



Climate Change Hazards Summary Report for Facility Investment Planning

Boston National Historical Park March 2021

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Introduction

Parks are required to complete a PARK Project Narrative Template for each proposed Great American Outdoors Act Facility Investment Plan (GFIP) project for Legacy Restoration Funding in fiscal years 2023-2025. Information provided in this report is intended to help parks consider climate change related hazards when addressing Question 16 of the narrative template.

Specifically: What risks or hazards (current and projected, e.g. effects of climate change) are likely to affect this project? If applicable, what adaptation strategies and/or resiliency measures have been identified for scenarios that pose high risks to project assets?

Step 1: Review summary information for known or potential hazards identified for Boston National Historical Park

- Review the list of potential hazards below and decide whether or not they apply to your specific GFIP project. NPS Climate Change Response Program (CCRP) staff attempted to identify potential hazards for the park; however, park staff and project planners have more information about hazards that are likely to be applicable to a specific project.
- The hazards below were selected from a longer list included in Appendix 1, which also indicates CCRP's 'best professional judgement' about the relevance of the hazard for this park. Note both lists serve as a "coarse filter" screening tool to help identify potential climate-related hazards for facility and asset planning.

Hotter average days and more very hot days

Extreme temperatures can increase weathering of structures, threaten park staff and visitor safety, and increase stresses for HVAC systems. If not addressed through building design or more efficient temperature control systems, the increased demand for complex air conditioning systems can add stress to building envelopes and can require significant alterations to a structure. Hotter days will affect visitation and may require more spaces for visitor cooling.

For the Boston area, annual average temperature is projected to increase 2.1°F (1.2°C) and 6.7°F (3.7°C) by mid-century (NECASC, 2018). The annual average temperature is projected to increase in eastern Massachusetts between 3.4 °F (1.9°C) and 7.5°F (4.2°C) by the year 2099, based on low or high greenhouse gas emissions, respectively (Kunkel, et al. 2013). Extreme temperature, i.e. above 95°F (35°C), is projected to occur from 6 to 9 days per year more frequently between the years 2041-2070 than what was experienced between 1980 and 2000 (Kunkel, et al. 2013; Parris, et al. 2012). Under a high greenhouse gas emission scenario, Boston, Massachusetts' summer climate in 2080 may feel 7.3°F (4.1°C) warmer than current temperatures (Fitzpatrick and Dunn 2019). Based on projected temperature increases, visitation is expected to increase overall, especially during historically low and shoulder season periods (Fisichelli and Ziesler, 2015).

Park staff assessment – relevant to GFIP Project:

- ☐ Yes
- ☐ No

Altered precipitation patterns, increased extreme precipitation, and changing humidity
Changing precipitation and humidity conditions can result in local flooding, encourage mold growth, wood decay, increase fire risk, and intensify drought conditions, depending on the pattern of change. Extreme precipitation events present a variety of threats to infrastructure and operations including flooding of sites, sewage backup, accelerated decay of masonry, overcoming drainage systems, road wash out, cracks in building infrastructure, destabilization of buildings and pipes, erosion of supporting ground around structures, among many other effects.

The annual total precipitation is projected to increase in eastern Massachusetts by 3-6%, with extreme precipitation days (above 1 inch (25 mm)) increasing by up to 18% for the period between 2041 and 2070 (Kunkel, et al. 2013). Fitzpatrick and Dunn (2019) project summer climate in Boston, MA to be 17.1% wetter by the year 2080. The winter season is expected to see the greatest precipitation increase between 3-34% by end of century, with summer and fall seasons more variable (NECASC 2018).

Park staff assessment – relevant to GFIP Project:

- ☐ Yes
- ☐ No

Increased drought frequency, intensity, magnitude, and duration

Rising air temperatures and changing precipitation patterns are exacerbating drought risk in many parts of the United States (Wehner et al. 2017). Changing drought conditions (frequency, severity, duration) can challenge a variety of infrastructure and operations (Department of Homeland Security 2015) in the NPS (e.g., water supply and wastewater systems), impair water quality (Mosley 2015), affect soil heaves and shrinkages (Fernandes et al. 2015), and may enhance other related risks such as wildfire.

The Northeast U.S. is a wet region that historically experiences damaging droughts, despite simultaneous increasing precipitation (Dupigny-Giroux et al. 2018). Climate models suggest that, despite projected increasing precipitation, increased temperatures and precipitation variability will likely lead to more frequent short, but intense drought conditions (Krakauer et al. 2019, Pendergrass et al. 2020). These "flash droughts" are characterized by short, intense sudden onset droughts and rapid intensification of conditions with severe impacts (Pendergrass et al. 2020). With annual average precipitation increasing, it's uncertain how much drought will increase, but a small projected decrease in average summer precipitation in Massachusetts could combine with higher temperatures to increase the frequency of episodic droughts, like the ones experienced across the Commonwealth in the summers of 2016 and 2020 (NECASC 2018).

Park staff assessment – relevant to GFIP Project:

- ☐ Yes
☐ No

Sea level rise and coastal storm surge

Global sea level is rising and will continue to increase (Tebaldi et al. 2012), with local variability. Higher relative sea level causes accelerated coastal erosion, landward migration of shorelines, and saltwater intrusion and changes in groundwater, and amplifies flooding caused by higher storm surges (Field et al. 2007). Sea level rise (SLR) poses considerable risks to infrastructure, lighthouses, forts, and other historic structures. Sea level rise visualization tools are available such as the [NPS Sea Level Rise Viewer](#) and for parks with exposure or vulnerability assessment by asset through the [Climate Vulnerabilities Map](#).

In the Boston area, relative sea level rise (includes land subsidence and eustatic sea level rise) has caused an increase in sea level elevation of approximately 1.0 ft (0.3 m) over the last century and projected to further rise by 1.4-2.4 ft (0.4-0.7 m) by 2050 and 4.0-7.6 ft (1.2 m – 2.3 m) by 2100 depending on a low or high greenhouse gas emission scenario (NECASC 2018). Given US Army Corps of Engineers background information for storm surge and projected sea level rise in the Boston area, a 100 year storm event would become equivalent to a modern day 500 year storm event by the year 2100 (Kirshen et al. 2008), indicating an increased percent probability of a storm of this magnitude occurring or being exceeded in any given year. . A recent coastal engineering review for the BOST Easton Building rehabilitation design (dated 14 October 2020) identifies between 0.2 m and 0.6 m SLR increases, depending on greenhouse gas emissions, and provides adaptation guidance along with a link to the [Boston Coastal Flood Resilience Design Guidelines](#).

Park staff assessment – relevant to GFIP Project:

- ☐ Yes
☐ No

Riverine flood/Flash flood

Extreme precipitation events and the risk of flooding are expected to regionally intensify with a changing climate (Dethier et al. 2020, Tabari 2020). Floods threaten infrastructure and operations through a variety of mechanisms, including inundation of structures, enhanced erosional forces, road wash out, structural collapse from force of floodwaters, sewage backup, and damage to utilities, generators, and electrical systems. Post-flooding effects include increased rot, fungal/insect attack, mold and mildew, and physical deterioration of wood, brick and stone building materials.

Cheng, et al. (2017) identify climate change-induced flooding hazards and mitigation strategies for Boston's Charles River watershed. They describe flooding hazards increasing along the Charles River for various climate change emission scenarios and call for use of climate science and hydrological assessments to inform adaptation designs.

Park staff assessment – relevant to GFIP Project:

- ☐ Yes
- ☐ No

Hurricanes

Hurricanes are projected to increase in intensity and precipitation in a warmer world (USGCRP 2017). Storm surge can cause flooding and road wash outs. The combination of sea level rise and increased hurricane storm surge will flood structures that previously were outside of the floodplain. Flood and storm surge depths may be deeper than in previous storms. Flooding may occur in areas that had no flooding during past storms. Building standard guidance is based on base flood elevations of 2-3 ft above FEMA flood zones of 100-year (1%-annual chance) storms, depending on the building criticality. For existing buildings that are not above base flood elevation, adaptation measures to reduce flood impacts should be considered. Hurricanes also threaten structures via damage from wind, wind-blown rain and debris; their large temperature swings stress buildings through sudden thermal expansion and can crack pipes.

North Atlantic hurricane intensity and rainfall rates are projected to increase under continued climate change, although projections of the total number of North Atlantic hurricanes under climate change vary (IPCC 2014, USGCRP 2017). Under a low greenhouse gas emissions scenario, the maximum intensity during the course of individual North Atlantic hurricanes could increase 4% and rainfall rates could increase 15% to 20% by 2100 (Knutson et al. 2015). At current sea level, maps of inundation by [hurricane](#) category are available (Caffrey et al. 2018). Both erosion and storm surge will become more damaging and more likely as sea level continues to rise.

In New England the primary storm impacts are from Nor'easters rather than hurricanes. There is limited information on how climate is affecting Nor'easters, so Boston Harbor Islands National Recreation Area is part of a multi-park study to better understand changing Nor'easter vulnerability, the results of which will include BOST. There is much uncertainty over changes in storm characteristics, though even if storm characteristics do not change, storm surge will reach further inland due to rising sea level.

Park staff assessment – relevant to GFIP Project:

- ☐ Yes
- ☐ No

Pest infestation

Increased temperatures and CO₂, changes in precipitation, and disturbance due to extreme climate events can increase the survival, spread, growth, and establishment of pests (IPCC 2014). Rooting and burrowing mammals and termites have the potential to cause direct damage to power, water, transportation, and building facilities (Vissicelli 2018). Facilities may be impacted indirectly through other mechanisms exacerbated by climate change such as forest insect pest invasions or fluctuating ground water levels leading to increased tree mortality, hazard trees, and treefall.

Park staff assessment – relevant to GFIP Project:

- ☐ Yes
- ☐ No

Invasive species

Increased temperatures and CO₂, changes in precipitation, and disturbance due to extreme climate events can increase the survival, spread, growth, and establishment of invasive species (IPCC 2014).

Weeds and aquatic mussels have the potential to cause direct damage to power, water, transportation, and building facilities (Vissicelli 2018). Non-native species that may not currently impact facilities may become harmful due to changes in local climates (NRC 2002, IPCC 2014). With warming, the length of the growing season is expected to increase, which can benefit some invasive species.

Park staff assessment – relevant to GFIP Project:

- ☐ Yes
- ☐ No

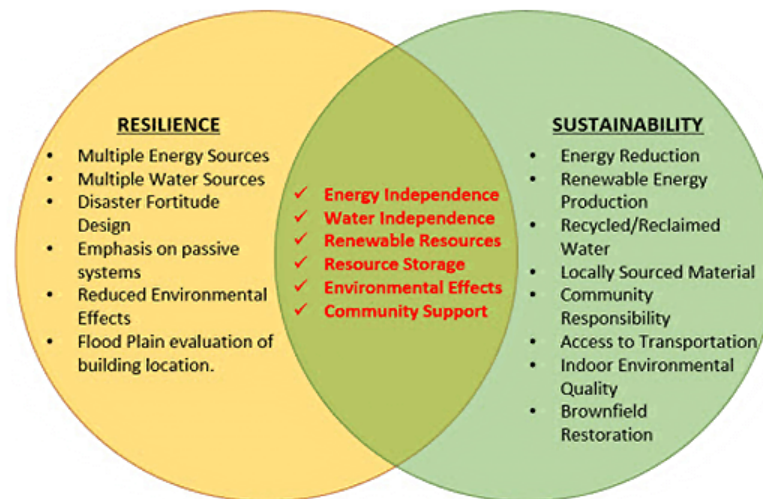
Step 2: Consider adaptation and resiliency strategies

- Review definitions of resiliency and adaptation strategies.
- Identify adaptation strategies that will help park resources respond to the hazards identified in Step 1.

Question 16 requires a screening for climate hazards followed by a review of adaptation and resiliency strategies that would be put in place to respond to these hazards. For the purposes of this report and investment planning, resilience is a property of a system or asset and generally refers to the ability of the system or asset to maintain its intended purpose following a temporary disturbance.

Adaptation strategies, in the context of built infrastructure, refers to the intentional management decision to identify, prepare for, and respond to observed or expected sustained changes in hazards, including climate change, to adjust to a sustained change in conditions.

It is important to note that resilient park operations can be supported through the use of green infrastructure such as sustainable landscaping, as well as sustainable energy, water, and building envelope solutions. The figure below illustrates this relationship.



Lists of adaptation strategies for different types of infrastructure projects in response to different hazards can be found here: [Incorporating Climate Change Adaptation in Infrastructure Planning and Design](#) (see Chapter 4, Tables 25-34). If used, these adaptation strategies will need to be modified for proposed park projects.

Buildings and assets within national parks may include cultural resources (e.g., historic and pre-historic buildings and structures). The adaptation and resiliency options for cultural resources often overlap with those defined for facilities; however, NPS has detailed specific strategies when dealing with cultural resources and climate change in national parks ([Cultural Resources Climate Change Strategy](#)). “Climate

change poses an especially acute problem for managing cultural resources because they are unique and irreplaceable — once lost, they are lost forever” ([NPS Policy Memorandum 14-02](#)).

Step 3: Develop an answer to Question 16 for your specific project and location, as well as strategies to address each hazard

- Example responses to Question 16 are provided below. THESE ARE GENERIC EXAMPLES FROM OTHER PARKS. You can view other examples here: [Example responses to Q16 on hazards Organized by Park](#).
- You will need to develop park specific answers based on the hazards identified in Step 1 and the adaptation strategies identified in Step 2 for your park and project. The park response should be as project-specific as possible.
- The NPS Climate Change Response Program (CCRP) and Sustainable Operations and Maintenance Branch (SOMB) are available to help evaluate climate change hazards and resiliency strategies for your specific projects. Requests should be sent to the NPS [GFIP Hazards and Risk Assistance email account](#); a member of the team will reply with support.

Question 16: What risks or hazards (current and projected, e.g. effects of climate change) are likely to affect this project? If applicable, what adaptation strategies and/or resiliency measures have been identified for scenarios that pose high risks to project assets?

Example from Minute Man National Historic Park: Restoring historic structures

Several climate change hazards may affect building-related projects at MIMA, including hotter average days, more extreme heat days, increased hurricane impacts from wind and flooding, altered precipitation patterns, and increased extreme precipitation. Adaptation and resiliency strategies for the expected hazards are described below:

- Hotter average days and more extreme heat days will increase demand and requirements for higher capacity air conditioning systems unless accommodated through modified building designs or other systems.
- Extreme heat and humidity can stress the building envelope and will require significant humidity control alterations for structures.
- Changes in building design or post-flooding dehumidification systems, in coordination with the NPS Historic Architecture, Conservation and Engineering Center or Historic Preservation Training Center, to avoid any increase in energy use.
- Hurricane force wind and wind-blown rain as well as damage from wind-blown debris or treefall will require wind resistant fortification of the structure. Addressing hazardous trees and retrofitting roof structures to be more wind resistant may also be required.
- Flooding from increased hurricane events, increased extreme precipitation, or in conjunction with altered precipitation patterns may require modifications to building infrastructure location and landscape drainage systems.

- Post-flooding effects may include increased rot, mold and mildew, and physical deterioration of wood, brick and stone building materials. Adaptation actions will include identifying appropriate dehumidification and air handling systems and coordinating with the NPS Historic Architecture, Conservation and Engineering Center or Historic Preservation Training Center regarding alternatives and maintenance for historic structures.

Examples from Gateway National Recreation Area:

As a marine park located at the lower end of New York Harbor and the Atlantic Ocean and Jamaica Bay(NY), any project contemplated within the park must consider the following complex issues: Climate Change, Sea Level Rise, Historic Storm Surge Events and Park Policy (Superstorm Sandy), Geomorphic Data (Water Table & Subsidence Issues), FEMA Flood Zone Designations, Coastal Management and Compliance. The Secretary of the Interior's standards for Flood Adaptation, Sustainability, and Resiliency will also be incorporated as required to meet NPS standards. Many of these issues have been previously addressed through recovery projects completed during Superstorm Sandy Recovery but each new project will require examination, review, and approval based on the specific elements of the project.

1)Marine structures: Docks, bulkheads, etc.

Projects involving marine structures must consider sea level rise and potential for increased future storm surge. Shoreline protection structures will evaluate how their intended function will change under higher sea level and storm surge. Projects to repair replace decks, boardwalks, and boat docks will include flow-through decking, up-sized pile foundations, and elevated boardwalk and docks where applicable. All site infrastructure may need to be raised to accommodate King Tide elevations (high tide flooding), ~50 years of sea level rise (adjusted for life cycle of the assets), and wave action. All structures must incorporate design elements to address impacts to adjacent and downdrift natural and cultural resources since many marine structures alter sediment transport pathways.

2)Historic Structures at Sandy Hook

By nature of their purpose, forts and batteries are in locations of increased exposure to storm flooding and sea level rise but are mostly not especially sensitive. Climate impacts increase maintenance and replacement needs for some features, e.g. metal doors, increased concrete spalling. Electrical and ventilation systems need to be adapted to reduce system vulnerability. Hurricane force wind and wind-blown rain as well as damage from wind-blown debris will require wind resistant fortification of some structures; for rehabilitation of hangars in particular, retrofitting roof structures to be more wind resistant may be required. Adaptation actions for most structures including operations buildings, maintenance and housing will include identifying appropriate sustainable infrastructure and facility designs that are more resilient to heavy precipitation, basement flooding, mold and pest infestations. Actions will include assessing building drainage systems, identifying appropriate dehumidification and air handling systems. For historic structures, coordinate with historic preservation experts including the NPS Historic

Architecture, Conservation and Engineering Center (HACE) regarding alternatives and maintenance for historic structures that are sustainable and meet the Secretary of the Interior's Standards for the Treatment of Historic Properties. Additionally, the park has submitted a project for consideration of Legacy Restoration Funding that addresses deferred maintenance and repairs to a seawall protecting historic structures at Sandy Hook. Additional seawall projects have been submitted into Line Item Construction for funding consideration to make repairs to the seawall adjacent Officer's Row. Both projects seek to address potential climate change issues over the lifespan of the existing seawalls at the park.

Step 4: Seek additional assistance if desired

Additional resources for answering question 16 and related questions can be found in:

- Appendix 1 below, which includes a full hazards checklist, providing additional links for supporting information related to each hazard.
- Appendix 2 below, which provides a map to visualize how climate is changing for the park.
- The [GFIP Guidance and Logistics](#) folder under the [Resources to Assess Risks and Hazards tab](#) includes:
 - An Excel workbook labeled [T75 Parks GFIP NRSS Supporting Materials](#) that provides links to information for natural resources to be considered during project design and construction.
 - A [FAQs – Assessing Risks and Hazards](#) document that provides detailed guidance for answering Question 16.
 - A [Natural Hazard Assessment Webinar](#) recording that provides key information, definitions, and guidance for understanding natural hazards and related resources.

The NPS Climate Change Response Program (CCRP) and Sustainable Operations and Maintenance Branch (SOMB) are also available for assistance in evaluation of climate change hazards and resiliency strategies as they relate to specific projects. Questions can be sent to the NPS [GFIP Hazards and Risk Assistance email account](#) and a member of that team will reply with support.

Appendix 1: The Climate-Related Hazard Checklist

This appendix provides an initial evaluation of climate hazards for **Boston National Historical Park** according to the hazard ratings identified below. The information used to identify hazards in the checklist is mostly from regional assessments. Park and project specific information was generally not available when assessing these hazards. NPS Climate Change Response Program (CCRP) staff made an initial attempt to identify potential hazards for the park broadly (see 'Best Professional Judgment' column); however, park staff and project planners have more information about hazards that are likely to be applicable to a specific project.

Explanation of Hazard Ratings

Known hazard: Conditions that cause the hazard are well documented in the area where the park occurs. If applicable to the project site, these hazards should always be addressed in the project plan.

Potential hazard: Conditions that cause or underlie the hazard are known to occur nearby or are likely to occur based on studies with conditions similar to the park. If applicable to the project site, these hazards should be considered for inclusion in the project plan.

Not applicable: No evidence *was identified* showing this hazard is relevant to the park. Note this is a coarse filter evaluation; local knowledge of a hazard(s) should be used, when available.

Table 1. Climate-related Hazards Checklist

Potential Climate Hazard	Best Professional Judgment	Examples of risk or secondary hazard	Sources of General Non-site specific Data	Sources for Site Specific Data
Hotter average days and more very hot days	Known Hazard ☒ Potential Hazard ☐ Not Applicable ☐	• Inadequate HVAC • Road surface degradation • Lack of water due to increased water for irrigation • Increased humidity • Danger to staff	• National Climate Assessment • State climate summary	• National Climatic Data Center • DAYMet gridded climate data • National park historical and projected climate change

Potential Climate Hazard	Best Professional Judgment	Examples of risk or secondary hazard	Sources of General Non-site specific Data	Sources for Site Specific Data
Increased drought frequency, intensity, magnitude, and duration	Known Hazard ☐ Potential Hazard ☒ Not Applicable ☐	• Limited water supply for cooling, landscaping, structural fire suppression, other equipment • Increased competition for available water and water rights conflicts • Crack/heave damage in drier soils • Increased vulnerability to wildfire (below)	• Drought Monitor • National Integrated Drought Information Center • National Climate Assessment • State climate summary	• Drought Monitor • National Integrated Drought Information Center
Increased wildfire frequency, intensity, magnitude, and duration	Known Hazard ☐ Potential Hazard ☐ Not Applicable ☒	• Damage to facilities and contents • Smoke damage • Air quality dangerous to staff and visitors • Increased runoff • Increased erosion • Damage to water treatment plants	• Barbero et al. 2015 International Journal of Wildland Fire	• NIFC • International Wildland-Urban Interface Code

Potential Climate Hazard	Best Professional Judgment	Examples of risk or secondary hazard	Sources of General Non-site specific Data	Sources for Site Specific Data
Altered precipitation patterns, increased extreme precipitation, and changing humidity	Known Hazard ☒ Potential Hazard ☐ Not Applicable ☐	• Local flooding • Mold growth • Wood decay • Drought • Fire • Groundwater change • Surface erosion • Floods (see below) • Water damage to structures from driven rain • Unstable saturated soils	• National Climate Assessment • State climate summary	• National Climatic Data Center • DAYMet gridded climate data • National Park historical and projected climate change • Evaluations are mostly at regional scales
Riverine flood/flash flood	Known Hazard ☒ Potential Hazard ☐ Not Applicable ☐	• Damage or destruction of infrastructure • Stream channel migration • Stream bank erosion/extreme erosion • Safety • Water quality diminished • Damage to water source and delivery infrastructure • Changing requirements for culvert flow capacity	• FEMA Flood map service	• FEMA Map Service Center • Floodplain maps for HUD projects • Van Dusen et al. 2020 (for select parks) • May require a special flood study

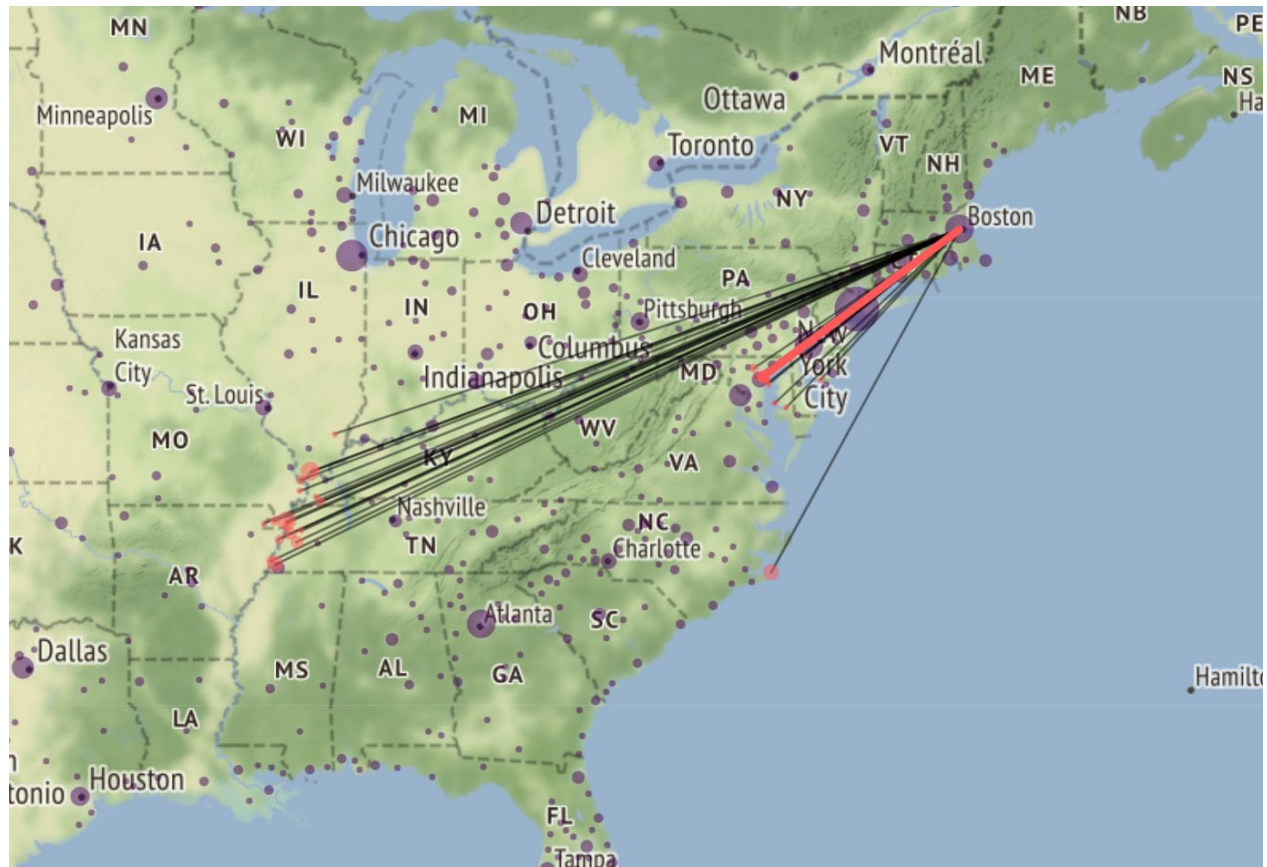
Potential Climate Hazard	Best Professional Judgment	Examples of risk or secondary hazard	Sources of General Non-site specific Data	Sources for Site Specific Data
Sea level change and coastal storm surge	Known Hazard ☒ Potential Hazard ☐ Not Applicable ☐	• Rising sea and lake levels • Rising water – wind driven (e.g. hurricane, nor'easter) • Saltwater intrusion • Vegetation damage	• NOAA SLR viewer • NOAA - Great Lakes Environmental Research Laboratory	• IRMA – Coastal reports • NPS SLR viewer • Specific Hazard Assessment: Coastal Storm Surge with Climate Change Effects (requires VPN connection) • SLR reports • Great Lakes Dashboard Project
Lake and reservoir level change	Known Hazard ☐ Potential Hazard ☐ Not Applicable ☒			
Hurricanes and tornadoes	Known Hazard ☒ Potential Hazard ☐ Not Applicable ☐	• Building destruction • Flying debris • Storm surge • Tree fall (see other categories for associated intense rainfall and floods)		• Wind speed data – from local codes • International Building Code • FEMA Map Service Center

Potential Climate Hazard	Best Professional Judgment	Examples of risk or secondary hazard	Sources of General Non-site specific Data	Sources for Site Specific Data
Pest infestation	Known Hazard ☐ Potential Hazard ☒ Not Applicable ☐	• Historic/facility fabric loss • Vegetation loss • Disease vectors may increase • Termites and other woodboring pests expanding range with warming and increased humidity	• USFS Forest Health Advisory System	• NPS Pest and Invasive Species Management Contacts • Fisichelli et al. forest pests • USFS maps
Invasive species	Known Hazard ☐ Potential Hazard ☒ Not Applicable ☐	• Aquatic mussels – water intakes clogged • Vegetation (kudzu, vines) – damage buildings, kill trees, obstruct waterways	• National Invasive Species Council	• NPS Pest and Invasive Species Management Contacts • Early Detection and Distribution Mapping System (current distribution) • Early Detection and Distribution Mapping System (projected distribution)

Appendix 2. What Will the Park Climate Feel Like in 60 Years?

The map below is intended to help visualize how the present-day climate in the region of **Boston National Historical Park** is projected to change as a result of climate change (Fitzpatrick and Dunn 2019). Under a high greenhouse gas emission scenario, Boston, Massachusetts' climate in 2080 may feel like today's climate near Rosedale, Maryland. The typical summer in Rosedale, Maryland is 7.3°F (4.1°C) warmer and 17.1% wetter than summer in Boston, Massachusetts. The red line shows the average of the 27 climate models; the black lines show the 27 individual projections assuming continued high emissions, providing a sense of the plausible range of future climates. The size of a red circle gives a sense of how good of a match that location is, with smaller circles indicating better matches; all circles (red or purple) denote cities used in the analysis. The analysis is based on twelve climate metrics, including minimum and maximum temperature and precipitation by season (spring, summer, fall,

winter). More details are available in the reference cited above and the website <https://fitzlab.shinyapps.io/cityapp/>.



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Disclaimer

Report Purpose and Scope:

Parks identified for Legacy Restoration Funding in fiscal years 2023-2025 are required to develop a Great American Outdoors Act Facility Investment Plan (GFIP). The intended use of this series of park-specific reports is to help parks address Question 16 of the narrative template: *What risks or hazards (current and projected, e.g. effects of climate change) are likely to affect this project? If applicable, what adaptation strategies and/or resiliency measures have been identified for scenarios that pose high risks to project assets?*

Each report compiled and summarized published information on a suite of climate change hazards. Each report included an analysis of each hazard, for which the report author assigned a 'hazard rating' as follows:

Known hazard: Conditions that cause the hazard are well documented in the area where the park occurs. If applicable to the project site, these hazards should always be addressed in the project plan.

Potential hazard: Conditions that cause or underlie the hazard are known to occur nearby or are likely to occur based on studies with conditions similar to the park. If applicable to the project site, these hazards should be considered for inclusion in the project plan.

Not applicable: No evidence was identified showing this hazard is relevant to the park. Note this is a coarse filter evaluation; local knowledge of a hazard(s) should be used, when available.

As articulated within the report (in an appendix of the hazard ratings) those ratings constitute the author's 'best professional judgement' about the relevance of the hazard for that park based on the reviewed literature (cited in the narrative text for the hazard & provided in the report bibliography).

The intended use of each report is to inform decisions for facility investment planning related to (i) potential hazards that a suggested facility investment concept would need to appropriately consider and avoid or mitigate and (ii) identifying facilities possibly at greater relative vulnerability due to the identified hazards. The level of information quality in the report was calibrated to those purposes, i.e. to inform development of questions for a facility investment scoping process to further explore.

Peer Review Process:

Each report was based on a template, which heavily relied on boilerplate text for the non-park specific elements. The boilerplate text underwent multiple rounds of informal peer review by assorted CCRP staff, including members of the Climate Science and Adaptation Team, the Communications Team, the Regional Climate Change Liaisons, and the Climate Change Liaison to Facilities and Planning. Each report was peer-reviewed by a member of CCRP to check interpretation, consistency in hazard ratings, improve narrative coherence, and flag priority additions/modifications. In situations where revisions were required, the peer reviewer then re-reviewed the final revised report to assure adequate resolution of the identified issues.