a stack of A Citizens Guide to Section 106 on hand. Produced by the Advisory Council on Historic Preservation, the brochure explains the Section 106 process for nonprofessionals. Download it at <https://www.achp.gov/digital-library-section-106-landing/citizens-guide-section-106-review>.

In Connecticut, Councils of Governments (COGs) develop regional planning documents concerning hazard mitigation and conservation/development. Some municipalities adopt these plans as their own, but most local agencies develop their own land use plans and policies. This is advantageous, since local planning documents can be tailored to local conditions with a great degree of specificity and can better provide direction for immediate action. After a disaster, localities are the first responders for emergency management and disaster recovery. The responsibility for damage assessments and grant processing for local historic resources often rests with a town's Planning and Zoning staff (see Appendix I, "Recommendations for Integrating Historic Preservation at the Local Level.>").

Many of Connecticut's municipalities address historic preservation in community zoning. Most communities maintain plans for addressing flood hazards. Few identify the intersection between the two planning areas, however. In addition, few historic preservation ordinances, zoning regulations, or historic district guidelines address natural hazards. Opportunities for cross-integration of historic preservation and resilience are varied: Historic preservation now is considered in the statewide plan for disaster recovery, and FEMA funds historic resources projects in hazard mitigation planning. Details about the roles, responsibilities, and opportunities for government and other organizations may be found in Appendix I.



The Grand Avenue Bridge in New Haven (1896, reconstructed 1984, NR) connects historic resources on both sides of the river in the National Register-listed Quinnipiac River Historic District. Much of the area is also a local historic district. Credit: Douglas Royalty/SHPO.

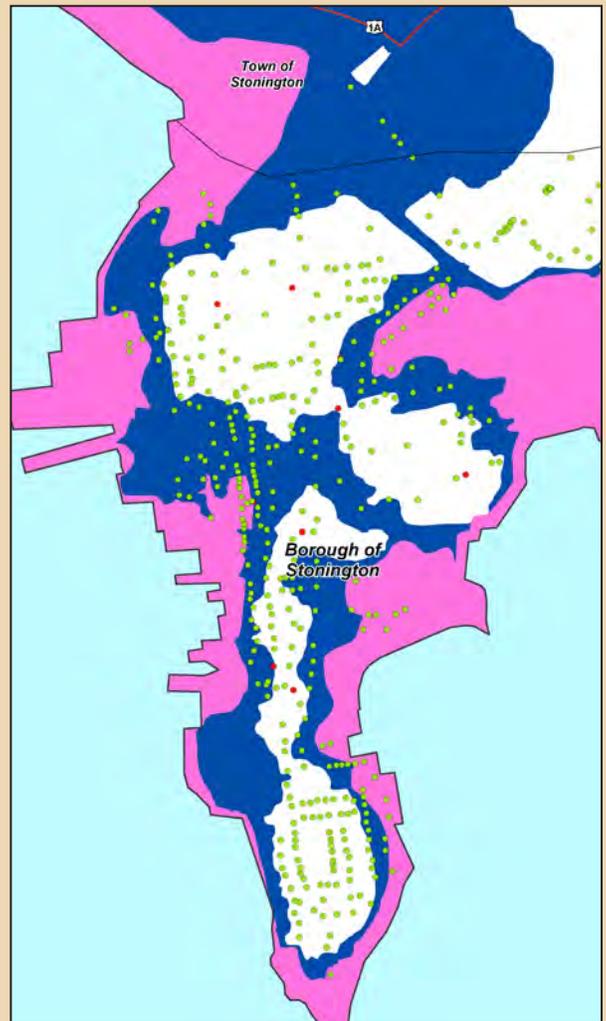
BEST PRACTICE: GIS Mapping of Historic Resources within Hazard Overlays

Data management using Geographic Information Systems (GIS) has been adopted widely in the field of planning. This approach makes possible the geographic integration of a wide variety of information on existing conditions and land use as well as areas of special concern, such as hazard areas.

As part of the SHPO's Hurricane Sandy disaster relief and recovery program, a GIS and database were created of all known and recorded historic properties in Connecticut's coastal counties of Fairfield, New Haven, Middlesex, and New London. The GIS includes locally designated properties; all properties listed on the State and National Registers of Historic Places; and properties designated as National Historic Landmarks. Survey and registration data are linked to the project databases. This geocoded information provides robust analytical capabilities.

Any community may supplement the historic property layer with other layers of geographic information, such as those for roads, evacuation routes, shelters, or other emergency services. Users can pinpoint individual properties, neighborhoods, or areas of the community to graphically depict where historic properties and higher-risk areas intersect. Historic property types can be overlaid on aerial photography to provide better orientation for the public and for town officials about the location of historic resources in relation to other landmarks, streets, and hazard sources such as rivers, streams, and inland or tidal wetlands.

The development of GIS layers for historic properties and the integration of those layers with a community's existing GIS data are recommended as the most expedient approaches to integrating historic property data with other data sets used in planning. Newly identified historic properties as well as updated information on existing properties can be added to such GIS layers. The attributes of a historic property may also be expanded to include resilience data, such as character-defining features, level of recognition, and hazard vulnerabilities.



Borough of Stonington: Map of FEMA's Special Flood Hazard Areas and Historic Resources. Historic property points mapped with the 100-year/1% annual still-water flood risk (shown in blue) and the high-velocity flood risk subject to wave action (shown in pink), providing easy visual references to at-risk properties for community members. Credit: Dewberry.

GIS Mapping Tools:

Historic resources in the four coastal counties have been mapped in GIS, with overlays for flood zones and sea level rise scenarios in direct-shoreline times. For this data, contact the SHPO: https://portal.ct.gov/DECD/Content/Historic-Preservation/06_About_SHPO/About-SHPO-new/Contact.

BEST PRACTICE: Incorporating Historic Preservation into Action Statements

Planning documents reflect your town’s unique conditions, challenges, values, and goals. As plans are developed, community stakeholders contribute to the development of objectives, policies, and strategies. These stakeholder meetings offer the opportunity to introduce historic preservation values in the dialogue on resilience.

The most successful planning documents include specific STRATEGIES with ACTIONABLE items so that plans can continue to move forward. Strategy tables with action items that address historic resources with an ASSIGNED AGENCY and with possible FUNDING SOURCES identified always should be included, as shown below.

Example of STRATEGIES linked to ACTIONABLE items and FUNDING SOURCES

Historic Resource	Action	Agency	Funding Source
Old Town Hall	Improve drainage to reduce the frequency of flooding in the lower levels	Public Works	Bond Funds
Old Settlement on River Street	Stabilize adjacent streambank	Public Works	Natural Resources Conservation Service: Emergency Watershed Protection Program
Library Building	Develop snow removal priority plan	Public Works	No cost
Old Town Historic District	Develop design guidelines for elevations and flood-proofing	Planning Department	CIRCA Municipal Resilience Grant
All Designated Historic Resources	Develop Emergency Management protocols to ensure response team is aware of historic resource locations and special post-disaster procedures	Emergency Management Department	No cost

The above table contains hypothetical examples of historic resources and strategies to help protect them. Real-world scenarios of local government planning actions that may involve actions, as well as funding sources that involve historic resources, may be found in two of the appendices attached to this report. See Appendix II-A, “Best Practices Before Disaster: Prepare,” and Appendix II-B, “Best Practices During Disaster: Withstand.”

BEST PRACTICE: Conduct Public Outreach in your Community

Planners should make every effort to obtain the views of stakeholders on historic resources for hazard planning. Recently, the SHPO executed a statewide survey program to gauge residents' reactions to historic preservation goals and community attitudes toward different types of historic properties. The outreach documented in the Connecticut *Shared Stewardship: 2018–2023 Statewide Historic Preservation Plan* (2018) forms a model for planners in the state's municipalities. That and similar programs employed a multifaceted approach to garner public and professional views. (See for instance, the State of Maryland's *Flood Mitigation Guide*.)



Excerpt from *Shared Stewardship*, highlighting survey results.

Public outreach should be well planned to gain feedback from all affected communities, and to assure that a large enough number and diversity of responses is generated. Goals should also be clearly formulated:

- **Community workshops held in different neighborhoods at different times. Include various topics and materials such as:**
 - ✓ Where to find grants.
 - ✓ How to advocate for preservation in your neighborhood.
 - ✓ How to identify historic properties and create historic districts.
 - ✓ Increase public education on the importance of heritage.
 - ✓ Direct advocacy for historic preservation.
- **Design and distribute both paper and online surveys**
 - ✓ Survey forms give residents unable to attend meetings a voice
 - ✓ Questionnaires formulated after workshops can be more focused, and solicit responses to wide areas of concern.
- **Discuss hazards and risks to historic resources:**
 - ✓ What is the proper balance between resilience and preservation?
 - ✓ Are historic property owners taking protective measures?
 - ✓ How do historic resources form a part of community identity?

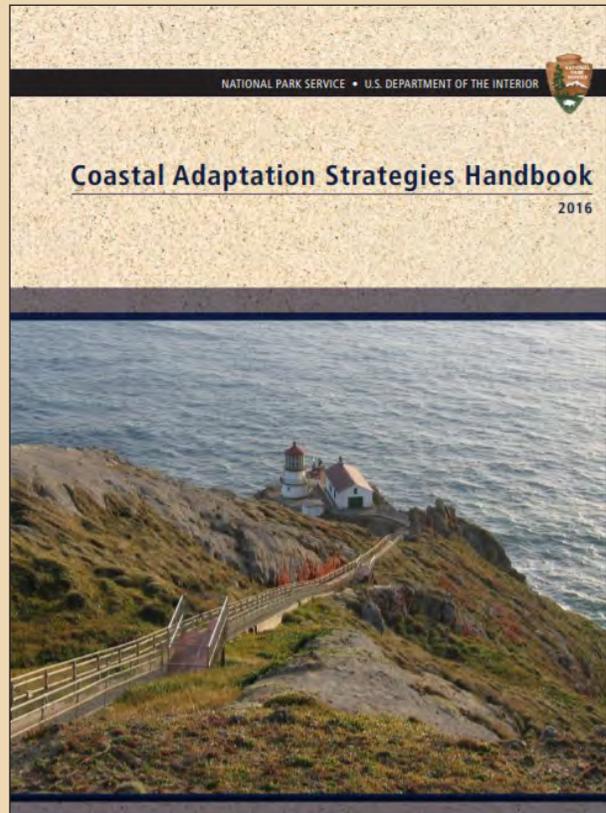
BEST PRACTICE: Be Aware of Developments in Climate Science, Draw Planning Insights from the Work of Others

Climate science is an evolving field fraught with uncertainty, owing to the pace of physical change in the environment, the global nature of the challenges, and our current ability to identify long-term environmental trends rather than forecast specific hazard events. In recent years these challenges have spurred increased concern and action over the potential loss of heritage resources on an international level. Staying apprised of projections for the specific climate changes for your region and advances in the preservation field in resilience will support informed and integrated planning for all community assets.

In the United States, agencies such as the Department of Defense (DOD) and the National Park Service, among others, have focused efforts for resilience planning on properties under their stewardship. These efforts frequently include historic properties and may include valuable “lessons learned” for your community when faced with similar projections for climate change.

One example of such planning guidance is the *Coastal Adaptation Strategies Handbook* published by NPS in 2016 to provide managers, partners, and other practitioners in the national park system with guidance in exploring and implementing climate change adaptation strategies for more than 120 parks vulnerable to sea level change, saltwater intrusion, ocean acidification, coastal storm events, and changing annual temperature and precipitation ranges. The handbook summarizes the Park Service’s approach to policy and planning and includes important data on the success of the agency’s resilience approach during Superstorm Sandy. For the *Handbook*, see <https://www.nps.gov/subjects/climatechange/coastalhandbook.htm>.

A compilation of case studies, *Coastal Adaptation Strategies: Case Studies* (NPS 99/129700), serves as an addendum to the handbook and provides specific vulnerability analyses for 24 examples of NPS properties ranging from naturalized environments and archaeological assets, to cultural environments and structures. See <https://www.nps.gov/subjects/climatechange/upload/2015-11-25-FINAL-CAS-Case-Studies-LoRes.pdf>. The professional literature, number of case studies, and number of resilience plans integrating historic preservation with resilience planning is growing exponentially. An understanding of projected changes to your community, comprehensive data on local historic resources, and analysis of their vulnerabilities will increase your community’s ability to identify parallel issues and draw planning solutions from work in the field to date in a cost-effective and meaningful manner.





Laurel Beach Casino in Milford (1929, NR) is associated with coastal Connecticut's recreational history. Credit: R. Christopher Goodwin & Associates, Inc.

B. During Disaster: WITHSTAND

Key steps in withstanding disasters are:

- Implement hazard mitigation measures while considering historic preservation.
- Maintain historic properties, reach out to owners of privately-owned historic resources, coordinate outreach with SHPO.
- Develop, in conjunction with local departments of public works, assessments of public property vulnerabilities, and corrective actions.
- Develop resiliency measures for historic properties.

Historic properties frequently are located in coastal and riverine areas related to prehistoric and historic settlement patterns. These places often are the most threatened by natural hazards. The next step toward integrating historic preservation in resilience planning is identifying measures to increase the probability that these resources can withstand the effects of severe weather and storm events and to incorporate those measures into community plans. This process involves implementing hazard mitigation measures and carrying out emergency operations and response protocols in ways that ensure consideration of historic preservation. **Successful preservation during and after a natural disaster requires cooperation between and across emergency response personnel and departments.** Mitigation projects also are accomplished during this phase to support sites to withstand future hazards. Planning for this phase in disaster mitigation is key, and a part of that process should be ensuring that historic resources are included in emergency response plans.

More on Withstand Phase

Appendix II-B is a table of resources, actions, agencies, and funding sources relevant to various actions during the Withstand phase.

Get Certified

Municipalities can strengthen their preservation efforts by taking part in the Certified Local Government program. (Fifty towns in Connecticut already have.) Interested in becoming a CLG? See https://portal.ct.gov/DECD/Content/Historic-Preservation/01_Programs_Services/Municipal-Programs/Certified-Local-Government-Program.

Many of the most effective measures for historic properties to withstand natural hazards are at the discretion of private owners. These include regular cyclical maintenance and interventions specific to the condition and siting of the resource. Public outreach through municipal planning agencies, the SHPO and its statutory partners, and local historical societies can help inform owners of the threats facing their historic properties. The location of hazard zones, historic resource vulnerability, and corrective action consistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties should be considered in the development of outreach programs for the owners of affected resources. The SHPO is the source of technical assistance and guidance on standards and approaches to interventions on historic properties that safeguard the significance and integrity of the resource while addressing resource vulnerabilities.

Municipal planners may be more directly involved in developing measures to enhance a historic resource's ability to withstand natural hazards in cases involving public property. These resources may include public buildings, designed landscapes such as town greens, cemeteries, parks, statues, and streetscapes. Coordination with the Building Official or the Department of Public Works should be considered to establish an ongoing program to assess resource vulnerability and to take corrective action based in solutions consistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties. The baseline data compiled in the first step of this planning framework will inform the development of cyclical inspections and intervention to diminish resource vulnerability.

Integration of historic preservation in resilience planning calls for the inclusion of heritage resources among those community assets worthy of protection. Communication and collaboration among municipal departments, the community, and between levels of government is critical. Projects to harden and/or modify infrastructure as deterrents to hazard damage should be designed to enhance the ability of historic resources to withstand hazards while retaining their historic integrity. Construction of "hard" community improvements, such as seawalls and enhanced drainage systems that are designed to protect areas from inundation, should include historic resources within the protection area, when at all possible. It should be noted that such projects may require SHPO review under Section 106 of the NHPA, depending on federal involvement. Federal agencies must consider the effects of federally funded, licensed, or permitted undertakings upon historic properties and afford the Advisory Council on Historic Preservation the opportunity to comment. The SHPO is the primary contact for consultation under the Section 106 process, and local governments are invited to participate as consulting parties in the process.

BEST PRACTICE: Hard Shoreline Protection and Impacts to Historic Properties

The design of shoreline protections where historic properties are directly or indirectly affected should, when possible, emphasize retention of the character-defining elements of the historic resources. Additions to historic properties and new construction in their immediate vicinity should be compatible in scale, mass, proportion, and materials while achieving the engineering objectives of the project. This added layer of design attention will assure the full consideration of local heritage values and encourage innovative engineering solutions responsive to the community.

Coastal sites are particularly vulnerable to current and future hazards and may be, or have been, subject to mitigation measures such as seawalls, jetties, and bulkheads. Such “hard” shoreline protections can diminish the historic character of a resource and in general have negative environmental effects: Impermeable barriers can push water elsewhere, worsening flood risks in places without barriers. To avoid such impacts, the Connecticut Department of Energy & Environmental Protection (DEEP) has discouraged the use of hard barriers. In some circumstances, however, “soft” solutions, such as living shorelines, reforestation, and wetland restoration, may not be possible. Installation of hard barriers may have direct adverse effects to historic properties.

Fort Trumbull in New London, a site that played a significant role in Connecticut history since the Revolutionary War, demonstrates these limitations. After Fort Trumbull’s Revolutionary War destruction, it was reconstructed, continuing its military use through the early twentieth century. At some point, armament (rip-rap) was placed along its shoreline. The rip-rap does not appear in an 1870s oil painting, which depicts the fort in a bucolic setting, nor is it mentioned in the short 1972 National Register nomination. The rip-rap could have been added during twentieth century alterations to the fort, or after 1970, when it became a state park. Changing shoreline protection from hard to soft could impact the historical integrity of a structure and have implications for its National Register status. Detailed historical documentation is important.

These changes and Fort Trumbull’s evolving role in our nation’s and Connecticut’s history are well documented through historical information, photos, and narration, much of which is available onsite in the visitor center. (Fort Trumbull, which is listed in the National Register of Historic Places, is a state park managed by DEEP.) Maintaining narrative and visual documentation collections such as paintings, photographs, artifacts, as sites evolve can help interpret their historical relevance and character. As historic properties are reviewed for short- and long-term risks, changes to the structures and landscape over time may become part of the properties’ historic significance and achieve importance over time.



*Modern view of Fort Trumbull and its shoreline armament.
Credit: CT DEEP.*



View of Fort Trumbull, ca. 1870–75, by General Seth Eastman. The painting is displayed at the U.S. Capitol.



Steel House at Connecticut College, New London (1933, NR). Credit: Douglas Royalty.

Recovery after Disaster

More details concerning ways to coordinate responses after a disaster can be found in Appendix II-C, "Best Practices Post-Disaster: RECOVER."

C. Post-Disaster: RECOVER

Key steps in recovering from disasters should:

- Consider local ordinances or policies to single out historic structures or districts for special post-disaster treatment, including demolition stays and rehabilitation guidelines.
- Identify historic properties affected by the disaster.
- Coordinate demolition proposals with historic preservation officials at local, state, and federal levels.
- Coordinate with SHPO to seek funding for restoration of publicly and privately-owned historic properties.

The period of recovery following a disaster is critical to historic resource preservation. As property owners struggle to repair and rebuild, they may make mistakes that adversely affect the historic character of a resource. Post-disaster, a property owner may review damages and decide that preservation is not financially or physically feasible, and then opt to demolish the resource. The processes of debris removal and storage, property condemnation and demolition, and other recovery efforts may destroy or diminish historic resources. Historic resource-resilient recovery requires communication and education. Sometimes, it means convincing property owners that preserving historic features is worthwhile.

Measures that may speed disaster recovery while protecting historic resources fall into three broad categories: regulations, communication, and funding. Ordinances may be passed establishing a path for property owners to preserve their structures proactively by, for example, exempting them from floodplain building guidelines (as may be done for historic districts in their entirety). In addition, regulations specifying what may be done to historic structures to mitigate impacts speeds recovery for less damaged buildings. After a disaster, allowing or extending demolition delays could give municipalities and property owners time to assess whether and how historic resources may be saved despite significant damage.

Communication and consultation are critical to communities as they recover from disasters. Town officials in charge of historic preservation should consult with local emergency management and planning departments before disasters. Emergency response personnel therefore can coordinate actions with preservation officials and community members and minimize impacts to historic properties. The SHPO is the designated authority on treatment of historic resources; it is critical that citizens and governments consult with that office to seek expertise and approval.

Funding is key to recovery. Post-disaster funding for repairs to disaster-struck properties, including historic properties, may be available from FEMA, HUD, NPS, or other federal agencies (often via state-administered programs such as the SHPO's Hurricane Sandy grant program). Although historic preservation requirements vary depending on the funder, formal designations as historic properties can be critical for grant applicants. National Park Service funds, for example, are available only for National Register-listed properties or those properties determined eligible for the NR. On the other hand, federally funded recovery projects without such requirements may cause adverse effects to historic resources that require mitigation.

Other potential funding sources for property owners may include low-interest government loans, such as those from the U.S. Small Business Administration, nonprofit charitable organizations, and private foundations such as the 1772 Foundation, which offers grants for historic property owners in Connecticut in partnership with the Connecticut Trust for Historic Preservation. For advice on how to perform repairs while maintaining a structure's historic integrity, consult with the SHPO's office.

Communities that have identified their historic resources, recognized significant properties through local, state, and national designations; executed measures such as those discussed above to support the ability of resources to withstand natural hazards; and integrated historic preservation into planning documents are well positioned to access and to address damage to their historic resource base after a disaster. Data on the historic significance and pre-event integrity of a resource can be used in identifying hazard-related damage and to prioritize work toward the recovery of resources valued by the community. Previously compiled data on historic properties will streamline assistance applications, facilitate communications and technical assistance from the SHPO, and serve as a community resource in private historic preservation recovery efforts.

Finding Recovery Funding



The Barnum Museum under repair after storm damages, 2016. Credit: Carol M. Highsmith/Library of Congress.

Funds for the repair and rehabilitation of storm-ravaged historic properties may be available from a variety of sources. After the NRHP-listed Barnum Museum in Bridgeport was damaged by a 2010 tornado as well as Hurricane Irene and Superstorm Sandy, state, local, and private grants helped fund restoration work at the museum. For more on recovery funding options, see "Selected Historic Preservation Contacts" at the end of this document.

Emergency Response Is Local

It is important to remember that responses to disasters are typically managed at the local level. Local management of emergencies as it relates to historic preservation includes identifying compromised structures and removing debris. Although not the first priority in emergency responses, responding to historic preservation needs can take place during recovery.

Other ways to streamline recovery are to create an expedited review process, take historic properties into account within debris management plans, and, in the review process after a flood or other disaster, seek assistance from previously identified preservation partners. Expedited review processes for historic properties, when properly prepared before a disaster, can be quickly approved and allow stabilization or minor repairs to take place without hearings before a historic district commission or historic properties commission. In the same way that pre-planned review processes can expedite repairs, considering preservation in debris management allows historic materials from badly damaged or destroyed properties to be salvaged. What may be lost from one structure may be recycled, and may even help preserve the historic character of another. The appointment of a preservation professional to local emergency response boards would help ensure the proper consideration of historic resources at the appropriate early points during disaster responses.



St. Luke's Chapel in Stamford (1891, NR), now home to a nonprofit organization serving the homeless, was repaired after Superstorm Sandy with historic preservation funds from the SHPO's Hurricane Sandy program. Credit: Douglas Royalty/SHPO.

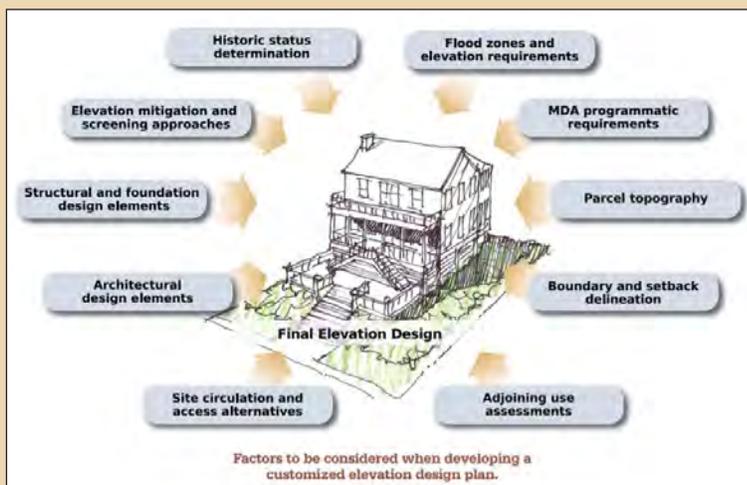
BEST PRACTICE: Building Elevation and Impact on Historic Properties

Many historic resources at risk in Connecticut are residential buildings. Recovery may mean evaluating risk on a case-by-case basis. Property owners need to understand the most appropriate ways to protect a historic resource from current and future risks. Owners of properties at risk of flooding may consider elevating their historic home to protect it, though they should understand that this option may be considered an adverse effect on the historic resource.

The elevation of historic houses within hazard zones is a challenging resilience strategy that balances historic integrity and elevation height requirements. Houses that are individually designated as historic properties or that are located in historic districts are recognized for their historical significance and integrity. Integrity is measured by evaluating the presence of seven aspects: location, setting, design, materials, workmanship, association, and feeling. Elevation has the potential to affect design and feeling and thus the overall historicity of the resource. Elevation often substantially alters the historical relationship of the house and its historic setting and surrounding neighborhood. Elevation also can necessitate major changes to the overall design of a building. In short, from a strict historic preservation perspective, successful elevation projects must result in post-elevation buildings that retain character-defining features and are recognizable from the period of significance. Projects that fail to meet this standard may lose their historic designation.

While the NPS has not issued preservation guidelines for elevation of historic properties, some elevation projects have been approved by NPS, and some states have issued their own guidelines. Approved projects generally involve minor elevation that can be screened so that the resource retains its overall integrity. The elevation of historic properties within a historic district can prove challenging. Properties should not be elevated on a case-by-case basis, as that action affects the integrity of the entire district. NPS has in the past given its approval for such projects when an entire group of buildings was to be raised up.

In the aftermath of Hurricanes Katrina and Rita, the Mississippi Development Authority (MDA) was among the first to develop a methodology for assessing this flood adaptation measure for historic houses in its guide, *Elevation Design Guidelines for Historic Homes in the Mississippi Gulf Coast Region* <https://www.adaptationclearinghouse.org/resources/design-guidelines-and-funding-for-elevating-historic-homes-in-the-mississippi-gulf-coast-region.html>. While much of the Mississippi guidance illustrates this methodology through examples of the region's unique domestic architecture, the approaches developed in this FEMA-funded guidance are adaptable to other areas of the country as evidenced by their reference by SHPOs nationwide. This guidance presents the factors to consider minimizing the impact of elevation on historic designs, which are universal in their application.



Credit: Mississippi Development Authority, *Elevation Design Guidelines for Historic Homes in the Mississippi Gulf Coast Region*.

the region's unique domestic architecture, the approaches developed in this FEMA-funded guidance are adaptable to other areas of the country as evidenced by their reference by SHPOs nationwide. This guidance presents the factors to consider minimizing the impact of elevation on historic designs, which are universal in their application.

The Mississippi guide was published following the destruction of significant numbers of historic properties. Given the flood depths in the hazard areas where resources are located, the guide presents elevation in place as a viable method of protection for surviving dwellings.

Any decision to elevate a historic building should be made after thorough planning and analysis. Although returning a building to its pre-disaster level of integrity while elevating it to the required height may not be feasible—and can lead to de-listing of the property from historic registers—retaining as many historic design features as possible should be considered. Standardized elevation approaches may not prove satisfactory, regardless of the post-project historic status. Analyze historic resource inventory data to define the historic relationship between the house and its setting. Consider the building’s location and setbacks, site circulation, and historic landscape materials. The design of the original foundation and design of the body of the house should be considered as well as original character-defining features such as porches and exterior chimneys. Retain original site circulation patterns when possible. Consider elevation screening materials that are compatible with historic building materials. Use landscaping to further mitigate scale and to screen views through the new “clear” story. Use the design of historic porches to inspire new elements that are similar in character and materials that can visually tie the building to the ground.



Credit: Mississippi Development Authority, *Elevation Design Guidelines for Historic Homes in the Mississippi Gulf Coast Region*.

Elevation changes the character and design of a building substantially. Homeowners often must evaluate the impacts of those changes during the traumatic and economically challenging days of a community’s recovery. Elevation guidelines can help provide direction, as shown in the figure above, for elevation projects of different heights and for context-sensitive landscape, foundation, and stair design to protect structures and to complement the historic nature of the buildings. The historic resources data compiled by municipal planners for resilience planning can serve as a valuable resource in assessing those impacts. The SHPO is a source for technical assistance in this process. Such assistance will include the most current guidance from the Secretary of the Interior on the treatment of historic properties.

BEST PRACTICE: Historic Resources, Flood Hazard Requirements, and Variances

During the disaster recovery period, property owners may choose to make structures more resilient, or they may be obligated to do so via substantial damage or substantial improvement regulations. There are essential elements to consider while navigating the recovery of historic properties in a post-disaster environment. Historic preservation (retaining character-defining features) and hazard adaptation (structural alterations to a resource to prevent risk from future hazards) often are considered mutually exclusive, but accommodations may be possible. Successful historic preservation often is driven by the intent of the property owner. It is essential to provide homeowners of historic properties with recovery tools that will help put them on a preservation-friendly recovery path.

The National Flood Insurance Program (NFIP) provides some relief for historic structures in 44 Code of Federal Regulations (CFR) 59.1. These regulations allow municipalities to exempt designated historic structures from the standard “substantial damage” and “substantial improvement” requirements that would apply to other structures in the SFHA. Model language is provided in FEMA’s technical guide, *Floodplain Management Bulletin on Historic Structures* (FEMA P-467-2). The 44 CFR 60.6(a) also allows municipalities to issue variances of floodplain management ordinances for repair and rehabilitation of designated historic structures. Local municipalities, historic preservation groups, and property owners will need to evaluate benefits and costs to alternative approaches to maintain historic integrity and to ensure a property’s durability and longevity by mitigating against future risks. Mitigation measures that do not diminish historic character but that achieve mitigation goals can be as simple as elevating mechanical and utility equipment.

Recent policy updates to the NFIP may result in significant insurance ramifications such as higher annual premiums and ineligibility for future Increased Cost of Compliance (ICC) mitigation funds for structures that are granted variances from local ordinances on floodplain hazard reduction, regardless of historic status. Historic property owners should check with flood policy insurers to determine pricing impacts prior to starting any work. Certain mitigation funding sources prioritize historic preservation, such as federal funds that require Section 106 of the NHPA review, which mandates consideration of undertakings’ effects on historic properties. Likewise, state mitigation funding requires SHPO review for properties over 50 years of age and those in close proximity to archaeological resources.

Help for Historic Property Owners

The SHPO has developed two guidebooks on resiliency planning in addition to this guide for planners. One, concerning resiliency planning is titled Historic Preservation and Resiliency Planning in Connecticut. The other, aimed at owners of historic properties, is titled Resilient Stewardship: Maintaining Your Historic Property in an Era of Climate Change. These documents are available at the SHPO’s website.

BEST PRACTICE: Historic District Overlay Zones and Village Districts



In areas where historic resources are grouped together in high-risk areas or are subject to a significant hazard, a Historic District Overlay Zone (CGS 7-147a-147k) or a Village District (CGS 8-2j) may provide alternatives for mitigation measures that provide architecturally consistent responses to protecting structures in the long term. Applications for certain exterior alterations to properties in a historic district overlay zone are reviewed for a Certificate of Appropriateness by a Historic District Commission. Project applications in Village Districts are reviewed by zoning commissions that employ a Village District Consultant to ensure that modifications to structures are consistent with and appropriate under village district guidelines. Village district regulations are flexible aesthetic regulations that may differ from the Secretary of the Interior's Standards for the Treatment of Historic Properties. Both the historic district overlay zone and the village district require review of exterior modifications to structures that could include elevation projects and other dry or wet floodproofing efforts; such efforts should be appropriate to the historic character of the neighborhoods or historic areas where resources are located.

Morris Cove Historic District, New Haven (NR), has more than 300 contributing buildings representing architectural styles from the late nineteenth to the mid-twentieth centuries. Its location on Long Island Sound makes it vulnerable to storms and rising sea levels. Credit: R. Christopher Goodwin & Associates, Inc.

Historically appropriate design guidelines should be a goal for Historic District Overlay Zones or Village Districts that are located predominantly in FEMA flood zones. Once adopted as an appendix or as part of the zoning regulations, such overlays can provide design guidelines for structures that complement the historic nature communities to determine whether local district designation can provide the combination of aesthetic oversight capacity and consistent application of mitigation measures to ensure that the sense of place is maintained in these special areas. Local districts provide an additional layer of review for either alternative, but an adoption of design guidelines for mitigation measures will provide clarity for property owners who seek to move forward to protect their historic resources.

ENTRANCES AND PORCHES

<p>RECOMMENDED</p> <ul style="list-style-type: none"> ■ Retain and repair porches. ■ Replace missing porch features. ■ If necessary to enclose porches, enclose behind columns and railings and use divided glass to fill the original open area. 	<p>NOT RECOMMENDED</p> <ul style="list-style-type: none"> ■ Applying inappropriate new materials ■ Enclosing open porch areas that were not originally enclosed, creating an opaque façade 	<p>NOT RECOMMENDED</p> <ul style="list-style-type: none"> ■ Removing porches and not replacing them.
---	---	--



APPROPRIATE PORCH ENCLOSURE (TREMONT STREET)



INAPPROPRIATE NEW MATERIALS

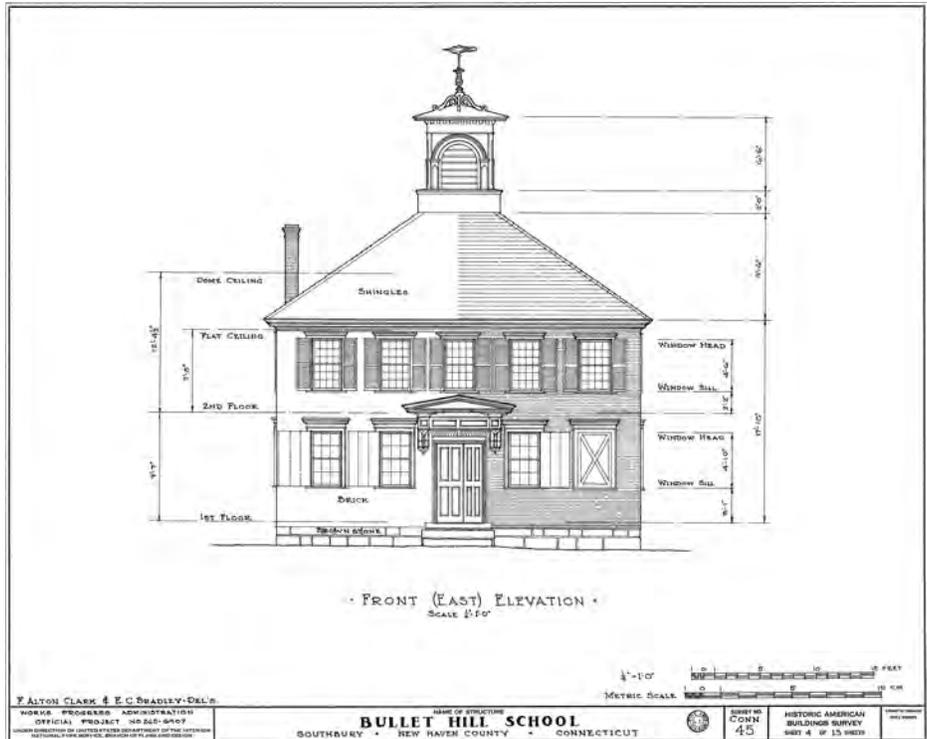


PORCH ROOF REMOVED AND NOT REPLACED.

Municipal guidelines for the treatment of historic properties should be consistent with the Secretary of the Interior's Standards while identifying and addressing local building types and characteristics. The City Hartford's guidelines uses photos and sketches to clearly illustrate do's and don'ts. See http://www.hartford.gov/images/DDS_Files/Plan_Zoning/Commissions/Historic_Comm/hist_guidelines.pdf.

HDC Handbook

The Connecticut Trust for Historic Preservation has developed a handbook for Historic District Commissions and Historic Property Commissions covering everything from how to establish a local historic district to how to be an effective commission. Go to <http://lhdct.org/documents/Handbook%20for%20Historic%20District%20Commissions%20in%20CT.pdf>.



Bullet Hill School in Southbury (1762, NR) is a “living museum” that interprets Connecticut’s educational history. Credit: Historic American Buildings Survey/Library of Congress.

Land Use Planning and Flood Control



Construction of an oyster reef in Delaware Bay. Credit: U.S. Fish and Wildlife Service.

More states and municipalities are turning to “living shorelines” for coastal resiliency. For details on Delaware’s program, see <http://dspace.udel.edu/bitstream/handle/19716/18434/creating-flood-ready-communities.pdf?sequence=1&isAllowed=y>.

D. Future Disaster: ADAPT

Key steps in recovering from disasters are:

- Consult with stakeholders to prioritize historic resources early in the adapt phase.
- Coordinate with regional and state agencies on adaptation planning and project implementation.
- Strengthen monitoring and maintenance of historic assets to inform adaptation strategies.
- Identify adaptation options for historic properties, and call out those that best preserve properties’ historic integrity.

The final element of a resilient preservation approach is adaptation to a changing climate and increased hazard risks. Climate scientists’ projections indicate that climate change is a progressive phenomenon; many communities will likely face multiple Prepare-Withstand-Recover-Adapt cycles. To date, reactive efforts have been emphasized by the Withstand and Recover segments of the planning cycle as storm events necessitated immediate action. It is anticipated that proactive activities in the Prepare and Adapt phases will accelerate to meet the challenges of climate change. Our arsenal of adaptation options is likely to expand through innovative design and engineering strategies.

Adaptation to climate change can take different forms, from management strategies on a macro level to treatment plans for individual (or groups of) buildings on a micro scale. In between those levels, it is possible to adapt via land-use changes or landscape designs. Aside from strategies discussed earlier in this guide, there are other ways to think about coping with hazards with a long-term viewpoint. From a management perspective, the USGS has gathered numerous studies about the impact of various large, destructive storms over, mainly, the past decade, including “Hurricane” Sandy (<https://www.usgs.gov/hurricane-sandy-themes/coastal-elevation-data-and-mapping>). Many states, private organizations, and international governments and non-governmental organizations interest themselves in the management topic. Finally, some federal agencies offer not just information, like USGS, but also special types of training. NASA, for example, has developed a remote sensing course for disaster management (<https://disasters.nasa.gov/training>).

Land-use and landscape planning, in turn, must mitigate increased severity and greater frequency of coastal storms, answering the basic question of where to put excess water. In such planning, the significance of the many—for instance, historic districts—may prevail over the importance of the few, such as, perhaps, outlying historic structures, sites, and landscapes. Land use may also change in the face of adaptation. When scores of seasonal beach cottages were destroyed by the New England hurricane in 1938, some stretches of coastal land were adapted for new uses. After 1938, many cottages were not rebuilt, and state and local governments purchased some lands to create parks and open space that are now buffers to storm- and sea level rise-driven higher water levels.

Creation of water-absorbing or -diverting landscape features is also a part of building adaptation. These need not be on a municipal scale; individual property owners and/or districts can build swales to slow down water in channels; can develop retention ponds; and can plant native species that thrive in wetter, even brackish, conditions, and aid in soil retention within channels, banks, and ponds. Installation of green roofs is another means of water (and heat) absorption, but, like structure elevation, this may alter the historic integrity of a building. (See <https://www.nps.gov/tps/sustainability/new-technology/green-roofs.htm> for NPS advice on green roof installations.) Further lessons might be learned from foreign efforts: After a disastrous 2007 flood, Britain’s government published a study recommending things like penetrable surfaces, water storage features, and rainwater harvest systems, among other ideas. The city of Nijmegen, in the Netherlands, is going to great lengths to live better with the River Waal after the realization that the long tradition of dikes and levees was both not working and worsening the flooding problem. The city’s substantial archaeological and historical heritage have become focal points in reimagined urban landscapes. Both the Nijmegen (Room for the River Waal) and UK (Planning Policy Statement 25) reports are abstracted in the annotated bibliography.

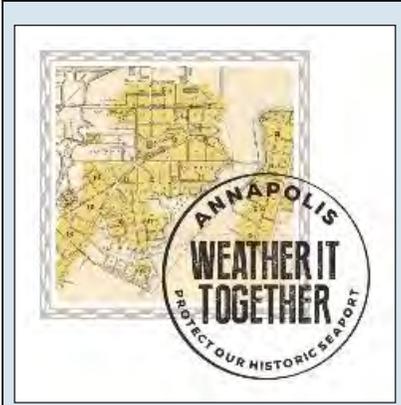
There are other ways that communities, planners, state agencies, and citizens involved in historic preservation should prepare for climate change effects on tangible elements of Connecticut’s history. As with any such preparation, risks

Monitoring Climate Change Impacts to Buildings



A climate monitoring panel installed in a historic Norwegian building. Credit: Haugen et al. 2018.

Monitoring the impacts of climate change on historic buildings and their component materials is critical. Haugen et al.’s methodology (2018), initially applied in Norway, offers a model that is widely adaptable to other places and climates. For the article, see <https://doi.org/10.3390/geosciences8100370>.



Weathering it Together In Annapolis

Maryland's capital city, which is already experiencing the effects of climate change, has a large number of historic resources to protect. Funding for the city's Cultural Resource Hazard Mitigation Plan was obtained from state and federal agencies. With those funds, the city developed a FEMA-recommended plan, although the guiding efforts were very much local. The full document is at <https://www.annapolis.gov/DocumentCenter/View/10064/Consolidated-CRHMP-Report-April-2018>.

must be determined first. To manage such risks, it will be necessary to monitor, or be able to quickly reference, monitoring studies already accomplished, to determine the effects of climate change on building materials, methods, and features. Features to monitor and questions to ask include: What are the building's materials? What is the building's maximum load for wind resistance, average temperature, or seasonal temperature swings? How do changes from fresh to brackish water surroundings, let alone more frequent floods, affect materials, given the destructive effects of water in general, and salt-/brackish-water incursions in specific?

At a resource-specific level, much of this will occur as part of the hazard recovery phase. Structural and site treatments will include building retrofits and upgrades to hazard mitigation structures, such as improvements to seawalls. They may also include landscape or urban design adaptation measures, with elevated roadways being an additional possibility aside from the aforementioned water mitigation measures. Additional actions include updating planning documents to account for observed shortcomings during the previous event, developing planning documents such as coastal resilience plans, and incorporating climate change and sea level rise into plans, ordinances, and regulations.

It is critical to identify the range of adaptation options for historic resources, from floodproofing to energy-efficiency measures—even relocating the resource—to prioritize those measures that best retain the resource's historic integrity. For example, building high seawalls may, in some places, protect historic resources, but such barriers can significantly alter the viewscape from resources that historically were closely connected to the sea, whether for pleasure or livelihood. Offshore barriers such as artificial reefs, marshlands, living dunes and shorelines, or some combination of these, may be better choices.

Given the potential for progressively more hazardous effects of climate change, planners and the public may need to recognize that not all historic resources can be protected. Note that this elevates the importance of documentation, since it may be the only available preservation measure for some vulnerable properties. Resources should be focused on properties designated historic after careful study as well as on resources likely to be designated historic in the future. This requires a proactive approach to evaluation, as discussed in the Prepare segment above. It also requires identification of climate change-related impacts to properties that are particularly vulnerable. Determining those risks will inform the kinds and amounts of preparation needed for particular resources. It is essential to involve the widest possible range of local stakeholders in the prioritization of resources. In Annapolis, Maryland, the *Weather It Together* plan was a direct response to the Governor's Commission on Climate Change, which authored the *Maryland Climate Action Plan* in 2008. The first draft of the city's plan was distributed in 2013; it was finalized in 2018 (<https://www.annapolis.gov/885/Weather-It-Together>). The plan informed city residents and businesses about local historic resources and their vulnerabilities, sought stakeholders' input on prioritizing resources, and received wide buy-in for the city's hazard mitigation plan for historic resources.

Planners at all levels of government should consider adaptation while deciding on broad suites of policies. Conservation and hazard mitigation are discussed in this guide as they relate to preparing, withstanding, and recovering from climate change effects. Although governments more regularly handle planning in development contexts, historic preservation is part of that conversation. Together, development, preservation, and hazard planning form a strong triad. These planning objectives can guide communities to achieve a balance between the economic advantages of preservation, development goals, and hazard-planning needs.

Adaptation also requires coordination, similar to the recovery process. While the same types of governmental bodies are involved in the Prepare and Recover stages, the emphasis here is on preparation informed by climate change impact studies. The goal is for municipal departments, with impact study statements in hand, to preemptively build relationships between relevant government levels and communities (for advice and sharing of resources). Municipal officials who manage historic resources should network with conservation departments and floodplain managers, as well as with emergency personnel and public works officials. Meanwhile, planning and zoning commissions should be aware of historic preservation exemptions (see Section V-C, Recover), historic district overlays, and ways to adapt historic structures to various threats.

On a statewide level, the Connecticut Institute for Resilience & Climate Adaptation (CIRCA) is developing a “resilience road map” in coordination with state agencies, regional councils of governments, and municipalities. CIRCA’s Resilient Connecticut program, for example, ties resilient adaptation planning to economic development (in particular, transit-oriented development) in “corridors of resilience” meant to protect critical infrastructure and promote resilient communities (<https://resilientconnecticut.uconn.edu/>). Meanwhile, Connecticut’s quasi-public Green Bank helps communities, individuals, and property owners invest in clean energy (<https://www.ctgreenbank.com/>). The bank, created by the General Assembly in 2011, is funded in part by public funds that in turn attract a much larger amount of private investment monies for the purpose.

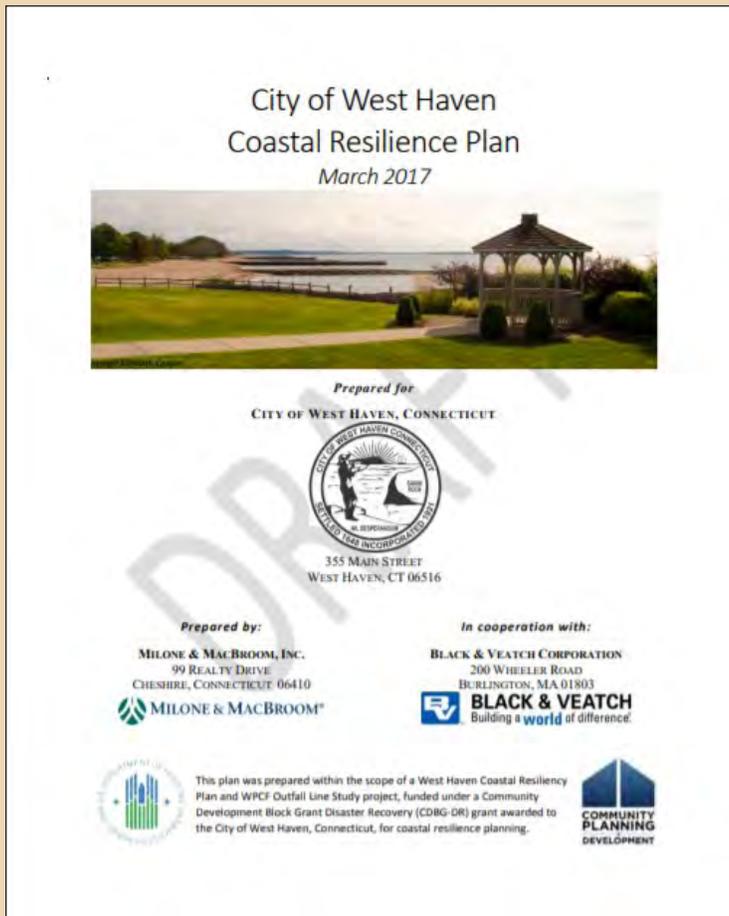
Another facet of adaptation is education. To coordinate official efforts and to build historic resource resilience into planning, local governments should reach out to residents who are invested in the preservation of historic properties. Municipal staff should be informed about the types and locations of such resources within their jurisdiction, while owners of historic properties should be made aware of planning efforts and incentives to preserve their properties in the face of various hazards. Above all, planners and building officials must be educated in ways to identify historic buildings (evaluating their significance and integrity). Without these efforts, historic resources are less recognizable and more difficult to account for during planning.

Resilient Connecticut



CIRCA’s Resilient Connecticut program, funded by a grant from HUD’s National Disaster Resilience Competition, will offer planning tools, technical analysis, and field research to help the state develop climate adaptation policies. See <https://resilientconnecticut.uconn.edu/>.

BEST PRACTICE: West Haven Coastal Resilience Plan



Coastal resilience plans (CRPs) aim to address the current and future social, economic, and ecological resilience of a municipality in response to the anticipated effects of sea level rise and of anticipated increases in the frequency and severity of storm surge, coastal flooding, and erosion. Although not currently required by state or federal laws, CRPs are being prepared voluntarily by forward-thinking communities as tools to consolidate disparate planning, development, and regulatory efforts that relate to coastal resilience, and to focus future investments in resilience. Coastal Resilience Plans also can establish *Future Hazard Zone* overlays based on climate change projections, as well as implement flood- (or other hazard) protective regulations from a locally driven focus. Such plans can and should identify and discuss historic properties at risk.

West Haven’s CRP, for example, explicitly considers the effect of hazards on historic properties. The evaluated methods of adaptation consider mitigation methods and their appropriateness in various scenarios. Their report notes that none of the town’s approximately

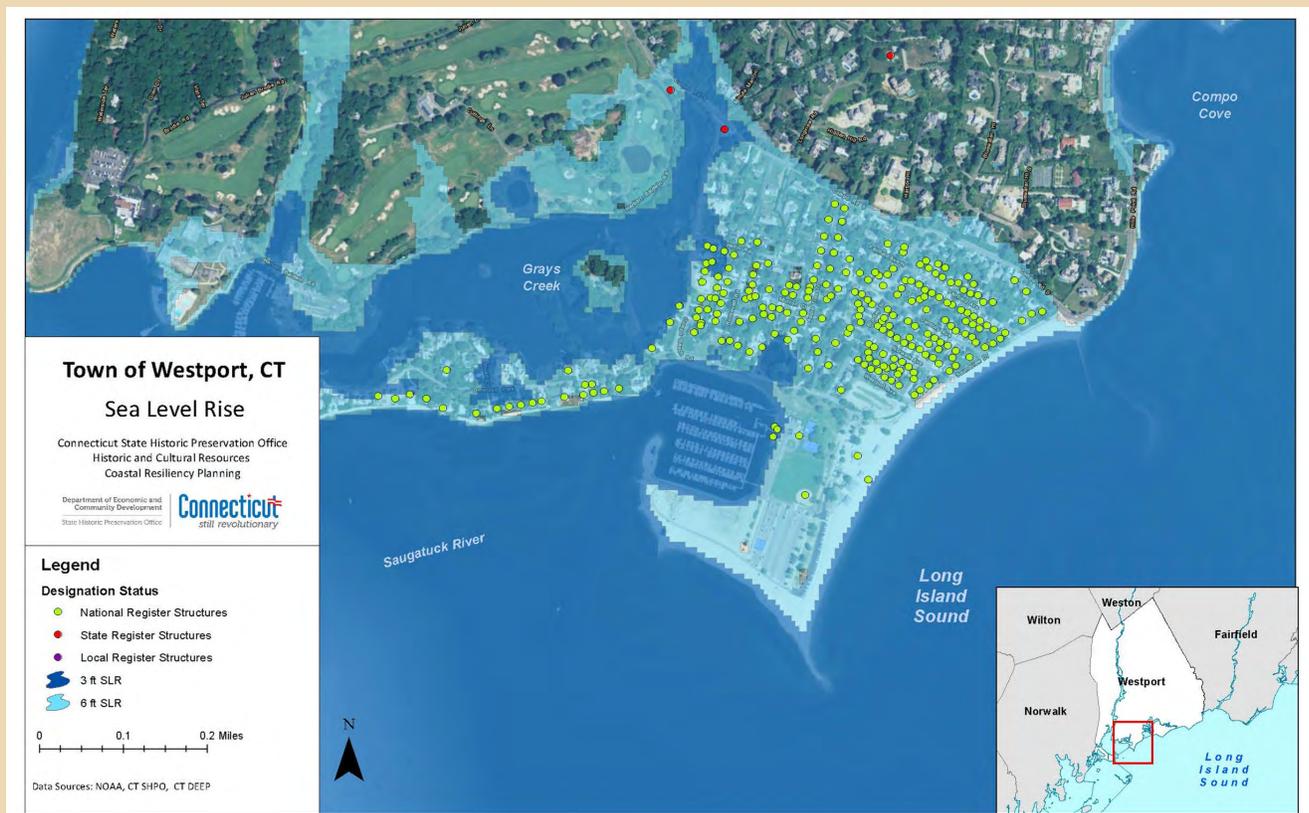
900 locally significant historic sites, is listed on any historic register, a clear impediment to their preservation. The document therefore recommends “historic survey” to identify resources at risk.

Connecticut towns with Coastal Resilience Plans include Branford, Guilford, Madison, Milford, Old Saybrook, Stonington, Stratford, and West Haven. Most of these plans are hosted on their town websites; they can inform how to proceed with your own resilience plan or study to better inform your Natural Hazard Mitigation Plan.

BEST PRACTICE: Sea Level Rise Analysis

Sea level rise is a significant hazard that will continue to affect historic resources into the foreseeable future. The GIS data prepared as part of the SHPO's post-Sandy recovery efforts can be used to review future impacts to historic resources by adding sea level rise layers such as in the example shown for the Town of Westport (below), with the three-foot sea level rise depicted in darker blue and the six-foot rise in lighter blue. Although the planning horizon for sea level rise is uncertain, the National Oceanic and Atmospheric Administration (NOAA) has averaged annual Long Island Sound sea level rise over the last 30 years to calculate a rate equal to about 2.8 millimeters per year based on historic tide gauge data measurements (<https://tidesandcurrents.noaa.gov/sltrends/sltrends.html>). CIRCA has also projected sea level rise rates for the state. It has calculated a rise of up to 50 cm higher than the current Long Island tidal datum level by 2050. It is likely to continue its rise after 2050 (<https://circa.uconn.edu/>).

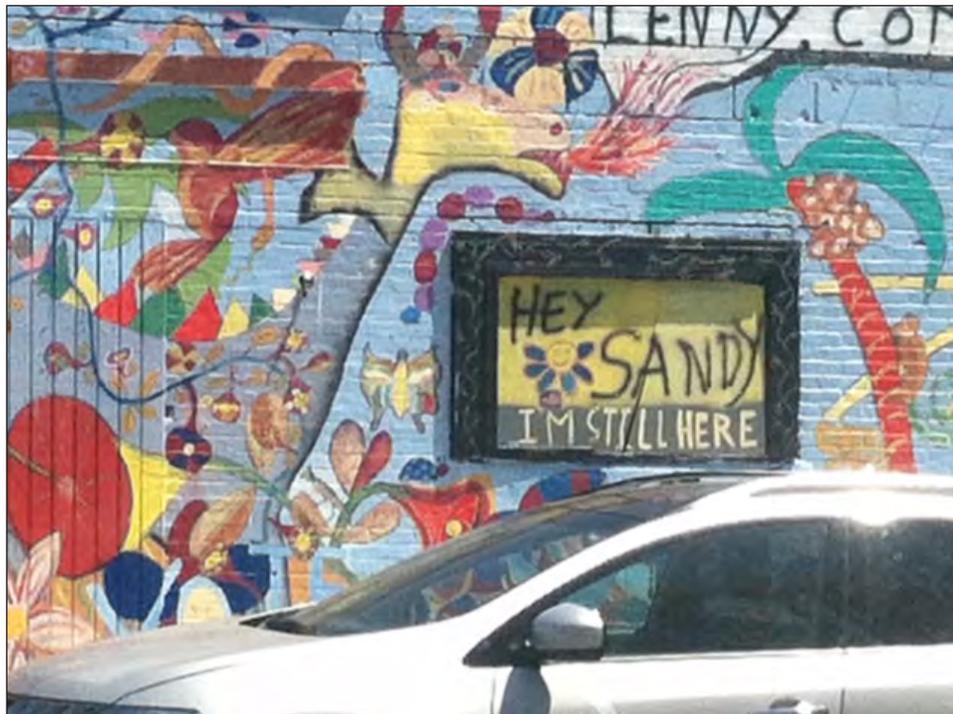
Visual tools such as the map below should help town officials articulate impacts to their constituents and help identify and design potential flood mitigation strategies. The mapping not only shows properties at risk; it also can be used to identify vulnerable access points in neighborhoods where roads have the potential for inundation from future sea level rise, which may limit evacuation and emergency access. When aerial photography is brought into the GIS, the image becomes an even more powerful tool, especially for members of the public.



Planners and preservationists can use GIS maps that project hazards in relation to historic resources, as here in Westport, to provide data for discussions about mitigation and adaptation options. Credit: NOAA data; map by Dewberry/R. Christopher Goodwin & Associates, Inc.

SAFR (State Agencies Fostering Resilience)

In 2015, then-Governor Dannel P. Malloy established SAFR to create a statewide resilience “road map.” Among its members are the state Department of Housing and CIRCA, the state’s Institute for Resilience and Climate Adaptation, which are lead agencies in resiliency planning and development projects under way as part of the National Disaster Resilience Competition. See <https://circa.uconn.edu/projects/safr-ndrc/>.



Superstorm Sandy changed the way emergency managers and other government officials viewed the vulnerability of Connecticut’s coastline. Credit: Laura Mancuso/SHPO.

CONCLUSION

Connecticut is a small state, but one rich in history and culture. Its communities draw their sense of place from iconic town greens, roads and railroads, scenic shore points, and historic buildings, neighborhoods, and landscapes of all kinds. Connecticut is also a pioneer in historic preservation. Recognizing the importance of its historic and cultural resources, the State established the Connecticut Historical Commission in 1955, more than 11 years before Congress passed the National Historic Preservation Act of 1966. (The CHC became the State Historic Preservation Office after passage of the NHPA.)

Connecticut also has a long history of vulnerability to natural hazards. Notable storms range from the hurricanes of 1936, 1938, and 1955 to the more recent Hurricane Irene and Superstorm Sandy, and from the Blizzard of 1978 to Winter Storm Nemo in 2013. In addition to hurricane winds, flooding, and severe winter weather, the Connecticut State Hazard Mitigation Plan identifies hazards and quantifies risk for wildfires, tornadoes, earthquakes, and other hazards to which Connecticut has been exposed historically.

Connecticut has maintained an active program of natural hazard mitigation since the early 1980s, and numerous state agencies are engaged in the practices of

sustainability and resilience. In partnership with the University of Connecticut, the Department of Energy and Environmental Protection created the Connecticut Institute of Resilience & Climate Adaptation (CIRCA). CIRCA's mission is to "to increase the resilience and sustainability of vulnerable communities along Connecticut's coast and inland waterways to the growing impacts of climate change on the natural, built, and human environment." In addition, Connecticut formed SAFR (State Agencies Fostering Resilience) to develop a resilience plan for combatting climate change.

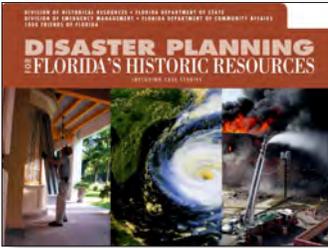
Resilience is the ability of any system (infrastructure, government, business, and resources) to resist, absorb, and recover from or successfully adapt to an adversity. Community Resilience is the ability of a community to prepare for anticipated hazards, adapt to changing conditions, and to withstand and recover rapidly from disruptions. Like many places in the United States, the nexus between historic preservation and resilience has gone largely unrecognized in Connecticut until recently. But both preservation and resilience have a common focus: preserving the quality of life, character, sustainability, functionality, and prosperity of the places where we work, live, and play.

By following the best practices presented in this guide, Connecticut's municipalities will increase the resilience of historic resources by:

- preparing for adversity through understanding risks and vulnerabilities;
- integrating historic resources with resilience planning; and
- educating citizens on actions they can take.

With plans in place, communities will be well positioned to withstand the hazards, to act, and to execute emergency operations protocols and mitigation measures. When the inevitable hazards occur, communities should be prepared to recover more quickly and with less expense by executing thoughtful disaster recovery protocols that include the protection of historic resources; by enforcing design guidelines and requirements when rebuilding; and by communicating and collaborating with partners at all levels of government. Finally, as the climate continues to change, threats will increase, as will the number of historic resources at risk. To adapt, we must plan for climate change, record changes to the conditions of our historic properties, and update and implement our planning documents accordingly. The State Historic Preservation Office (DECD) and other agencies stand ready to assist your preservation planning efforts, and to provide guidance on historic resources in your municipalities. Working together, we can help to assure that the tangible evidence of our shared past can survive for future generations.

SELECTED ANNOTATED REFERENCES AND ADDITIONAL RESOURCES



1000 Friends of Florida

2006 *Disaster Planning for Florida's Historic Resources Including Case Studies.* <http://www.1000friendsofflorida.org/building-better-communities/disaster-planning/>.

2008 *Disaster Mitigation for Historic Structures: Protection Strategies.* Prepared by 1000 Friends of Florida and Florida Department of State, Division of Historical Resources; Florida Division of Emergency Management. <http://www.1000friendsofflorida.org/building-better-communities/disaster-planning/>.

1000 Friends of Florida, a non-profit organization dedicated to building better communities and saving Florida heritage, and The Florida Department of State, Florida Division of Emergency Management cooperated to author these manuals. Both booklets are available from the 1000 Friends website. The publications examine historic resource protection in Florida. The 2006 document comprises case studies for disaster preparedness taking into account historic resources. The 2008 guide gives practical advice on materials, installation techniques, and systems needed to protect historic structures.

Cassar, May

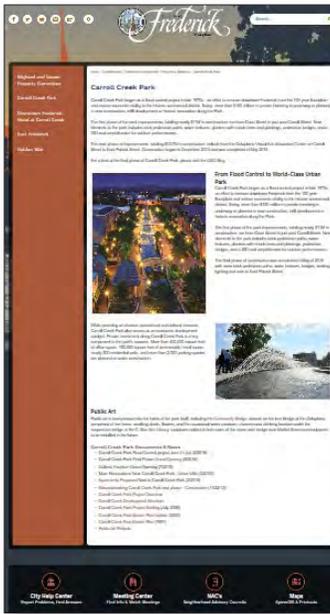
2011 *Impact of Climate Change on Cultural Heritage: From International Policy to Action.* *Conservation Perspectives Spring.* http://www.getty.edu/conservation/publications_resources/newsletters/26_1/impact.html.

Cassar's article is a brief review of methods used to address heritage and climate change. The author argues that physical aspects of a heritage site are inseparable from its cultural and social relevance. Therefore, interdisciplinary action to prepare for climate change effects is necessary. The author focuses on bridge-building between arts (historic preservation) and science (climate change forecasting and mitigation).

Cherry-Farmer, Stephanie L.

2013 *Challenges and Tools for New Jersey's Historic Resources During Hurricane Sandy Recovery: Sustained Revival.* http://gardenstatelegacy.com/files/Sustained_Survival_Cherry-Farmer_GSL19.pdf.

This article documented the-then-not-yet-fully-understood impact of recovery processes on New Jersey's historic resources. Specifically, it describes the response by the New Jersey Historic Preservation Office to Hurricane Sandy, which primarily was a process of surveying neighborhoods. What is revealed here is the extent to which the lack of a pre-hurricane survey was a significant obstacle in determining the severity of storm damage.



The City of Frederick, Maryland
n.d. Carroll Creek Park. <https://www.cityoffrederick.com/169/Carroll-CreekPark>.

Frederick had a problem. Over the course of its history, a creek that flowed through its center, the same one that had powered its mills and factories before and during the Industrial Revolution, flooded the town's core regularly. After a devastating flood in 1972, the city, with financial help from FEMA and the State of Maryland, took action. The creek was routed through town, beneath its original course, within two giant culverts. Above them, creek water still flowed, controlled, in a decorative channel with brick walkways, unique bridges, and artistic installations. The taming of the creek proved to be the town's economic salvation. Eighteenth and nineteenth century buildings were saved, and the historic downtown became a magnet for dining, shopping, and urban life within a historic city core.



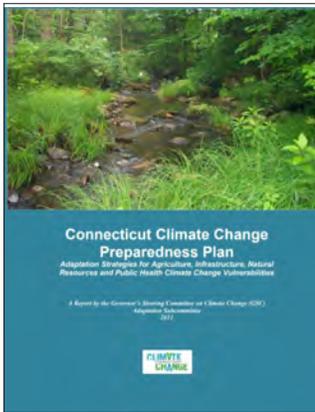
Cocks, Anna Somers
2005/2006 *The Science of Saving Venice*. <https://www.wmf.org/publication/science-saving-venice>.

This open-access publication of the World Monuments Fund highlights the work of this organization in restoring, documenting, and saving global cultural heritage sites. Here, the author discusses the impact on Venice of a terrible flood in 1966, which led to a historic structure survey and long-term plans for saving the city. Venice has been sinking at the rate of 10 cm per century, but in recent decades that rate has quickened due to human-caused environmental changes. The author, the chairman of Venice in Peril, documents her efforts since 1999 to stabilize the city's environment through various means, including hard and soft sea barriers.



Connecticut General Assembly
2018 *S.B. No. 7, Public Act No. 18-82. An Act Concerning Climate Change Planning and Resiliency*. https://www.cga.ct.gov/asp/cgabillstatus/cgabillstatus.asp?selBillType=Public+Act&which_year=2018&bill_num=82.

This act incorporates a greenhouse gas emissions requirement and new sea-level change projections into a variety of state-planning documents. The act also makes a variety of minor changes to the way the DEEP commissioner prepares a comprehensive energy strategy for the state.



Connecticut Department of Energy & Environmental Protection (DEEP)
2011 *Connecticut Climate Change Preparedness Plan: Adaptation Strategies for Agriculture, Infrastructure, Natural Resources and Public Health Climate Change Vulnerabilities.* A Report by the governor's Steering Committee on Climate Change (GSC) Adaptation Subcommittee.
http://www.ct.gov/deep/lib/deep/climatechange/connecticut_climate_preparedness_plan_2011.pdf.

This subcommittee evaluated projected impacts of climate change on the state's infrastructure, natural resources, and population health. Once the projected effects had been assessed, the subcommittee formulated recommendations to mitigate those hazards, focusing on land-use and resource planning. While each of four subcommittees arrived at its own conclusions, all addressed mitigation in a parallel five-step manner: intensify preparedness planning; integrate adaptation into existing planning; update standards; plan for flexibility and monitor change; and protect areas that buffer against changing climatic conditions.



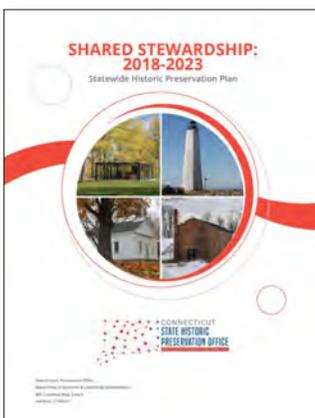
Connecticut Institute for Resiliency and Climate Adaptation (CIRCA)
2017 <http://circa.uconn.edu/sea-level-rise/>.

CIRCA, an institute run by the University of Connecticut, helps enhance resilience to sea-level rise. The institute recommends to state officials that planners follow a maximum sea-level rise scenario (50 cm by 2050, and as much as 200 cm by the end of the century). CIRCA also suggests that such scenarios be revisited at least every 10 years.



Connecticut State Division of Emergency Management and Homeland Security (DEMHS)
n.d. *Planning for All Hazards.* <https://portal.ct.gov/DEMHS/Emergency-Management/Resources-For-Officials/Planning-For-All-Hazards>.

DEMHS conducts all hazards planning at the state level in Connecticut and collects and reviews all locally generated hazard plans. The agency collaborates and coordinates with other statewide initiatives, including developing the Natural Hazard Mitigation Plan, which receives input from all levels of government, including tribal governments.



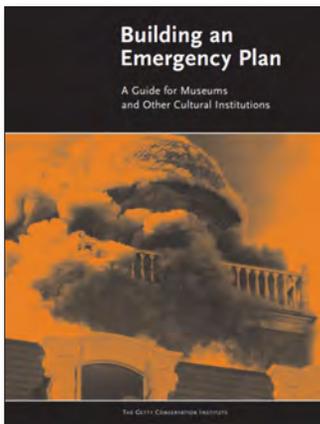
Connecticut State Historic Preservation Office
2018 *Shared Stewardship: 2018-2023 Statewide Historic Preservation Plan.* https://portal.ct.gov/-/media/DECD/Historic-Preservation/06_About_SHPO/Strategic-Plan-Final_hyperlinks.pdf?la=en

The Connecticut SHPO here published its five-year preservation vision. The goal is to advance the cause through richer and broader partnerships, greater investment in education, and develop resiliency strategies. The document highlights preservation success stories as examples of SHPO and other state programs, summarizes relevant state policies, and the result of a statewide survey of SHPO goals. Appendices and a bibliography offer further insights into goals, plans, policies, additional resources, and allied organizations.



Department for Communities and Local Government, London, UK
2009 *Planning Policy Statement 25: Development and Flood Risk Practice Guide*. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/7772/pps25guideupdate.pdf.

This UK national response to extensive floods in 2007 is a comprehensive guide to planning techniques and case studies that improve protection of infrastructure, towns, and buildings from both coastal and river flooding. The guide is informed by British experience, EU directives, and examples drawn from across the globe. In particular, the guide focuses on various methods to increase flood resiliency by discussing various methods to increase water storage, slow stormwater, create natural sea barriers, and lower river water levels by recreating floodplains.



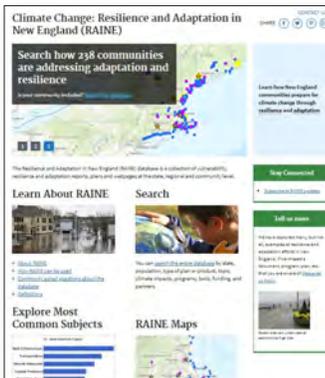
Dorge, Valerie and Sharon L. Jones
1999 *Building and Emergency Plan: A Guide for Museums and Other Cultural Institutions*. Getty Conservation Institute, Los Angeles. http://www.getty.edu/conservation/publications_resources/pdf/publications/emergency.html.

This Getty Institute guide demonstrates a step-by-step approach which may be taken by an institution in developing an emergency preparedness and response plan. Three groups which generally respond to emergencies are addressed: institution directors, emergency managers, and team leaders of departments. The guide is meant as a resource to be used by personnel in these departments to work together to formulate such plans. It also includes a useful appendix of further resources as well as example emergency plans.



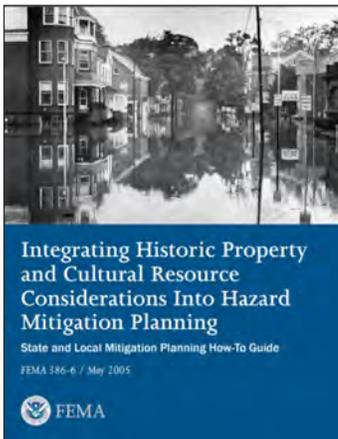
Environmental Protection Agency (EPA)
2016 *Climate Change Indicators: U.S. and Global Precipitation*. www.epa.gov/climate-indicators/climate-change-indicators-us-and-global-precipitation.

The EPA presents and tracks data on long-term climate trends, including precipitation, ocean levels, drought, temperature, and other weather phenomena. Data are available for both U.S. and worldwide locations.



n.d. *Resilience and Adaptation in New England (RAINE) database*. <https://www.epa.gov/raine>.

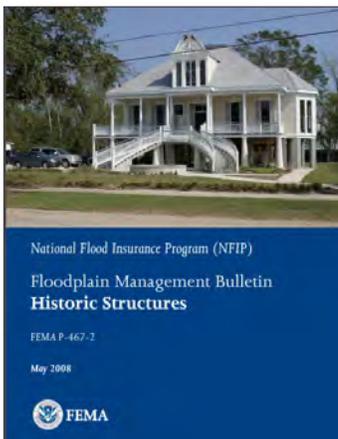
RAINE is an EPA database that holds data gleaned from New England states' efforts to adapt to climate change. Among other information fields, the database has internet links to reports about or from states, municipalities, and organizations related to climate change. The database is designed to let communities share their attempts to prepare for climate change and learning what directions others have decided upon. Municipal governments may especially find relevant which plans garnered funding and how partnerships were formed. Planners especially benefit from the fact that they can identify areas within their jurisdictions where few or no actions have been taken.



Federal Emergency Management Agency (FEMA)

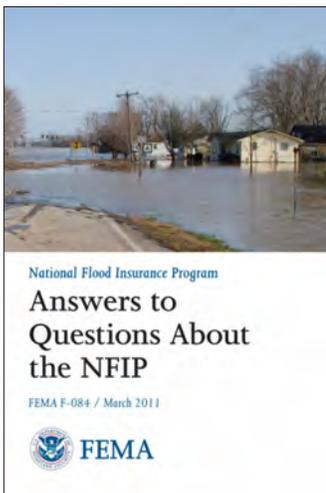
2005 *Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning: State and Local Mitigation How-To Guide*. FEMA 386-6. May. www.fema.gov/pdf/fima/386-6_Book.pdf.

This FEMA how-to guide is one a series of four such booklets. Each guide outlines practical ways to implement the more general “core four” guides’ recommendations to identify and mitigate hazards. The Historic Property guide demonstrates the economic and emotional importance of historic resources to an intended audience of government communities. The guide proposes a four-step plan to proactively save them: government committees should recognize resources within the hazard mitigation planning process; assess the risks these resources face (including formally inventorying those in hazard areas); develop plans for mitigation to include objectives for cultural resources; and implement plans while regularly monitoring progress.



2008 *Floodplain Management Bulletin Historic Structures*. FEMA P-467-2. https://www.fema.gov/media-library-data/20130726-1628-20490-7857/tb_p_467_2_historic_structures_05_08_web.pdf.

Under this program, historic structures do not have to meet the floodplain management requirements mandated by the National Flood Insurance Program (NFIP) to qualify for flood insurance. This exemption is an incentive for historic property owners to maintain the resource’s historic character and seek historic designation for it. Further, the program offers historic property owners the opportunity to receive subsidized flood insurance even if the structure has been damaged or improved. So long as the property maintains its designation, it is eligible for the subsidy. Generally, the booklet encourages owners to undertake those flood-damage-prevention measures possible that allow the property to keep its historic designation.



2011 *National Flood Insurance Program. Answers to Questions About the NFIP*. FEMA F-084. https://www.fema.gov/media-library-data/20130726-1438-20490-1905/f084_atq_11aug11.pdf.

This FEMA booklet clarifies various aspects of the landmark federal government-backed flood insurance program. The publication introduces the NFIP, provides overview information to prospective buyers, discusses coverage extents, and how to file a claim. For governments, the document outlines floodplain management, hazard and mapping requirements, hazard mitigation grants, and the impact of presidential disaster declarations.



Government of the Netherlands

2015 Room for the Waal project reduces flood risk in the Nijmegen area. <https://www.government.nl/latest/news/2015/12/03/room-for-the-waal-project-reduces-flood-risk-in-the-nijmegen-area>.

Rijkswaterstaat

n.d. Room for the River for a safer and more attractive river landscape. <https://www.ruimtevoorderivier.nl/english/>.

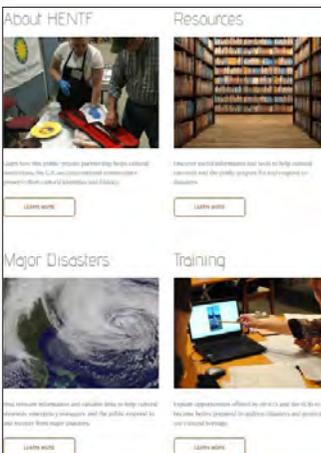
The government of the Netherlands, together with the cities of Nijmegen and Lent, oversaw a large-scale project to mitigate the River Waal’s flooding. The project involved the creation of a mile-long diversion channel (creating an island as an urban nature and archaeological park), deepening the river bed, removing flow obstacles, and excavating floodwater holding basins, among other features. Not only was the scale large, but it was complicated by the existence of archaeological sites (Roman and later), as well as unexploded World War II ordnance.



Haugen, Annika, Chiara Bertolin, Gustaf Leijonhufvd, Tone Olstad, and Tor Broström

2018 A Methodology for Long-Term Monitoring of Climate Change Impacts on Historic Buildings. *Geosciences* 8. <https://doi.org/10.3390/geosciences8100370>.

Haugen and colleagues, in their 2018 (but ongoing) study, adapted a generic climate change monitoring model to use for their approach to observing climate-induced changes to historic building materials. Although the study was applied to Norwegian structures, it is meant to be widely adaptable. The authors advocate a monitoring method, describing steps to take, equipment to use, and the types of data generated. They also provide examples from their studies in Norway, discuss problems encountered and further recommend certain variables to monitor. Haugen et al. go so far as to discuss an ideal team makeup for such studies.



Heritage Emergency National Task Force (HENTF)

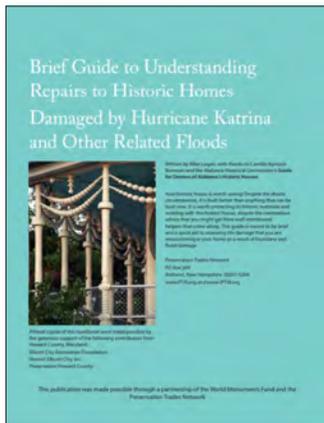
n.d. culturalrescue.si.edu/resources/heritage-emergency-national-task-force/.

HENTF is a partnership between FEMA and the Smithsonian Institution, whose mission is to protect the United States’ cultural heritage from the effects of natural disasters and other emergencies. It provides a coordination framework for local, state, federal, institutional, and tribal-level governments and bodies. It also promotes unified technical assistance to cultural institutions and the public and recommends courses of action to improve technical assistance delivery for cultural heritage protection, among other functions. HENTF’s objectives include education, technical assistance, coordination, and an increase in incorporation of cultural resources into disaster planning and mitigation efforts.



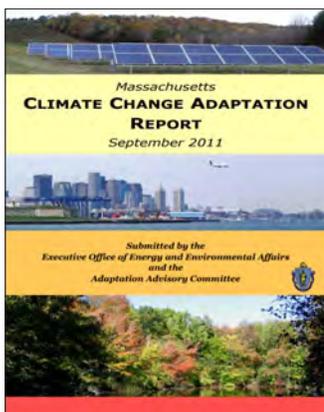
Holtz, Debra, Adam Markham, Kate Cell, and Brenda Ekwurzel
2014 *National Landmarks at Risk: How Rising Seas, Floods, and Wildfires are Threatening the United States' Most Cherished Historic Sites.* Union of Concerned Scientists, Cambridge, Massachusetts.

Holtz et al.'s report collects case studies that illustrate the impacts of climate change on National Landmarks. The study showcases a number of different landmarks, detailing how each has been and continues to be affected by climate change-related impacts. At the same time, the publication shows that climate change is not a future threat; it is one that has already manifested itself. The authors call for action, arguing that losses caused by climate change are supra-individual; they are community-wide. In addition to illustrating what is at stake, the report summarizes how climate change models are generated.



Logan, Mike
n.d. *Brief Guide to Understanding Repairs to Historic Homes Damaged by Hurricane Katrina and Other Related Floods.* Preservation Trades Network, Amherst, New Hampshire. <http://ptn.org/sites/default/files/docs/katrina-handbook.pdf>.

This guide is primarily aimed at homeowners in the Gulf Coast region who have been or could be affected by flooding. It introduces methods for repairing historic homes, beginning with a summary of repair and renovation procedures to protect structures from demolition. After a discussion of building materials and techniques, the booklet lists additional resources, including books, periodicals, and technical studies for historic property owners, organizations involved with historic trades, and guides to architectural history.



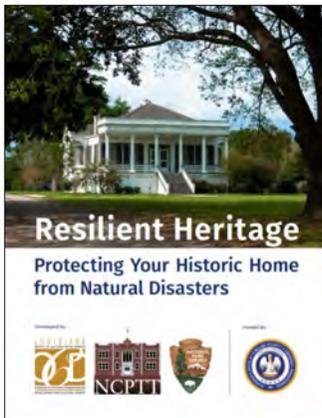
Massachusetts Executive Office of Energy and Environmental Affairs and the Adaptation Advisory Committee
2011 *Massachusetts Climate Change Adaptation Report.* <https://www.mass.gov/files/documents/2016/08/qz/eea-climate-adaptation-report.pdf>.

This report discusses the effects of climate change on Massachusetts. Specifically, the authors recommended broad strategies to adapt and mitigate impacts of climate change. The report's first half focuses on state agencies' roles, and the second half divides the state into physical zones to detail strategies for mitigating the vulnerabilities of these areas from climate threats.



Mississippi Development Authority (MDA)
2012 *Elevation Design Guidelines for Historic Homes in the Mississippi Gulf Coast Region.* <https://www.adaptationclearinghouse.org/resources/design-guidelines-and-funding-for-elevating-historic-homes-in-the-mississippi-gulf-coast-region.html>.

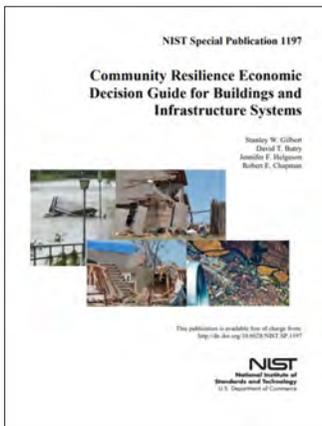
The MDA published a set of guidelines for the elevation of historic structures in response to the devastating effects of Hurricane Katrina on historic properties in the state. The guidelines demonstrate ways in which properties may be elevated for flood protection. They also show readers the design approval path and contain tips to find grants and forgivable loans for such a retrofit.



National Center for Preservation Technology and Training, National Park Service (NCPTT)

2015 *Resilient Heritage: Protecting Your Historic Home from Natural Disasters.* <https://www.ncptt.nps.gov/blog/resilient-heritage-2015-03/>.

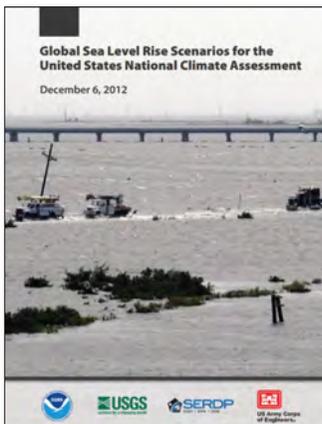
The NCPTT, a division of the NPS, specializes in offering historic preservation training for professionals, government officials from all levels, and members of historic preservation groups. Since Hurricane Katrina, the NCPTT has responded to natural disasters by offering both post-disaster response and pre-disaster planning for owners of historic properties. The guide recommends ways to protect historic structures from a variety of natural hazards.



National Institute of Standards and Technology

2015 *Community Resilience Economic Decision Guide for Buildings and Infrastructure Systems.* NIST Special Publication 1197. <https://www.nist.gov/publications/community-resilience-economic-decision-guide-buildings-and-infrastructure-systems>.

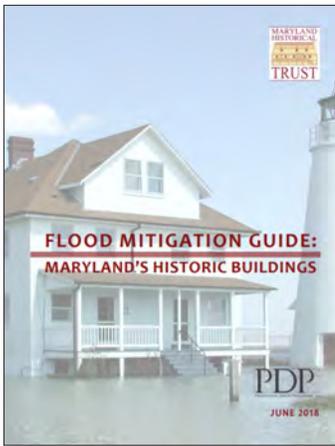
The Institute of Standards and Technology designed this paper to be an economic guide for communities to adapt to, withstand, and recover from disasters through resilience investment. The economic decision-making process is informed by relevant present and future costs and benefits associated with investment of new capital into resilience. The goal is for communities to have at hand maximum information to make quick but rational and justifiable expenditures to increase resilience. Social objectives of communities are also addressed as ways to measure appropriate expenditure for resilience.



National Oceanic and Atmospheric Administration (NOAA)

2012 *Global Sea Level Rise Scenarios for the United States National Climate Assessment.* NOAA Technical Report OAR CPO-1.

This document provides probabilistic scenarios of future sea level rise along the coasts of the United States. The objective of the report is to enable assessment experts and their stakeholders to analyze which important resources are vulnerable to sea level change and assess what impacts such changes may have. One aspect of sea level rise discussed is increased coastal flooding, which would impact a great variety of resources managed at the state, regional, and local levels.



State of Maryland

2018 *Flood Mitigation Guide: Maryland's Historic Buildings.* https://mht.maryland.gov/documents/PDF/plan/floodpaper/2018-06-30_MD%20Flood%20Mitigation%20Guide.pdf.

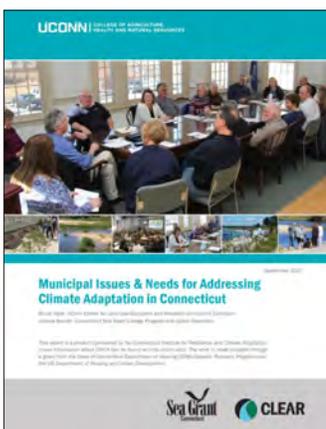
Maryland's guide is a resource for floodplain management. The document's aims are to bridge the gap between floodplain management, emergency management, climate adaptation, and historic preservation. The approach taken follows the established emergency management cycle: (1) planning; (2) response; (3) recovery; and (4) mitigation. The guide therefore creates a framework that enables preservation planners and lay advocates to understand floodplain management using the emergency management cycle. Most emergency responses in Maryland are locally focused. Therefore, it is primarily the responsibility of local planners to ensure that historic resources are properly considered while planning responses to and recovery from disasters. The publication also contains an extensive annotated bibliography, providing links to Maryland, federal, as well as international documents of relevance.



Sustainable CT, Inc.

n.d. <https://sustainablect.org/>.

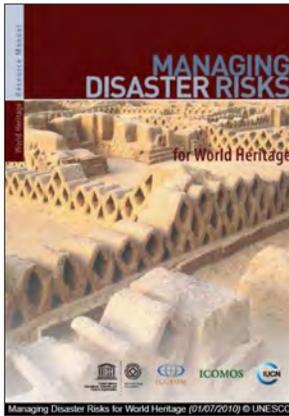
Sustainable CT is a non-profit organization created by Connecticut municipalities, citizens, businesses, and interest groups. The organization's goal is to provide the state's municipalities with a variety of voluntary and coordinated actions to create more sustainable communities. The website of the organization presents ways for groups and local governments to become sustainable-certified, take actions, partner with other communities, and find funding sources.



University of Connecticut Center for Land Use Education and Research (CLEAR)

2017 https://clear.uconn.edu/publications/climate/Report_Municipal_Needs_Assessment_Sept_2017.pdf

This document is the result of a HUD-funded study following Superstorm Sandy. The study's organizers interviewed citizens in 20 coastal Connecticut municipalities to develop a list of their most pressing concerns about climate resiliency. The information in the report is intended for researchers and state agencies. Issues facing these communities were placed into high, medium, and low categories. Within those categories, each of several areas suggested for improvement was explored. Within the high category, for example, were issues related to flooding and coastal erosion. While numerous topics were raised by participants, no published responses directly concern the effects of climate change and disaster response on historic resources.



United Nations Educational, Scientific and Cultural Organization (UNESCO)
2010 *Managing Disaster Risks for World Heritage*. <https://whc.unesco.org/en/managing-disaster-risks/>.

The UNESCO manual's purpose is to help managers of cultural (and natural) heritage sites reduce risks to these properties from either natural or human-caused disasters. The guide promotes an approach where disaster risks are identified and the risks from them to heritage sites mitigated. It also suggests that heritage properties can themselves help mitigate the effects of some disasters. While aimed at World Heritage Sites in particular, many of the conclusions within UNESCO's publication are applicable to historic properties of lesser (U.S. national, state, or local) significance.



United Nations Intergovernmental Panel on Climate Change (IPCC)
2018 *Special Report: Global Warming of 1.5° C*. <https://www.ipcc.ch/sr15/>.

The IPCC contributed a special report concerning the consequences of the planet's warming to 1.5°C beyond pre-industrial-era levels. The document outlines the risks associated with the projection that, by the year 2100, mean sea level will rise significantly and mean sea temperature will rise. On land there will be greater extremes of temperature and precipitation. In turn, these changes will impact ecosystems and biodiversity. Low-lying coastal areas and islands are special areas of concern. The report ranks various projections at medium or high levels of relative confidence.



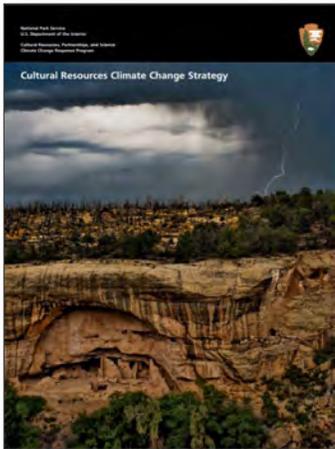
United States Climate Alliance
2018 *New Governors' Resilience Playbook*. <https://www.usclimatealliance.org/resilienceplaybook>.

The Governors' Resilience Playbook presents solutions for resilience planning by governors of participating states. The innovations presented discuss program launches, implementation, and lessons learned, among other topics. It also presents expertise garnered from private organizations involved in resilience studies and practice, including The Nature Conservancy and the Columbia Earth Sciences Center.



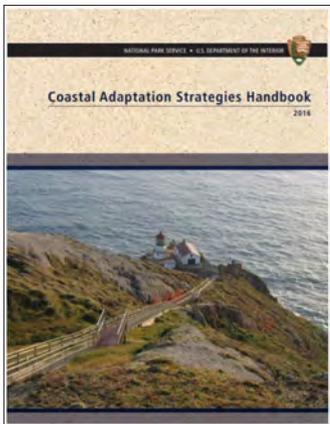
Urban Land Institute
2013 *After Sandy: Advancing Strategies for Long-Term Resilience and Adaptability*. <http://uli.org/wp-content/uploads/ULI-Documents/AfterSandy.pdf>.

This document is a summary of 23 recommendations for consideration in long-term resilience planning. While the recommendations were formulated for the New York-New Jersey area, they are broadly applicable to the northeastern region. The report focuses on (1) land-use and development; (2) infrastructure, technology, and capacity; (3) finance, investment, and insurance; and (4) leadership and governance.



U.S. Department of the Interior, National Park Service (NPS)
2016 *Cultural Resources Climate Change Strategy*. December. www.nps.gov/subjects/climatechange/upload/NPS-2016_Cultural-Resources-Climate-Change-Strategy.pdf.

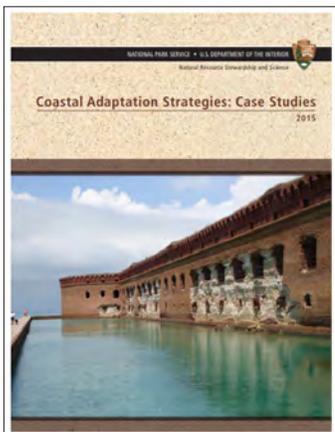
This NPS guide specifically addresses the threat to cultural resources from climate change, including from ocean acidification and global ice loss/sea level rise. The publication is guided by the principles that cultural resources are primary sources of data for documenting human interaction with climate change, and that changing climates affect cultural resource preservation and maintenance. Management decisions regarding cultural resources should assess vulnerability and significance, while engaging with stakeholders to understand impacts of loss.



2016 *Coastal Adaptation Strategies Handbook and Case Studies Addendum*. <https://www.nps.gov/subjects/climatechange/coastalhandbook.htm>, <https://www.nps.gov/subjects/climatechange/upload/2015-11-25-FINAL-CAS-Case-Studies-LoRes.pdf>.

Through this and similar documents, NPS fulfills its mandate to study the effects of climate change on vulnerable park resources. These two publications specifically address how coastal resources would be affected by predicted climatic shifts.

The coastal handbook study recommends adaptation via resistance to predicted changes, accommodating them, or directing the changes toward a specifically desired future. Although there always exists some uncertainty with climate change predictions, decisions actions should always be made with the best available scientific data. The handbook also directs policy makers to be flexible in planning deliberate adaptations. The handbook demonstrates various adaptation strategies which can be coordinated with routine resource maintenance operations.

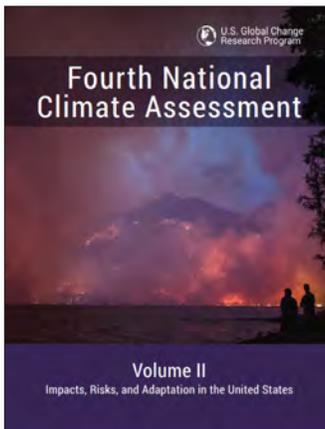


The NPS's case studies addendum handbook presents 24 summarized examples from across the country. In each case, national park resources are threatened by the effects of climate change and measures have been or are being taken to mitigate them. Of particular relevance, perhaps, for Connecticut, are case studies from the U.S. east coast, including Assateague Island National Seashore, which straddles Maryland and Virginia (forming two different case studies), Cape Lookout National Seashore in North Carolina, Gateway National Recreation Area, New York, and Cape Cod National Seashore in Massachusetts. The studies vary in their focus, from showcasing wetlands restoration (New York), relocating visitor facilities away from flood zones (Virginia, Maryland, and Massachusetts), altering a general management plan (Maryland and Virginia), to assessing the need for storm recovery plans (North Carolina).



n.d. Four Approaches to the Treatment of Historic Properties. <https://www.nps.gov/tps/standards/four-treatments.htm>.

On this webpage, The National Park Service outlines correct treatments for historic buildings and landscapes. It first defines the four key approaches to historic property treatments, Preservation, Rehabilitation, Restoration, and Reconstruction. The site also discusses when each of the latter four approaches is appropriate. To decide on a proper treatment plan, planners or property owners must weigh factors such as historical significance, physical condition, proposed use, and intended interpretation. The website offers links for interested parties to explore chosen topics in depth, including standards for restoration; guidelines for sustainability; guidelines for the treatment of historic properties; guidelines for the treatment of historic landscapes, and many other issues.



U.S. Global Change Research Program
2018 *Fourth National Climate Assessment*. November. <https://nca2018.globalchange.gov>.

This document is Volume II following The Global Change Research Act of 1990. Volume II's findings include a variety of supporting evidence concerning climate change and effects. Of particular interest are the two chapters that discuss the social response strategies of mitigation and adaptation. In addition, other parts of the volume focus on coasts and the effects of climate change on tourism and recreation.

SELECTED HISTORIC PRESERVATION CONTACTS

National Organizations	
National Alliance of Preservation Commissions P.O. Box 1011 Virginia Beach, Virginia 23451 757-802-4141 https://napcommissions.org/	National Center for Preservation Technology and Training 645 University Parkway Natchitoches, LA 71457 318-356-7444 https://www.ncptt.nps.gov/
National Trust for Historic Preservation 2600 Virginia Avenue NW #1100 Washington, D.C. 20037 202-588-6000 https://savingplaces.org/	Trust for Architectural Easements 1906 R Street NW Washington, D.C. 20009 888-831-2107 https://architecturaltrust.org/
Connecticut State Organizations	
Connecticut State Historic Preservation Office DECD/SHPO 450 Columbus Blvd. Suite 5 Hartford, CT 06103 860-500-2300 https://www.ct.gov/cct/cwp/view.asp?a=3948&q=293806	Connecticut Trust for Historic Preservation 940 Whitney Avenue Hamden, CT 06517 203-562-6312 https://www.cttrust.org/
Local Organizations	
Guilford Preservation Alliance P.O. Box 199 Guilford, CT 06437 http://guilfordpreservation.org/WordPress/historic-guilford	Greenwich Preservation Trust PO Box 4719 Greenwich, CT 06831 203-661-6343 http://greenwichpreservationtrust.org/
New Haven Preservation Trust 922 State Street New Haven, CT 065111 203-562-5919 https://nhpt.org/	New London Landmarks 49 Washington Street New London, CT 06320 860-442-0003 https://www.newlondonlandmarks.org
Norwalk Preservation Trust P.O. Box 874 Norwalk, CT 06852 203-852-9788 http://www.norwalkpreservation.org/	Old Saybrook Historical Society 350 Main Street Post Office Box 4 Old Saybrook, CT 08475 860 395 1035 http://www.saybrookhistory.org/

APPENDIX I. Recommendations for Integrating Historic Preservation at the Local Level

Plan Name	Dates	Likely Agency	Current Required Historic Resource Section	Recommended Sections
Regional Plan of Conservation and Development (POCD)	Every 10 years	Council of Governments (COG)	<ul style="list-style-type: none"> a. POCDs are required to address historic resources (State Statute Section 8-35a(a)(D)). b. POCDs are not required to address SLR but usually address natural hazards in some capacity 	<ul style="list-style-type: none"> a. Address hazards in historic resources chapter or element; include point data on resources b. Address historic resources in hazards chapter or element c. Describe and quantify historic resources at risk d. Include strategies that address risks to historic resources from natural hazards
Regional or Local Hazard Mitigation Plan (HMP)	Every 5 years	COG or P&Z or elected officials	N/A	<ul style="list-style-type: none"> a. Include historic resources in hazard and risk assessments via mapping, description, and quantification of vulnerability b. Identify historic resources that are also critical facilities c. Include historic resource value analysis in terms of social and economic loss d. Cite specific mitigation actions that directly protect valued historic resources
Local Plan of Conservation and Development	Every 10 years	Municipal planner or consultant	<ul style="list-style-type: none"> a. POCDs are required to address historic resources (State Statute Section 8-23(e)(1)(F)(iv)) b. POCDs are not required to address SLR but usually address natural hazards in some capacity 8-23(d)(11) 	<ul style="list-style-type: none"> a. Address hazards within historic resources chapter or element with maps b. Address historic resources within the hazards chapter or element c. Describe and quantify historic resources at risk d. Include strategies that address risks to historic resources from natural hazards
Resilience Plan	2005	Municipal planner or consultant	N/A	<ul style="list-style-type: none"> a. Incorporate historic resource locations into risk and vulnerability assessment b. Use neighborhood-level concept planning for historic districts c. Note importance of ensuring emergency access to historic properties
Flood Hazard Regulations	Version 4.1, 2014	By ordinance	N/A	<ul style="list-style-type: none"> a. Clarify substantial improvement and variance language in floodplain ordinances or regulations b. Formalize variance procedure in floodplain ordinances or regulations
Historic District Ordinances or Regulations	N/A	Municipal planner/ Historic District Commission	N/A	<ul style="list-style-type: none"> a. Develop resilience standards for local historic districts b. Incorporate other classes of resources (i.e., archaeological, historic landscapes) in revisions to historic district ordinances c. Develop guidelines for building elevations within historic districts
Zoning Regulations and Subdivision	N/A	P&Z	N/A	<ul style="list-style-type: none"> a. Amend zoning and subdivision regulations to allow the commissions to require archaeological and historic surveys prior to approval b. Amend regulations to support redevelopment and creative reuse of historic properties while maintaining historic characteristics
Emergency Operations Plan (EOP)	Biennial update (or notice of no change)	Emergency Management Department	N/A	<ul style="list-style-type: none"> a. Address historic resources in an annex b. Add a recovery/damage assessment annex c. Point data can be used by responders to understand historic resources d. Designate specific department or individual responsible for checking on the status of historic resources during and after a disaster e. Develop EM protocols to ensure response does not harm historic resources

APPENDIX II-A. Best Practices Before Disaster: PREPARE

A. Identify Historic Resources and Evaluate Historic Significance

Resource	Action	Location	Agency	Partners	Funding Source	Dates
Inventory of Historic Resources	Identify the historic assets within your community and create detailed records (archival research, fieldwork, and photographs).	<ul style="list-style-type: none"> ✓ Buildings ✓ Structures (bridges, e.g.) ✓ Objects (monuments, e.g.) ✓ Landscapes (town greens, e.g.) ✓ Archaeological sites ✓ Other 	LHD or SHPO or NPS	Local historical society or CT Trust for Historic Preservation	SHPO Survey & Planning Grant program (Historic Resources Inventory)	rolling
	Evaluate the historic significance of the properties identified on the list by using historic designation reports or by established criteria applied within historic contexts to complete the inventory of historic properties.	<p>Designated Historic Properties</p> <ul style="list-style-type: none"> ✓ Archaeological Preserves ✓ Local Historic District or Properties ✓ State Register of Historic Places ✓ National Register of Historic Places <p>Supplemental Resources</p> <ul style="list-style-type: none"> ✓ National Historic Landmarks ✓ HABS/HAER 			SHPO Survey & Planning Grant program (Historic Designation Reports)	rolling
Geographic Information System (GIS) mapping	Depict the Historic Resources Inventory spatially.	<ul style="list-style-type: none"> ✓ Statewide Historic Resource Inventory ✓ Archaeological “blob” Map 	SHPO or CLEAR		SHPO Survey & Planning Grant program (Partners in Planning)	ongoing

B. Determine Vulnerabilities of Historic Resources and Understand Risks from Natural Hazards						
Resource	Action	Location	Agency	Partners	Funding Source	Dates
Natural Hazard Risk Assessment	Hurricanes and Wind Hazards Blizzards/Winter Storms Tornados Flooding and Precipitation Fire and Wildfire Earthquakes and Landslides	Special Flood Hazard Zones	BOS or PC		CT-DEMHS Hazard Mitigation Grant Program (HMGP)	Every 5 years
Climate Vulnerability Assessment	Expand beyond the NHMP to assess your community's vulnerability to primary effects of climate change, like coastal and riverine flood risk, sea level rise, and extreme temperature fluctuations.	Town-wide: ✓ Rising sea level ✓ Changing temperatures ✓ Increased precipitation	BOS or PC		CIRCA? CT-DEMHS Flood Mitigation Assistance (FMA) grant program	
Analysis of Historic Resources' Vulnerability to Natural Hazards	Identify how the secondary impacts of climate change are likely to affect cultural resources (damage or destruction) in your community. Create a list of priority vulnerabilities.		HDC-CLG or PC		SHPO Survey & Planning Grant program (Pre-Development Study)	
Pre-Development Study of Priority Resources	From the Inventory of Historic Properties, complete pre-development studies on historic structures municipal or non-profit historic resources, or to assign registration and treatment priorities overall.	Pre-Development Studies ✓ Historic Structures Report ✓ Feasibility or Adaptive Reuse Study ✓ Structural Soundness Study ✓ Condition Assessment Report ✓ Architectural Plans / Specifications	HDC-CLG or PC		SHPO Survey & Planning Grant program (Pre-Development Study)	
Geographic Information System (GIS) mapping	✓ Statewide Historic Resource Inventory ✓ Archaeological "blob" map		SHPO or CLEAR		SHPO Survey & Planning Grant program (Partners in Planning)	ongoing

C. Integrate Historic Preservation and Hazard Mitigation into Planning Documents

Resource	Action	Location	Agency	Partners	Funding Source	Dates
Historic Preservation Plan	<ul style="list-style-type: none"> ✓ Incorporate the goals and objectives of the Statewide Historic Preservation Plan ✓ Include inventory of historic resources ✓ Apply analysis of historic resources' vulnerability to natural hazards 	Regional or Municipal	HDC-CLG or PC	Historical Society	SHPO Survey & Planning Grant program (Municipal Historic Preservation Planning Report)	Every 5 years
Hazard Mitigation Plan (HMP)	<ul style="list-style-type: none"> ✓ Incorporate the goals and objectives of the State Natural Hazard Mitigation. ✓ Include local historic resources and other historic resources in hazard and risk assessments via mapping, description and quantification of vulnerability. ✓ List historic resources that are also critical facilities. ✓ Include historic resource value analysis in terms of social and economic loss. ✓ Cite specific mitigation actions that directly protect valued historic resources. 	Regional or Municipal	Council of Governments (COG) or Planning & Zoning Commission (PZC)	Emergency Management Department (EMD)	CT-DEMHS Hazard Mitigation Grant Program (HMGP) or CT-DEHMS Pre Disaster Mitigation (PDM) program	Every 5 years
Plan of Conservation and Development (POCD)	<ul style="list-style-type: none"> ✓ Incorporate the goals and objectives of the State Plan of Conservation and Development. ✓ Address hazard within the historic resources chapter or element; include point data. ✓ Address historic resources within the hazards chapter or element. ✓ Describe and quantify historic resources at risk. ✓ Include strategies that address risks to historic resources from natural hazards. 	Regional or Municipal	PZC or Planning Commission			Every 10 years

C. Integrate Historic Preservation and Hazard Mitigation into Planning Documents						
Resource	Action	Location	Agency	Partners	Funding Source	Dates
Community Resilience Plan (CRP)	<ul style="list-style-type: none"> ✓ Incorporate historic resource locations into risk and vulnerability assessment. ✓ Use neighborhood-level concept planning for historic districts. ✓ Note importance of ensuring emergency access to historic properties. 	Regional or Municipal	PZC or Planning Commission			
Emergency Operations Plan (EOP)	<ul style="list-style-type: none"> ✓ Address historic resources in an annex. ✓ Add a recovery/damage assessment annex. ✓ Designate specific department or individual responsible for checking on the status of historic resources during and after a disaster. ✓ Develop EM protocols to ensure response does not harm historic resources. 	Regional or Municipal	Emergency Management Department			
Floodplain Management Ordinance	<ul style="list-style-type: none"> ✓ Clarify substantial improvement and variance language in floodplain ordinance. ✓ Formalize variance procedure in floodplain ordinance. 	SFHAs	Legislative Body			
Subdivision and Zoning Regulations	<ul style="list-style-type: none"> ✓ Amend regulations to require archaeological and historic surveys prior to approval. ✓ Amend regulations to support redevelopment and creative reuse of historic properties while maintaining historic characteristics. 	Municipal	Zoning Commission			
Historic District Regulations	<ul style="list-style-type: none"> ✓ Develop resilience standards for local historic districts. ✓ Incorporate other classes of resources (i.e., archaeological or historic landscapes). ✓ Develop guidelines for building elevations in historic districts. 	LHDs	Historic District Commission			

APPENDIX II-B. Best Practices During Disaster: WITHSTAND

A. Implement Plans					
Resource	Action	Location	Agency	Funding Source	
Action Statements and Accountability	✓ Use a table of tactics prescribed by the objectives of each strategic plan for resilience of historic resources.	NHMP, HPP, POCD and CRP	COG, BOS, PC		
Municipal Improvements	<ul style="list-style-type: none"> ✓ Drainage/Road Reconstruction Projects ✓ Projects that protect buildings from wind damage ✓ Projects that protect flood-prone homes and other insurable buildings 	<ul style="list-style-type: none"> ✓ Town-wide ✓ Windborne Debris Region ✓ Special Flood Hazard Area 	BOS	CT-DEMHS Hazard Mitigation Grant Program (HMGP)	
	<ul style="list-style-type: none"> ✓ Stormwater Management ✓ Acquisitions 	<ul style="list-style-type: none"> ✓ Town-wide 		CT-DEHMS Pre Disaster Mitigation (PDM) program	
	<ul style="list-style-type: none"> ✓ Community Flood Mitigation Projects ✓ Local Plans to Reduce Flooding Impact ✓ Mitigation of Severe Repetitive Loss properties ✓ Mitigation of Repetitive Loss Properties 	<ul style="list-style-type: none"> ✓ Special Flood Hazard Area 		CT-DEHMS Flood Mitigation Assistance (FMA) program	
B. Enforce Design/Construction Guidelines/Standards					
Resource	Action	Location	Agency	Funding Source	
Floodplain Management Ordinance		<ul style="list-style-type: none"> ✓ Special Flood Hazard Zone 	BOS		
Subdivision and Zoning Regulations		<ul style="list-style-type: none"> ✓ Town-wide 	ZC, PC		
C. Execute Mitigation Measures and Projects					
Resource	Action	Location	Agency	Funding Source	
Historic District Regulations	<ul style="list-style-type: none"> ✓ The baseline data compiled in the first step of this planning framework will inform the development of cyclical inspections and intervention to diminish resource vulnerability. 	<ul style="list-style-type: none"> ✓ Local Historic Districts 	HDC		
Old Town Hall	<ul style="list-style-type: none"> ✓ Improve drainage to reduce the frequency of flooding in the lower levels. 		Public Works	Bond Funds	
Old Settlement on River	<ul style="list-style-type: none"> ✓ Stabilize adjacent streambank. 		Public Works	Natural Resources Conservation Service: Emergency Watershed Protection Program	
Library Building	<ul style="list-style-type: none"> ✓ Develop snow removal priority plan. 		Public Works	No cost	
Old Town Historic District	<ul style="list-style-type: none"> ✓ Develop design guidelines for elevations and flood-proofing. 		Planning Department	CIRCA Municipal Resilience Grant	
All Designated Historic Resources	<ul style="list-style-type: none"> ✓ Develop Emergency Management protocols to ensure response team is aware of historic resource locations and special post-disaster procedures. 		Emergency Management Department	No cost	

D. Execute Emergency Operation Plans (EOP) and Procedures				
Resource	Action	Location	Agency	Funding Source
Historic Resources Annex of EOP	✓ Follow EM protocols in Historic Resources Annex to ensure response does not harm historic resources.		EMD	
Recovery/Damage Assessment Annex of EOP	✓ Follow EM protocols in Recovery/Damage Assessment Annex.		EMD	
E. Communicate and Collaborate with Partners				
Resource	Action	Location	Agency	Funding Source
Between Municipal Departments				
Between Communities (Mutual Aid)				
Between Different Levels of Government			HDC or SHPO or NPS	
F. Educate Stakeholders				
Resource	Action	Location	Agency	Funding Source
Municipal Staff	✓ Keep current of developments in climate science specific to your area.		UCONN CLEAR	
Historic District Commissions	✓ Draw planning insights for historic resource resilience from the work of other groups and agencies.		SHPO or CT Trust for Historic Preservation	
Property Owners	✓ Perform regular cyclical maintenance of historic properties and interventions specific to the condition and siting of the resource.		HDC	

APPENDIX II-C. Best Practices Post Disaster: RECOVER

A. Execute Recovery Protocol	
Action Statements and Accountability	✓ Use a table of tactics prescribed by the objectives of each strategic plan for resilience of historic resources.
B. Communicate and Collaborate with Partners	
Action Statements and Accountability	✓ Use a table of tactics prescribed by the objectives of each strategic plan for resilience of historic resources.
C. Execute Recovery Protocol	
Action Statements and Accountability	✓ Use a table of tactics prescribed by the objectives of each strategic plan for resilience of historic resources.
D. Communication and Collaboration	
Between municipal departments	<ul style="list-style-type: none"> ✓ Floodplain manager ✓ Planning & Zoning/Building Department ✓ Emergency manager ✓ Emergency response personnel ✓ Department of Public Works ✓ Historic District Commission, historian, etc. ✓ Conservation Commission
Between communities (mutual aid)	
Between different levels of government	✓ Consult with SHPO

APPENDIX II-D. Best Practices Future Disaster: ADAPT

A. Involve stakeholders		Actions	Possible Funding
Consult early; proactive deliberations can help prioritize historic resources through awareness		✓ Use a table of tactics prescribed by the objectives of each strategic plan for resilience of historic resources.	N/A
		✓ Recall that not all resources are equally adaptable, significant to local heritage, nor that all proposed solutions will be equally acceptable at the local level. (See Annapolis's Weather It Together as an example.)	N/A
		✓ Decisions should be made at the local level.	N/A
B. Coordinate with regional and state agencies			
Coordination aids in developing a unified and expert-informed approach, and may also result in better chances for long-term project funding. These are regional challenges appropriate for regional bodies to be involved in.		✓ Plan land use policies	✓ DEEP
		✓ Develop open space preservation policies ✓ Consider links between hazard mitigation, historic preservation, and economic development. (See Frederick, Maryland, example in bibliography.) ✓ Coordinate with state agencies: DEEP; DEMHS; and SHPO to prioritize, fund, and expedite projects. ✓ See CIRCA's Resilient Connecticut project, as an example of an adaptation framework that can inform local plans.	✓ SHPO survey and planning grant ✓ DEMHS
C. Strengthen monitoring and maintenance of historic assets			
Documentation and monitoring are two primary tools available to planners for understanding what resources are present, and which threats are impacting them to what extent.		✓ Recall that the best adaptation strategies emanate from data collected on how climate change affects properties and building materials. ✓ Municipalities may choose to select one or more "case study" properties to monitor and analyze (see Haugen et al.'s study in Norway as one example).	✓ SHPO survey and planning grant ✓ CIRCA municipal resilience grant
D. Identify adaptation options for historic properties			
A variety of adaptation options may be appropriate for a community in general. However, not all such options retain properties' historic integrity.		✓ Recognize that building adaptation and documentation is a fast-developing field. ✓ New technologies are regularly introduced, and it is critical to be up-to-date on them, or find consultants who are. ✓ Develop/update historic structure and cultural landscape reports for key properties. ✓ Survey historic resources with available technologies for complete documentation including using drones, laser scanners, and 3D photogrammetry. ✓ Note how different communities have approached building adaptation in distinct ways.	✓ SHPO survey and planning grant



This project was supported by the Emergency Supplemental Historic Preservation Fund of the National Park Service, U.S. Department of the Interior, funded under Public Law 113-2, The Disaster Relief Appropriations Act