# A Decision Framework for Managing Cultural Landscapes Impacted by Climate Change: A Preliminary Report

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#### Introduction

This article presents a summary of preliminary findings from a project underway to provide resource managers at all levels with a suite of potential strategies through which to develop landscape-specific action plans for responding to, and when possible mitigating, the impacts of climate change on cultural landscapes.

The project, sponsored through a grant from the National Park Service (NPS) National Center for Preservation Technology and Training (NCPTT), uses six cultural landscapes in national parks in the eastern United States to assist the research team to explore climate change impacts on the ground. The team queried the case study resource managers<sup>1</sup> and many other NPS staff<sup>2</sup> to better understand management challenges in each of the parks and related cultural landscapes.

This project does not provide exact or definitive solutions to the multitude of questions that arise regularly in this realm. The intent, rather, is to outline a broad framework for discussion; a framework that explores ways of approaching these problems for any specific cultural landscape.

As the impacts of climate change become more evident, the effects of these phenomena on NPS cultural resources require a concerted effort to understand the changes underway and develop appropriate management responses.<sup>3</sup> We need to fulfill our societal value of historic preservation, legislative and regulatory requirements, and expectations as well. For cultural landscapes, this may be especially difficult to achieve. Cultural landscapes, through their inherent dynamic nature, present particular problems when faced with the impacts of climate change. Whether through a sudden event or a long-term trend, these impacts may range from subtle to obvious, and present the resource manager with myriad preservation challenges. In the era of climate change in which we now find ourselves, it is valuable to un-

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derstand those challenges, yet recognize that climate change does not pre-empt established and tested policies, strategies, and techniques.

### Background

The project described in this article is founded on well-defined cultural landscape practices, and both established and evolving NPS policies, as well as recent events, particularly the 2014 NPS-organized workshop on Preserving Coastal Heritage in response to Hurricane Sandy.<sup>4</sup>We were especially mindful of the NPS Policy Memo 14-02:<sup>5</sup>

Climate change poses an especially acute problem for managing cultural resources because they are unique and irreplaceable—once lost, they are lost forever.... [and] the decisions we make and the priorities we set today will determine the effectiveness of NPS stewardship of cultural resources in the coming decades.

In addition there were numerous NPS publications about specific cultural landscapes, especially cultural landscape reports developed at the Olmsted Center for Landscape Preservation.<sup>6</sup> The project benefits from the ongoing work of the NPS climate change response teams both published<sup>7</sup> and in process. By the very nature of the work, the project relies on emerging climate science information, data, and insights into a realm of landscape change that can be at times both clear and challenging.

The established NPS policies and procedures regarding cultural landscapes are the foundation for the process described in this work. This includes sections 106 and 110 of the 1966 National Historic Preservation Act and all amendments,<sup>8</sup> park foundational documents, and other legislative and regulatory requirements.

The core of the NPS response to climate change is based on four pillars: science, adaptation, mitigation, and communication.<sup>9</sup> According to the NPS Climate Change Response Program, the adaptation strategy for cultural resources, including cultural landscapes, involves conducting vulnerability assessments, monitoring the condition of cultural resources as they are stressed by a changing climate, and identifying appropriate actions for at risk resources before the threat from climate change becomes acute.<sup>10</sup>

These are complex challenges that will benefit from knowledge, data, and expertise from a multitude of disciplines and professions. Robust teams likely will include planners, climate scientists, cultural landscape specialists, ecologists, biologists, botanists, civil engineers, architects, and other professionals as appropriate.

Although outside the realm of this project, the work builds, in part, on the recognition that established historic preservation guidance and codified procedure for cultural landscapes does not recognize the changing nature of climate. Specifically, the *Secretary's Guidelines for the Treatment of Cultural Landscapes*<sup>11</sup> assumes a predictable set of climate conditions, even though they may change from season to season or through yearly cycles. This is not meant as a criticism of those standards, but rather a recognition that we may need to think more deeply about our ways of approaching landscape preservation than presented here.

Additionally, as our climate changes and presents our society with increased pressures and stresses, the values that reinforce historic preservation efforts may also need to evolve.

This may be especially true in environments that face severe weather anomalies, such as droughts in California or the dramatic increase of snowfall in New England this year. Understanding the larger changes occurring in our climate and the impacts on cultural landscapes, however, helps us develop tools to respond to them.

## **Decision framework**

Climate change science reveals that impacts, while systemically global, affect different ecoregions in specific ways, at both the macro and micro scales.<sup>12</sup> This includes the most recognizable impacts, such as sea-level rise at Portsmouth Village, at Cape Lookout National Seashore in North Carolina,<sup>13</sup> to the more subtle ones, such as the changing bloom cycles due to rising temperatures and precipitation patterns at Saint-Gaudens National Historic Site in New Hampshire.<sup>14</sup>

Cultural landscapes will be threatened by specific climate change phenomena and impacts, requiring management decisions and actions that respond to those phenomena—whether a trend or an event—as well as a park's legislative mandate, management strategy, resource priorities, budget realities, and staff expertise.

This work provides a framework of options for managers to develop action plans in order to make informed decisions into the future about specific cultural landscapes. The proposed decision framework is based on three broad foundations and trajectories. First, the framework relies on the premise that cultural landscapes can only be protected or man-

**Figure 1.** The integrity of the spatial arrangement at Portsmouth Village, Cape Lookout National Seashore on the Outer Banks in North Carolina, is threatened by the continued inundation and ponding caused by sea-level rise. Photo by Olivia Burry-Trice, 2014.



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Figure 2. The cultural landscape and climate change decision framework that provides action plan options for park managers has three phases: research, planning, and stewardship.

aged if they are researched, documented, described, and evaluated. While this will most often mean the completion of a cultural landscape inventory (CLI) or a cultural landscape report (CLR) this may not always be feasible. Second, the framework recognizes that this work is in a nascent stage and will need to be tested, refined, and revised. Third, the framework understands that climate science is an evolving and developing field, providing updated data and analysis. Any refinement of the framework will require close attention to current climate science techniques, findings, and data, both globally and locally.

Although the three stages of this framework—research, planning, and stewardship—are presented in sequence, the practical implementation of this framework may mean reconsidering the conclusions reached at any stage in this process.

#### Research

In-depth research is a vital component of any project of this nature. The decision framework organizes the research agenda around two detailed categories: cultural landscapes, and climate projections and impacts.

Cultural landscape research is most often accomplished through a CLI or a CLR. In some cases, this may not be feasible, and a preliminary CLI or possibly limited documentation through a historic American landscape survey (HALS)<sup>15</sup> may be adequate. Regardless of the documentation method, it is critical that the cultural landscape, and especially its

**Figure 3.** Changes in historic forest conditions, including a decrease in overstory density and an increase in vegetation density within the understory, can be seen at Rapidan Camp, Shenandoah National Park, Virginia. Photo by Robert Z. Melnick, 2014.



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character-defining features, are recorded and evaluated. This is a first step leading to future decisions regarding actions to mitigate climate change impacts.

Parallel to the cultural landscape documentation, it is essential to understand climate projections for a cultural landscape's region and the known or projected impacts on the landscape's character-defining features. Since climate change is known or anticipated to affect different regions and locales in varying degrees, it is important to collect as specific data as available for each cultural landscape. This may range from sea-level rise to temperature and precipitation variations over short or long periods, to storm occurrence and intensity. For example, a region may have a gradual increase in average temperature and a gradual reduction in precipitation.<sup>16</sup> The impact of these projections on a given agricultural cultural landscape, for example, might be increasing drought conditions and stress on native plant communities as well as traditional crops.

#### Planning

The proposed planning phase requires identifying the climate drivers, potential robust response strategies, spatial and resources vulnerability assessment, and climate event triggers for both disaster response and long-term trends.

During this phase, management options may be developed and evaluated, including a range or suite of options, as well as balancing them through other considerations, such as budget, personnel, legislative mandates, research capacity, and knowledge base, prior to testing acceptable options.

The development of adaptation options cannot be done in isolation from other park circumstances. It is important that the responses to climate change be incorporated into existing policies and procedures. Although a newly recognized phenomenon, climate change should be considered with other concerns, including a level of flexibility that needs to be incorporated into plans to address climate change impacts.

There are a number of treatment options that are not mutually exclusive. They all require careful monitoring, evaluation, and documentation.

These broad approaches, in ascending order of intervention:

- Determine that the cultural landscape is not in immediate danger of negative impact and take no action.
- Attempt to mitigate the climate change stresses through action off-site from the cultural landscape, thereby offsetting the direct impact on the landscape.
- Improve cultural landscape resilience by making compatible alterations and additions that meet the *Secretary of the Interior's Standards for the Treatment of Historic Landscapes*. Resilience can be generally defined as the capacity to: absorb stresses and maintain landscape function in the face of external stresses imposed by climate change, and to adapt and evolve in order to improve the sustainability of the cultural landscape, leaving it better prepared for future climate change impacts.
- Allow change to occur in the cultural landscape, attempting to limit the impact to some character-defining features that are high priority and have higher feasibility for preservation.

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• Allow the resource to evolve—even deteriorate—without intervention, and take no adaptation action. Undertake extensive and detailed landscape documentation and data recovery.

Under this preliminary framework, the climate change projections and impacts are then aligned with the CLI and/or CLR to complete a vulnerability assessment, identifying, to the best extent possible, those character-defining resources that are most likely to be seriously impacted by climate change variables. The purpose of the vulnerability assessment is to anticipate, if possible, the broad impact of the climate change projections on the cultural landscape. It is critical at this step of the process, therefore, that the vulnerability assessment addresses those cultural landscape character-defining features previously identified through the established NPS CLI/CLR process.

It is also important to identify specific planning needs and impact triggers that will result in management actions. The triggers may be at the planning scale, such as longitudinal data that describes temperature variations over a number of years, or at the disaster response scale, such as the dramatic impact of a hurricane or tornado. In either case it will be important to identify the triggers that will put into play specific responses and actions, or at least their consideration.

## Stewardship

Stewardship is the long-term care of a cultural landscape by implementing ongoing preservation maintenance activities. Physical interventions include routine maintenance on a monthly, yearly, or multi-year cycle, as well as repair and replacement in-kind of severely deteriorated character-defining features.

Cultural landscape stewardship builds on the identification of climate change impacts, and involves the analysis of the specific changes that can be anticipated based upon the previous steps of research and climate projections. Clearly identifying the known and anticipated impacts, whether they affect the entire cultural landscape or specific character-defining features, is an essential step before adaptation options can be developed and implemented.

The goal of stewardship is to physically preserve and protect a cultural landscape by managing change without attempting to arrest it.

Adaptation describes the parameters of acceptable change more broadly, allowing change in order to preserve landscape characteristics and character-defining features to the greatest extent possible, while making substitutions or alterations to increase the resiliency or durability of the landscape.

This results in the adoption and implementation of management options, followed by monitoring of the appropriateness and success of these actions over time, and subsequent revisions as needed. This may also include the development of a new range of adaptations, depending upon the success of mitigation measures.

This is a dynamic process that may also require making difficult system-wide decisions, based on cultural landscape significance, budget personnel, and management priorities.

# Climate change adaptation options for cultural landscapes

Climate change adaptation options are a range of alternative management approaches to mitigate impacts on cultural resources. These options were developed by NPS,<sup>17</sup> and are adapted here for their application to cultural landscapes. It is important, however, to evaluate other impacts of these actions, as it may be possible to cause further damage in the interest of protecting the cultural landscape. In the above example, for instance, what impact might that additional shoreline have on the larger landscape, and is that desirable?

• *Take no active intervention.* Taking no action is a legitimate planning decision. This includes monitoring the rate and degree of landscape dynamics, to assess whether or not it is within the historic range. In the northeastern US, for example, projected changing temperatures are likely to negatively affect the health of several tree types.<sup>18</sup> As the rate of occurrence is still being studied and the unknowns can be addressed with time, a decision to take no action is a valid and often necessary decision.

**Figure 4.** The allee of birch trees and the hemlock hedges at Saint-Gaudens National Historic Site, New Hampshire, are contributing features to the landscape that act as visual screens, objects of interest, and enclosures. Potential loss of these resources, due to a shift in their growing region and other problems, will disturb the integrity of the resource. Photo by Robert Z. Melnick, 2014.



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- *Offset stress(es).* Removing or deflecting a stress can reduce or remove the environmental or other force(s) acting on the resource. The goal of this option is to enhance survival of a cultural landscape while minimizing changes to the physical materials and setting. Importantly, this includes consideration at a "landscape" scale, to ensure that the effort to deflect or remove a stress does not result in negative impact to the larger ecosystem. This may include both temporary and long-term measures. An example would be to design and construct an additional shoreline that attenuates wave destruction on the coast of a cultural landscape.
- *Improve resilience*. Improving resilience includes actions that change the nature and/ or setting and are designed to make the landscape more resistant or durable to environmental or other forces. The goal of this option is survival of the landscape, despite possible impacts of actions on its historic integrity. Special attention should be given to plant communities, soil structure, and natural systems. For example, in an environment with increased temperatures and more arid climates, aerating the soil to increase permeability may be an appropriate adaptation to enhance soil structure and reduce root compaction.<sup>19</sup>
- *Manage change*. This option requires a broader acceptance of change as an essential process and itself often character-defining. The goal is to maintain character-defining fea-

**Figure 5.** The remnant dike structures at Dyke Marsh Wildlife Preserve, George Washington Memorial Parkway, Virginia, are significant cultural resources threatened by water level rises and increased storm events. Photo by Veronica Malinay, 2014.



tures of a landscape, even if original specific materials or individual species are no longer present. In historic nut orchards, for example, as part of a normal agricultural practice, trees reaching the end of their productive cycles are regularly removed and replaced.<sup>20</sup> This may require the addition of species that are resilient to changes in climate patterns.

- *Relocate/facilitate movement.* In the NPS climate change strategy, relocating or facilitating movement includes two types of actions: (a) moving a resource, and (b) allowing movement to happen. For cultural landscapes, this is an unusual or rare instance and movement is obviously not feasible for a whole landscape. This option may be an appropriate choice for character-defining features of a landscape once it is determined that the whole cannot be saved; for example, allowing for the migration of character-defining vegetation that is threatened by saturation or inundation to a more upland location that is better drained.
- Document, observe, and release. Document, observe, and release records a landscape • and then subsequently allows it to undergo full effects of environmental or other forces that are likely to destroy or remove all or portions it. Documentation may be exhaustive, but may also be done at a less-than-exhaustive level. This approach may be appropriate when exhaustive approaches are not feasible (due to limitations in access, or time, human capacity, or financial constraints), not warranted (due to the nature and scale of impacts), or there is merit in not recovering or preserving the whole of the resource (such as an archaeological site that may become inaccessible due to submergence, but is not anticipated to be fully destroyed). Other examples of documentation techniques that may be used in either approach include collection of pollen and seeds or plant cuttings, and oral histories and video. For cultural landscapes, it may also be especially valuable to include video recording, to ensure that the three-dimensional aspects of the landscape are documented to the best extent possible. Additionally, tools and techniques such as infrared aerial photography should be considered to record those features, such as abandoned roadbeds, that are no longer visible to the naked eye. It is necessary to document the cultural landscape during different seasons, as conditions will change throughout the yearly cycle.
- Interpret the change. Interpreting the change engages people in the future with the effects of climate change on a resource. It is an educational activity, and may be used on its own or in combination with any of the other options. A dramatic example would be preservation of a coastal resource such that its location and form remains either intact or otherwise visible from the coast once it is offshore or partially submerged (e.g., construction of an off-site structure to attenuate wave-induced erosion). Other examples include interpretation signage of changing ecosystems, or photo series of changes in garden phenology or vegetation across a landscape.

Interpretation in this context addresses not only preservation and history of the landscape, but also climate change itself, and seeks to tell the story of the place and climate change and how they are interacting. This also includes interpreting landscape change during and since the period of significance, to better demonstrate the impact of climate change within the context of landscape dynamics. Landscape interpretation also provides an educational opportunity, telling the ongoing story of the integration of natural and cultural systems.

# Project limitations and future work

As is evident in this report, fieldwork for this project was limited to six cultural landscapes in six parks in the eastern United States. Future phases must expand the study to include sites in the western United States, for example, with special attention to landscape types that were not represented in the original six. This may include, for example, arid landscapes, Pacific islands, high-mountain landscapes, and Pacific Northwest coastal zones.

The intention is to conclude the project with a manual of proposed actions for resource managers, building on the work briefly described in this article.

There are no easy answers or responses to these difficult challenges, but we can be creative, imaginative, and practical. Adhering to our standard or established historic preservation practices, however, is no longer a viable option in a world in which drastic change seems inevitable, if not always predictable.

## Endnotes

- 1. Brent Steury, Ann Kane, Marilou Ehrler, Michael Rikard, Rick Kendall, Deidre Gibson, and Amy Ruhe.
- 2. Special thanks to Shaun Eyring, Susan Dolan, and Marcy Rockman.
- 3. National Park Service, Climate Change Response Program, *Planning Brief: Flexible Planning in an Era of Uncertainty* (Washington, DC: NPS, 2014).
- 4. National Park Service, *Preserving Coastal Heritage Workshop Summary Report* (Washington, DC: NPS, 2014).
- 5. Jonathan B. Jarvis [National Park Service director], Policy Memorandum 14-02: "Climate Change and Stewardship of Cultural Resources," February 10, 2014.
- 6. John Hammond, Shenandoah National Park, Madison County, Virginia: Rapidan Camp Cultural Landscape Report (Boston: NPS, Olmsted Center for Landscape Preservation, 2014); National Park Service, Cultural Landscape Report for Jacob Riis Park, Gateway National Recreation Area (Denver: NPS Denver Service Center, 1992); Wiss, Janney Elstner Associates, Inc. and John Milner Associates, Inc., Cape Lookout National Seashore, Carteret County, North Carolina: Portsmouth Village Cultural Landscape Report (Atlanta: NPS, Cultural Resources Southeast Region, 2007); Lisa Nowak and Margie Coffin Brown, Saint-Gaudens National Historic Site Cultural Landscape Report for Aspect Volume II: Recent History, Existing Conditions, and Analysis (Boston: NPS, Olmsted Center for Landscape Preservation, 2009); National Park Service, Cultural Landscape Inventory: Washington's Headquarters/Village of Valley Forge Component Landscape—Valley Forge National Historical Park (Charlottesville, VA: Oculus, 2000).
- 7. For example, Caitlin Smith, *Climate Change and Cultural Resources: Impact Assessments and Case Studies* (Washington, DC: NPS, 2011).
- National Historic Preservation Act of 1966, as amended through 2006 (Public Law 89-665; 16 USC 470 et seq.)

- 9. NPS, Preserving Coastal Heritage Workshop Summary Report.
- 10. NPS, Planning Brief: Flexible Planning in an Era of Uncertainty.
- 11. National Park Service, *The Secretary of Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes* (Washington, DC: NPS, 1996.)
- 12. Environmental Protection Agency, "Impacts & adaptation" (unpublished report, 18 March 2014).
- Stanley R. Riggs and Dorothea V. Ames, Effects of Storms on Barrier Island Dynamics, Core Banks, Cape Lookout National Seashore, North Carolina, 1960–2001 (Reston, VA: US Geological Survey, 2007).
- 14. Environmental Protection Agency, "Northeast impacts & adaptation" (unpublished report, 9 September 2013).
- 15. National Park Service, "HABS/HAER/HALS" (unpublished report, 1 March 2013).
- 16. J. Alder, USGS Regional and Global Climate Change Viewer. Online at http://regclim. coas.oregonstate.edu (accessed 23 February 2014).
- 17. National Park Service, *National Park Service Climate Change Response Strategy* (Fort Collins, CO: National Park Service Climate Change Response Program, 2010).
- Environmental Protection Agency, *Climate Change: Northeast Climate Impacts*. Online at http://www.epa.gov/climatechange/impacts-adaptation/northeast.html (accessed 1 March 2015).
- For example: Guihua Chen, Ray R. Weil, and Robert L. Hill, "Effects of compaction and cover crops on soil least limiting water range and air permeability," *Soil and Tillage Research*, vol. 136 (March 2014), pp. 61–69; T.T. Kozlowski, "Soil aeration and growth of forest trees (review article)," *Scandinavian Journal of Forest Research*, vol. 1 (December 2008), pp. 113–123.
- 20. For example, Fort Ross Conservancy, *Historic Orchard at Fort Ross*. Online at www. fortross.org/orchard.htm (accessed 12 February 2015).
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