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Natural Resource Stewardship and Science

Integrated Coastal Climate Change Vulnerability Assessment

Colonial National Historical Park

Natural Resource Report NPS/COLO/NRR—2019/1945



ON THE COVER
Photograph of the Ambler House on Jamestown Island
Photograph courtesy of the National Park Service

Integrated Coastal Climate Change Vulnerability Assessment

Colonial National Historical Park

Natural Resource Report NPS/COLO/NRR—2019/1945

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Executive Summary

A climate change vulnerability assessment which integrated issues across natural resources, cultural resources, and facility assets, was conducted between May 2016 and February 2017 for Colonial National Historical Park (NHP). This was a rapid assessment using existing data and expert knowledge to understand the general trends in vulnerability across three time frames – 2020, 2050, and 2100 – and the risk to the park's goals. This assessment is a pilot of a method to combine these three resource types and to seek areas of integration that could increase the depth of understanding of the issues and seek opportunities for timely and sufficient action. The assessment broadly covers all of the resources in Colonial NHP and includes areas that are held by Preservation Virginia, since issues on the respective sites are similar and they have been key partners in the assessment.

Findings

- Colonial NHP is experiencing impacts from climate change and these impacts will increase in severity and scale. These changes could jeopardize the park's management goals if no action is taken over the coming decades. The majority of resources will be highly vulnerable by mid-century; while climate change impacts will be ongoing through the end of the century and beyond, much damage may already have been done by the middle of this century (Figure 1).

- Jamestown Island and the shoreline of the James and York River have been eroding for hundreds of years. By 2100, projections suggest much of Jamestown Island will be inundated. Roughly two-thirds of Colonial Parkway runs parallel to the York and James River shorelines, and the road structure, bridges, and culverts are at risk of erosion and resulting damage.

- Of the 59 prehistoric and historic archaeological sites identified in a 1995 study of Jamestown Island, two have been entirely lost to coastal erosion and sea level rise, and another 24 have been damaged (Blanton et al. 2000; Bassett, 2016). By 2065, only two archaeological sites on Jamestown Island will be entirely above water (Bassett, 2016). Historic structures in the Yorktown Village area including Archer Cottage, and Cornwallis Cave are flooding with increasing frequency.

- Common issues were identified as a way to look at shared vulnerabilities and opportunities for coordinated planning among the Cultural Resources, Natural Resources, and Facilities Divisions. The priorities targeted flooding, storm surge, and erosion of Jamestown Island, key parts of Colonial Parkway, and the Glasshouse Point complex.

- Many of the park's cultural resources are vulnerable to climate change. The main challenge will be to allocate priorities among the resources that need attention. The following cultural sites were prioritized based on a combination of vulnerability, significance of the resource, and management's capacity to act. These are the Early Archaic Camp, Sir Yeardley Site, Yorktown Redoubt 10, Jamestown seawall (Preservation Virginia property), Colonial Parkway, and Jamestown Island Area Cultural Landscape.

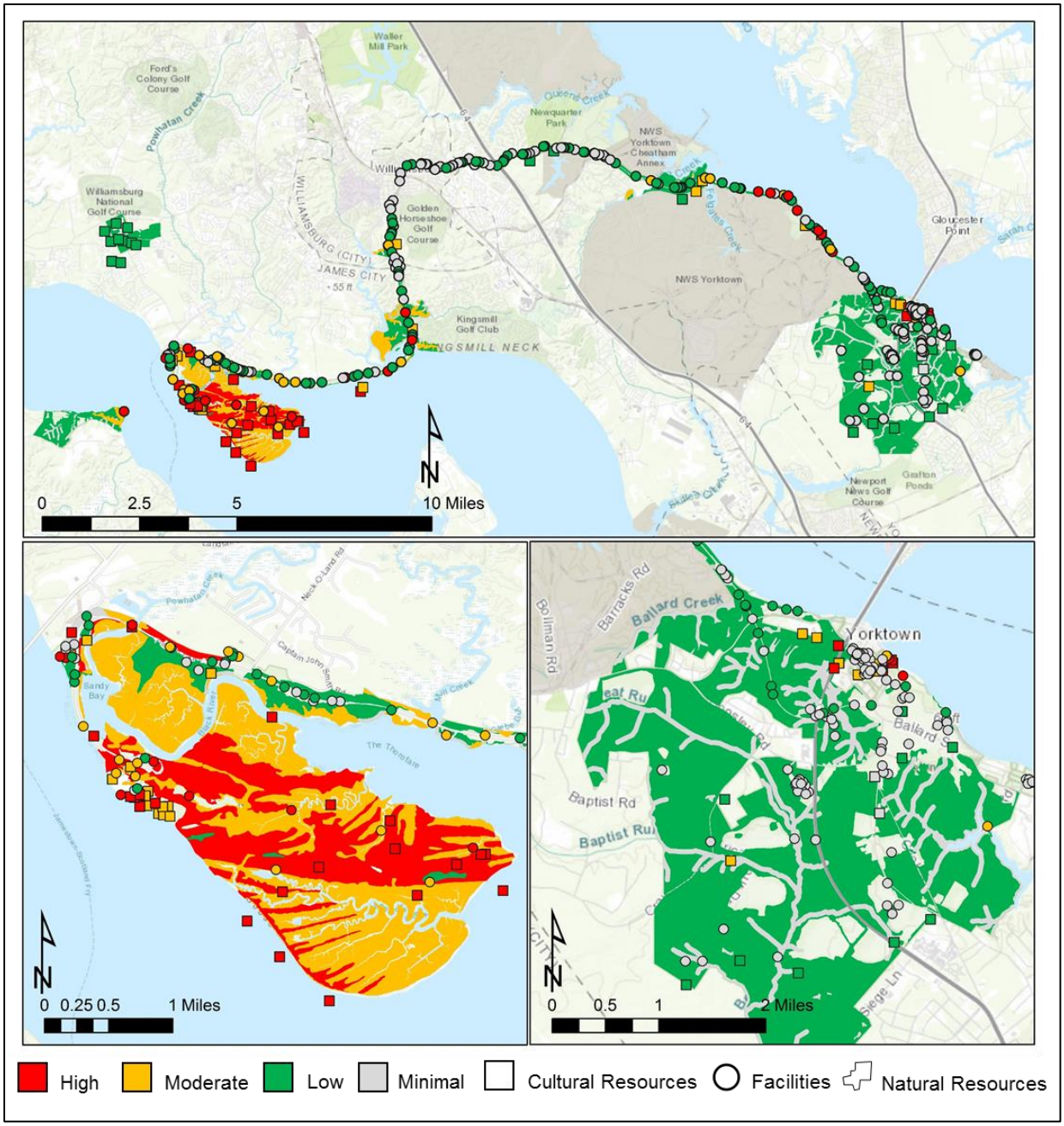


Figure 1. Overview of vulnerability scores based on climate projections for 2050 at Colonial National Historical Park, Virginia.

- Prioritization of cultural resources and decisions for actions should be done as soon as possible. Climate change is underway, and resources are already being impacted.
- The outcomes of this study can guide cultural resource managers to work with other divisions on resources of mutual concern for the sites as they are prioritized. Also important is to coordinate with outside partnerships to work on these Cultural Resources climate

vulnerabilities. The outcomes are not intended to stand alone, but to advise the development of research questions and partnerships.

- For natural resources, Jamestown Island is the greatest concern and a large proportion of its tidal marsh and tidal riparian forest is at high risk of loss or transition to other habitat types and open tidal waters. There are some indications that these gradual transitions are ongoing but are not yet captured in the monitoring data (Nicosia 2015). Tidal riparian forest is highly vulnerable throughout the park. In light of these dramatic expected changes, the goals for natural resources are likely to need to be updated to incorporate the significant changes that will be realized given the scenarios used in this assessment. The park seeks to protect ecosystem integrity as long as possible while recognizing that some habitat types will be reduced and transition to other categories. The park should also strive to increase ecological resilience of bird habitats, and amphibians and reptiles (herps). Slowing the loss of marsh ecosystems on Jamestown Island to maintain priority habitats and cultural landscape features should be viewed as an opportunity to interpret climate change and management response to changes as part of the visitor experience. Increased monitoring and research are crucial elements in achieving these updated goals.

- Facility assets along the low-lying coastal areas are vulnerable in a few key areas with 11% of structures and 18% of transportation assets rated as moderate to high vulnerability, representing over $238 million in assets at risk. Based on the projections and conservative exposure stressors over time, there are no changes in vulnerability between 2020 and 2100 except for the Jamestown outer loop road that will increase to high vulnerability in 2100. For Facilities, localized areas of concern included the Jamestown loop roads and shoreline protection, and the York River section of the Parkway due to erosion. An opportunity exists to improve the drainage around the historic buildings on Yorktown Bluff to protect the cultural resources and support potential third party use through lease agreements or concessions, which is a priority for Yorktown.

- Despite the moderate to high vulnerability of resources, for many resources and assets there is significant adaptive capacity. In addition to looking at the adaptive capacity for each individual resource or asset, there is the need to examine combined adaptive capacity among resources at a site or as a system. Matrices comparing vulnerability to adaptive capacity were produced to support a systematic view of the issues.

- The results of the vulnerability vs adaptive capacity matrix comparison organizing resources into four quadrants show groupings of vulnerability of park resources where there are opportunities to adapt and others where the park may have to reconsider management goals. If no actions are taken in advance to manage the vulnerability, it jeopardizes the ability of the park to meet its management goals in the coming century.

Recommendations

Incorporate Findings into Other Activities

A core principle of this assessment was to ensure that the process and results lead to follow-up actions. Participants saw the value of the climate change vulnerability assessment in providing information useful for varied elements of NPS work:

- Mainstream climate vulnerability information into other planning processes such as:
    - Foundation Document updates
    - Resource Stewardship Strategy
    - Work plans for divisions
    - NEPA (National Environmental Policy Act) compliance
    - Section 106 and 110 National Historic Preservation Act compliance
    - Capital Investment Strategy
    - Hurricane Preparedness Planning
- Support for partners (i.e. Preservation Virginia) and collaboration on efforts
- Baseline and existing condition reports
- Develop and prioritize archaeological research

Jamestown Island

- Short-term measures:
    - Interpret the ongoing change.
    - Maintain current access in order to help preserve and communicate the story.
- Conduct continuous environmental monitoring of the landscape, especially groundwater, to provide important information about the ongoing process of change. Park managers may need to let resources transition rather than pursue costly interventions that will have limited long-term effectiveness.
- Continue to document and excavate archeological sites, with timing dependent on continued monitoring of the pace and nature of shoreline and groundwater change.
- Modify the way visits to Jamestown Island are interpreted to make even stronger connections to the challenges which the original inhabitants and the colonists faced in living in a dynamic coastal plain.

- Compile and review all recent plans and detailed proposals on shoreline protection as part of updating the shoreline management plan. Update the shoreline management plan (Hardaway et al. 1999) for Jamestown Island to take the climate projections and findings of this vulnerability assessment into account.

- Develop a better understanding of sediment supply to the island, the condition of fringing marsh and its role in preventing or its susceptibility to edge erosion. Review technologies and methods that could expand the suite of adaptation options for the park to consider.

- Continue to work with municipalities and other partners to understand and manage stormwater runoff.

- Explore the potential to move collections to Yorktown before a more permanent storage solution is available.

- Monitor upland pond vegetation changes to understand the water table and the potential impacts on buried archaeological resources.

Colonial Parkway

- Address the immediate risk of erosion near the Colonial Parkway in sections by York River.

- Improve the stormwater runoff and revise culvert maintenance plan, including pursuing additional funding or design modifications, to reduce the likelihood of parkway flooding and closures by collaborating with adjacent jurisdictions and large landowners.

- Identify areas where natural resources could be used to protect the parkway infrastructure.

- Coordinate analysis and planning with the Federal Highway Administration to avoid actions that reduce ecological resilience over a longer time frame as there are only a few windows of opportunity before major investments are made that will influence adaptation options for decades to come.

Glasshouse Point

- Maintain the natural shoreline habitat to buffer from storm events.

- Begin discussions with the existing concession business at the Glasshouse Factory to discuss adaptation strategies and implementation timing.

- Initiate proper cultural resource documentation and interpretation for the Glasshouse Ruins should an extreme storm event occur in the short-term while also preparing for a medium-term strategy.

Highlighted Resources of Concern by Division

Cultural Resources

- Continue and seek partnerships including with Preservation Virginia and Virginia Institute of Marine Science (VIMS).
- Seek funding, including from the United States Army Corps of Engineers and NPS Civil Rights Initiative.
- Excavate sites that cannot be saved. Where appropriate and when possible, begin phase III archaeological excavations. Conduct further investigation into at-risk but poorly understood sites.

Natural Resources

- Increase ecological resilience and support ecosystem integrity and biodiversity while recognizing that some habitats are going to transition to another category. In particular, the park focuses on protecting herps (amphibians and reptiles), bird habitats, and marsh ecosystems on Jamestown Island as long as practical.
- Maintain physical access as long as practical, with the understanding that access may be different and more limited in the future.
- Coordinate with Cultural Resources around marsh migration monitoring and expected timing related to the role of changing habitats in the cultural landscape. It may also be relevant for access for adaptation strategies that include archeological resource recovery or protection in place.
- Expand monitoring and research in order to address data needs.
- Continue to work with York County to enforce stormwater management measures to protect Yorktown's non-tidal riparian forest.
- Control invasive species to prevent loss of native species. Phragmites on Jamestown Island is of particular ongoing concern.
- Interpret climate change and management response to changes as part of the visitor experience as habitat transitions take place.

Facility Assets

- Coordinate with Cultural Resources and Natural Resources Divisions on integration issues.
- Review the priority list and sort by timeline, available resources, and sequencing. Seek win-win options with other divisions and partners to reduce barriers for change.

- Fully develop the decision points that add in the lag time, unique to Facilities and transportation sector, between initiating planning and when the funding is provided to stay ahead of the changes in climate.
- Fully assess and document the state of culverts.

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List of Acronyms

AC	Adaptive capacity
APVA	Association for the Preservation of Virginia Antiquities
ASMIS	Archeological Sites Management Information System
CLI	Cultural Landscape Inventory
DOI	Department of Interior
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FMSS	Facilities Management Software System
HML	High, moderate, low
IPCC	Intergovernmental Panel on Climate Change
LiDAR	Light Detecting and Ranging
LSC	List of Classified Structures
NER	Northeast Regional Office (of the National Park Service)
NHP	National Historical Park
NOAA	National Atmospheric and Oceanic Administration
NPS	National Park Service
NRCA	Natural Resource Condition Assessment
POSE	Adaptive capacity categories: physical, organizational, social, and economic
ppt	Parts per thousand
RCP	Representative Concentration Pathway
SLAMM	Sea Level Affecting Marshes Model
SLOSH	Sea, Lake, and Overland Surges from Hurricanes
SLR	Sea level rise
SOP	Sustainable Operations Program
USACE	U.S. Army Corps of Engineers
USGS	United States Geological Survey
VIMS	Virginia Institute of Marine Science
WCU	Western Carolina University

Introduction

As a low lying coastal site, Colonial National Historical Park (NHP) faces serious issues in the coming decades due to climate change. Before undertaking adaptation planning, Colonial NHP partnered with the National Park Service (NPS) Northeast Region (NER) and the Coastal Resources Center at the University of Rhode Island (URI) to undertake this pilot vulnerability assessment to understand integrated vulnerability across natural resources, cultural resources, and facilities assets. This effort built on other NPS efforts focused on individual resource types, to develop a framework that can be applied at other parks, using existing data, modeling, and qualitative expert judgments. A separate methods report (Ricci et al. 2019) provides the details of the methods developed in this assessment.

Purpose of the Assessment

An integrated climate change vulnerability assessment was conducted to gain a deeper understanding of how the park is vulnerable and identify key linkages among the divisions. Colonial NHP is the first in the NPS system to develop and test an integrated vulnerability assessment for a coastal park targeting these three divisions, based primarily on the effective use of available information. These methods are intended to be transferrable to other coastal parks with a range of available resources, and could be further modified to be applicable to non-coastal parks.

The goals of the assessment were to help park managers identify and choose adaptation actions for priority vulnerable resources and assets, justify actions, and pursue funding to implement adaptation actions. Managers will also be able to determine investment priorities for resources that are highly vulnerable but have low adaptive capacity. This report is intended to both support parkwide planning efforts and to be a useful tool for each division to use for its own purposes.

At the conclusion of this pilot project, the expectation was that park staff would be able to:

- identify the time series of changes likely to occur across the park in the time frames of 2020, 2050, and 2100,
- explain the major linkages across the natural resources, cultural resources, and facility assets,
- identify the co-benefits across these three divisions for potential action,
- provide recommendations on actions that can be taken to keep adaptation options available.

The vulnerability assessment relied primarily on existing data, local knowledge, and subject matter expertise. Many existing science products contributed to the feasibility of applying the methodology, though the challenges of working across different resources and scales in a relatively rapid process meant that a variety of valuable data was not able to be included (Lookingbill et al. 2012; Gonzalez, 2015; Caffrey, 2015). The process combined this best available science and tools with qualitative expert judgment captured through the workshops.

The assessment broadly covers the entire park area as well as areas that are held by Preservation Virginia, with further attention to focal areas for integrated discussion. Each workgroup selected which resources and assets to include differently; details can be found in the accompanying methods document (Ricci et al. 2019). Preservation Virginia representatives played a significant role in the Cultural Resources Workgroup and they have been key partners in the assessment since they manage the location of James Forte which is a fundamental resource to all other early colonization-related sites on Jamestown Island. Individual resources on Preservation Virginia property were not included in those scored. The project benefitted greatly from the engagement of those leading the broader discussion of how to combine natural resources, cultural resources, and infrastructure within a single vulnerability assessment.

Setting overall priorities for adaptation within Colonial NHP will require taking the vulnerability of its natural resources, cultural resources, and facility assets into account. The vulnerability scoring should assist each division when setting planning priorities or targeting funding sources and for park-wide planning where there are opportunities and trade-offs among resources.

Climate change impacts, such as sea level rise, on cultural and natural resources as well as infrastructure are not specifically identified in the Colonial NHP General Management Plan prepared in 1993, however concerns about coastal flooding, storm and hurricane impacts, and salt water intrusion were recognized (Colonial National Historical Park, 1993). Climate change impacts have become specific concerns in light of increased frequency and intensity of climate related events impacting park and adjacent infrastructure, changing natural resource features and wildlife habitats, and causing loss of or damage to sensitive cultural resources. For example, storm surge from Hurricane Isabel in 2003 inundated the shoreline and flooded historic structures and the Jamestown archival collection. The storm damaged the previous visitor center and inflicted serious shoreline erosion impacts to other park structures and natural and cultural resource sites.

The three different resource types required different indicators of exposure, sensitivity, and adaptive capacity. Regarding cultural resources, the team discovered it was necessary to tailor sensitivity indicators to each cultural resource type: archeological resources, cultural landscapes, ethnographic resources, museum collections, and buildings & structures. Assessment of cultural resources incorporates information such as archaeological condition assessments and threats included in the Archeological Sites Management Information System (ASMIS), Cultural Landscape Reports from the Cultural Landscape Inventory (CLI), and historic structures information from the List of Classified Structures (LCS). Links were made to a museum program risk assessment for collections facilities by the NPS Park Museum Management Program that was underway at the time of this assessment (McCann et al. 2016). Facilities methods development was greatly enhanced by the coordination with the NPS's Sustainable Operations Program (SOP) to incorporate the methods derived from the Coastal Hazards & Climate Change Asset Vulnerability Assessment Protocol (NPS, 2016) and its implementation concurrent with this project (NPS, in prep).

Context of Integrated Studies in NPS

Current NPS guidance recommends an integrated approach to assessing resource vulnerability. Clear and well-tested methods for doing this are still being developed. Examples of this approach

completed to date include a review of existing vulnerability assessments for coastal parks in the northeast region and a handbook by NPS for coastal adaptation strategies (Ricci et al. 2017; Beavers et al. 2016). This is the first effort explicitly integrating cultural resources, natural resources and facilities assets though previous assessments have integrated cultural and natural resources (Amberg et al. 2012).

The idea for developing a relatively rapid assessment method was to use the best available science and capture existing knowledge into a system that could be iteratively updated as new information becomes available. To gather expert judgement, a broad team of experts was assembled, which included park, regional, and Washington office NPS staff, long term partners such as Preservation Virginia and academic research collaborators from the VIMS and other institutions. The vulnerability assessment set out from the beginning to engage all three divisions of the park both in information gathering and the workshop process by creating workgroups to prepare for and help lead the three assessment workshops. These provided opportunities for each division to advance the assessment as well as for the entire group to listen, engage, and reflect on aspects of the assessment in plenary and mixed group exercises.

It should be noted that the three divisions have different communication practices, such as level of description included in a report. Thus this report includes differing levels of descriptive detail, in order that it can be a useful document for each division to use on its own, as well as for the integrated vulnerability discussion.

Assessment Framework

Scanning the Conservation Horizon (Glick et al. 2011) has served as a guidance document for vulnerability assessments in many national parks and conservation areas. While Glick et al. (2011) and much of the natural resource literature on vulnerability and the Intergovernmental Panel on Climate Change (IPCC) has come to a consensus definition that vulnerability is a combination of exposure, sensitivity, and adaptive capacity, for the NPS and its focus not only on natural resources but also on non-living resources and assets there have been recognition that a different framework for addressing adaptive capacity is needed. Within the NPS, methods to define vulnerability for Facilities and non-living Cultural Resources recommend not including adaptive capacity within vulnerability, and instead defining vulnerability as the combination of exposure and sensitivity (NPS, 2016, Rockman et al. 2016). Further discussion of this difference is in the accompanying methods report (Ricci et al. 2019). In this pilot project, workshop discussions suggested the experimental approach of defining adaptive capacity of a resource more broadly than in other frameworks, and including extrinsic factors that ultimately express the capacity of resource and asset managers to manage vulnerability. Key factors include social, organizational, and economic capacities. Since these factors are not inherent to the resource, we chose to assess adaptive capacity separately from vulnerability, even for natural resources. Although this approach cuts against the established approach for natural resources (e.g., Beever et al. 2015), participants felt that this approach would be worth exploring because of potential advantages it offered for communication and planning purposes. Specifically, the notion of adaptive capacity as an attribute that reduces vulnerability was thought to counteract the park's ability to make a strong case for highlighting the importance of a likely problem and could

limit the ability to acquire the resources needed to adapt. Park staff believe that the vulnerability score based solely on sensitivity and exposure, without modifications from adaptive capacity, may be helpful in targeting research questions, prioritizing research efforts, selecting adaptation methods, and allocating funding.

Vulnerability is the degree to which a resource, asset or process is susceptible to adverse effects of climate change, including climate variability and extremes. Figure 2 provides an overview of how vulnerability and adaptive capacity were determined for this pilot effort. Exposure is the magnitude of change in climate and other stressors that a resource, asset, or process has already or may experience in the future. Exposure was calculated using climate projections in 2020, 2050, and 2100 for a range of climate stressors, based on the Intergovernmental Panel on Climate Change (IPCC) Representative Concentration Pathway (RCP) 8.5 where available, depending on the stressor. A climate stressor is a condition, event or trend related to climate variability and change that can exacerbate hazards. Sensitivity is the degree to which a resource, asset, or process is or could be affected, either adversely or beneficially, by climate variability or change. Adaptive capacity was assessed separately and used as a tool to bridge the vulnerability assessment and future adaptation planning processes.

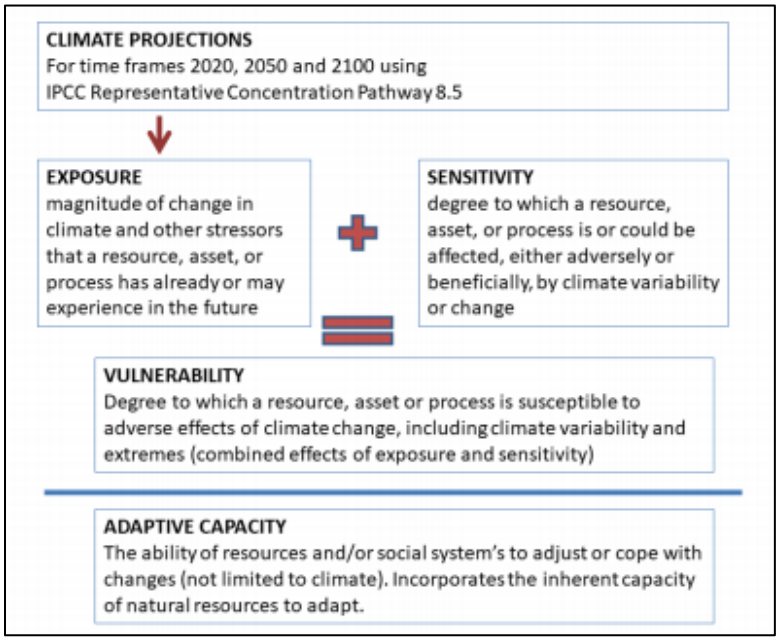


Figure 2. Overview of the climate change assessment framework adapted for this pilot vulnerability assessment at Colonial National Historical Park, Virginia.

Details of the exposure and sensitivity methods are further explained in the accompanying Methods report but further explanation about adaptive capacity is provided here (Ricci et al. 2019). To estimate adaptive capacity each workgroup carried out an analysis using a simple framework that divided the concept into four key types of capacities – Physical, Organizational, Social, and Economic (POSE) (adapted from Bruneau et al. 2003). Every resource/asset received an adaptive

capacity score, except for facility assets that were not exposed and thus automatically scored as minimal for vulnerability.

Physical capacity refers to the physical properties of systems, including the ability to resist damage and loss of function or to evolve into a new desired functional state. Physical properties include natural characteristics (e.g. wetlands that can vertically accrete or migrate upland) and infrastructure (vehicles, boats, gear, facilities). The method distinguishes between two following aspects of physical adaptive capacity:

> **Intrinsic**, sometimes referred to as natural adaptive capacity, is the ability of the species or habitat to resist climate impacts or re-establish itself in a changed environment. This is the component that for natural resources is usually included in vulnerability (Glick et al. 2011). The natural resources workgroup considered including it in vulnerability, but it was decided to keep separate for consistency with other workgroups. For natural systems within the park, the assessment of sensitivity to climate impacts includes some consideration of short-term response; the adaptive capacity analysis takes a longer-term perspective.
>
> **Technology/Infrastructure** refers to the availability of engineered or technical means to resist impact or to aid in migration, re-establishment or creation of similar habitat or the availability of infrastructure needed to adapt (vehicles, boats, gear, facilities), such as to move a resource.

Organizational capacity relates to the organizations and institutions that manage the physical components of the systems. This domain encompasses measures of organizational capacity, planning, training, leadership, experience, and information management that improve organizational performance and problem solving. This includes factors such as legal mandates or prohibitions and the need for conflict resolution among competing priorities.

Social Capacity considers the degree of public interest and support for adaptation actions, potential conflicts with neighboring land uses, and competing values of maintaining the cultural landscape versus allowing ecological processes to proceed. NPS sites often contribute to a community's sense of place and the local economy, and community members frequently develop strong interests in the preservation of the resources. These can influence the NPS's willingness to act even when they have the authority to do so. Non-local communities interested in the asset should also be considered as they could be influential in the ability to act.

Economic Capacity is the financial cost of implementing climate adaptation measures or the loss caused from damage due to climate impacts. For example, shore protection structures may provide temporary protection but are expensive, while allowing wetlands to migrate as impacts occur would be low cost. Protecting visitor centers and historic structures is also a significant economic activity which includes maintenance and recovery from hazard events. The NPS can also utilize partner funding so the discussion should include all sources of likely funding.

To guide the scoring of adaptive capacity within each of the POSE categories, relevant factors were identified to focus discussion; which and how many of these were considered varied by resource (Table 1).

Table 1. Examples of factors that could be considered within each of the four Physical, Organizational, Social, and Economic (POSE) capacity categories adapted for this pilot vulnerability assessment at Colonial National Historical Park, Virginia.

Physical	**Organizational**	**Social**	**Economic**

• Natural-intrinsic
  ○ Health
  ○ Abundance
  ○ Protection
  ○ Sensitivity to current impacts
• Infrastructure
  ○ Transportation (boats/vehicles)
  ○ Facilities
  ○ Shoreline structures
  ○ Monitoring protocols
  ○ Technology
	• Laws/Authority
	• Coordination
	• Agreements (formal and informal)
	• Plans
	• Implementation
	• Enforcement
	• Staffing - number of staff (term vs seasonal) and training
	• Transparency
	• Accountability
	• Meets multiple goals (across NPS divisions)
	• Number of viable management options (don't select them, just recognize the variety available)
	• Willingness to take effective action
	• Willingness to take timely action
		• Significance (across a variety of sectors/communities)
		• Cohesion
		• Community organizations and associations
		• Trust
		• Diversity of livelihoods, culture and language
		• Awareness
		• Conflicts
		• Equity (gender, financial)
		• Perceptions
		• Culture
		• Values and attitudes
		• Champions (leaders that support effort)
		• National interests
		• Constituencies dedicated to an asset
			• Base funding
			• Competitive funding
			• Congressional line items
			• Emergency funding
			• Administrative system to disburse finances in timely fashion
			• Likely scale of economic resources required to do a variety of actions

Since this assessment separated adaptive capacity from the vulnerability formula, it is valuable to show the relationship between the two for each resource/asset assessed. This is displayed through a matrix of vulnerability vs adaptive capacity for focal areas or resources/asset groupings. The following fur general concepts were assigned to each quadrant of the matrix that captures the general context based on the vulnerability and adaptive capacity scores:

- **Monitor for Change:** For low-vulnerability and low-adaptive capacity situations the term "monitor for change" was applied with the assumption that while these resources appear to be low priority for now, the situation can change.

- **Quick Wins:** For low-vulnerability and high-adaptive capacity situations the term "quick wins" was applied with the assumption that these resources may provide opportunities to begin adaptations using existing capacity.

- **Serious but Actionable:** For high-vulnerability and high-adaptive capacity situations the term "serious but actionable" was applied with the assumption that these resources are a priority due to their vulnerability and there is existing capacity to address them individually or preferably in an integrated way with similar resources.

- **High Concern - Reconsider Goals:** For high-vulnerability and low-adaptive capacity situations the term "reconsider goals" was applied with the assumption that there isn't sufficient existing capacity to address these highly-vulnerable resources and there is the chance that NPS goals will not be met should the vulnerabilities turn into impacts over time. In such circumstances, more realistic and achievable goals should be drafted.

Going forward, Colonial NHP would benefit from integrating adaptation planning into existing planning processes. Guidance for cultural resources to prioritize adaptation planning based on the combination of vulnerability and significance mean that a process to assess significance across resources will be needed (NPS, 2014; Rockman et al. 2016). The following two approaches were tested as example exercises of how vulnerability assessment results can be applied towards adaptation planning (Haasnoot et al. 2013; Barnett et al. 2014).

- **Decision Points:** Mixed workgroups were asked to consider focal areas of concern, Jamestown Island for example, that contain all three types of resources and consider the likely park management decisions that need to be made as part of routine management as the climate change impact scenarios unfold. A simple example is to determine whether portions of the loop road system should no longer be maintained at a level that could support vehicle traffic, and instead be replaced by pedestrian and bicycle paths. Decision Points attempted to place qualitative thresholds for acceptable vulnerability where action would be highly advantageous.

- **Adaptation Pathways:** Building on the Decision Point exercise, the workgroups brainstormed a menu of potential adaptation options. Each option was assessed for how long it might be effective based on climate change projections. Then, a simple pathways graphic of the options was produced which included how the NPS might sequentially adapt as the climate changes. Adaptation Pathways are only indicative of options available without further analysis and stakeholder engagement and are not a prescriptive plan for action. It is merely a tool to understand the potential for action that is reflective of the likely conditions decades from now, and may help avoid mal-adaptations or unintended actions. This can reduce or avoid ineffective allocation of resources and limiting future options by getting locked into a maladaptive path forward.

These exercises during the three workshops served in most cases as a way to integrate ideas, concepts, concerns, and priorities across divisions. As in most cases, the process and discourse itself was of significant value.

Assessment Process

The assessment process consisted of background work carried out mainly by URI staff and the detailed study of facilities conducted by Western Carolina University (WCU) under their SOP work (NPS 2016). Experts were organized into three workgroups – Natural Resources, Cultural Resources, and Facilities. Conference calls occurred before and in between three onsite workshops aimed at eliciting qualitative judgments, capturing staff knowledge, and testing and rehearsing efficient approaches for use by park staff. Workgroups at each onsite workshop were tasked with integrating and prioritizing across all park resources. This vulnerability assessment report and a companion methods report (Ricci et al. 2019) were prepared after the third workshop.

In advance of each workshop, workgroups were provided background information and orientations to be able to maximize the efficiency of each face-to-face activity. Each workgroup held one or more preparatory conference calls between the workshops.

The general flow and objective of workgroup activities is listed below:

Project Launch Conference Call: The project was introduced to Colonial NHP staff via conference call/webinar held on January 13, 2016.

Workshop #1 was held on June 1-2, 2016 at the Historic Jamestown Visitor Center and the Quarterpath Park & Recreation Center. The objectives were to:

- Learn and advise on the methods for conducting a rapid integrated climate change vulnerability assessment,
- Share expert analysis on the exposure and sensitivity of Colonial NHP's natural and cultural resources and facility assets,
- Reveal key linkages across the Natural Resources, Cultural Resources, and Facilities Divisions to understand the co-dependence of resources and assets at and their implications for achieving management goals.

Workshop #2 was held at the Historic Jamestown Visitor Center November 9-10, 2016. The objectives were to:

- Review the vulnerability of key assets/resources for three time frames.
- Select indicators for adaptive capacity and begin to assign scores.
- Reveal key linkages across the divisions at a select focal area to understand the co-dependence of resources and assets and their implications for achieving management goals.

- Identify next steps to conclude the assessment.

Workshop #3 was held at the Historic Jamestown Visitor Center on February 14-15, 2017. The objectives of the final workshop were to:

- Review the final draft scores for vulnerability and adaptive capacity.
- Select the key integration issues shared by all three divisions as well as priorities within each division.
- Identify recommendations and next steps on how to use the results – such as further data needs and adaptation planning.
- Evaluate the assessment process to inform the next iteration at a different site.

Full details of the method and a discussion of lessons learned through the process are available in the companion methods report (Ricci et al. 2019).

Climate Projections

Key climate stressors on resources and assets were identified by the workgroups. The stressors focused on priority issues, given the limited scope of the assessment. Stressors included by multiple workgroups were: sea level rise, flooding/storm surge, erosion, changes in temperature, changes in precipitation, and changes in groundwater (including soil chemistry). Other stressors by just one workgroup included changes in wind, runoff, drought, and humidity. For this assessment, non-climate stressors (i.e. development adjacent to the park) were not included unless they interacted with climate stressors (e.g. increased stormwater runoff as the result of increased heavy precipitation events).

The assessment looked at observed climate change trends and future projections. Three time frames, centered around 2020, 2050, and 2100, were identified. The near future of 2020 identifies existing vulnerabilities and recognizes the park is currently seeing impacts. The mid-century projection should be incorporated into the long-term planning horizon of some current and planned projects. The end-of-century projection recognizes our responsibility to preserve resources for future generations. Building on the principle of using existing data and knowledge where feasible, the team coordinated with other ongoing studies in Colonial NHP especially coordinating with the Facilities' Coastal Hazards & Climate Change Asset Vulnerability Assessment (NPS 2016; NPS in prep).

To project sea level rise, local data from the Sewells tide gauge and the Virginia Regional Assessment were consulted (McFarlane, 2013). Additionally, the Sea Level Change Curve Calculator showing the US Army Corps of Engineers (USACE) and the National Oceanic and Atmospheric Administration (NOAA) projections were consulted (USACE, 2016/2017). The NPS Caffrey (2015) sea level rise scenarios (2050, 2100) were selected for our exposure level to be consistent with SOP/WCU protocol (NPS, 2016) and comparable to other parks using the same methods for projections. A discussion of the implications of using these sea level rise rates significantly lower than other projections is included in the next section under Caveats.

In the case of temperature, precipitation and wind, the project partnered with the Department of Interior (DOI) Northeast Climate Science Center to develop baselines and projected changes. For temperature and precipitation, several metrics were analyzed (Table 2a-d) (see Appendix A for details) to determine which are expected to fall outside of the range of historical variability for each future time frame. While the projections were downscaled to the park, the spatial resolution on the projections was insufficient to determine any spatial differences within the park. To make it most relevant and useable for the practitioners, Table 3 of exposure was developed with key metrics, with a presence of exposure for each time frame.

Table 2a. Climate Projections for Temperature at Colonial National Historical Park, Virginia.*

Baseline (1996-2015)		2020		2050		2100		
Mean Annual Temp	**Hot days (>95 ^{0})**	**Mean Annual Temp**	**Hot days (>95 ^{0})**	**Mean Annual Temp**	**Hot days (>95 ^{0})**	**Mean Annual Temp**	**Hot days (>95 ^{0})**	**Notes**
59.9F	7.7 days	+1.1 – 1.6F	+6.3-7.3 days	+3.1 – 4.1F	+20.3 -32.3 days	+4.4 – 8.6F	+31.3-82.3 days	• Warming in all seasons • Fewer nights below freezing, especially in fall • Daily lows warming fastest in warm season • More hot summer days (>95 ^{0}F) • Longer heat spells (consecutive days >95 ^{0}F) • More frequent heat waves (>95 ^{0}F) for 3+days

*Based on methods developed for Acadia National Park and adapted for Colonial NHP by A. Bryan, Climate Postdoctoral Fellow, USGS, DOI Northeast Climate Science Center.

Table 2b. Climate Projections for Precipitation at Colonial National Historical Park, Virginia.*

Baseline (1996-2015)		2020		2050		2100		
Mean Annual Height	**Days exceeding 2”**	**Mean Annual Height**	**Days exceeding 2”**	**Mean Annual Height**	**Days exceeding 2”**	**Mean Annual Height**	**Days exceeding 2”**	**Notes**
51.2 in/decade	2” 2.8 days	+1.8 – 2.8 in/decade	+.4 - .2 days	+2.8 – 3.8 in/decade	+.4 - .7 days	+7.8 – 8.8 in/decade	+1.2 – 1.6 days	• More frequent, intense extreme events especially in fall • Precipitation amounts increasing, especially in fall; decreases in summer • Longer wet spells, especially summer and fall • Less snow, more rain, thinner snow packs

*Based on methods Acadia National Park and adapted for Colonial NHP by A. Bryan, Climate Postdoctoral Fellow, USGS, DOI Northeast Climate Science Center.

Table 2c. Climate Projections for Wind at Colonial National Historical Park, Virginia.*

Baseline (1996-2015)	2020	2050	2100	Notes
N/A	N/A	N/A	N/A	• Trends in extreme winds for (associated with hurricanes is not available. However, there has been a fair amount of research in tropical activity that point toward more intense hurricanes. • Increase in the "windiest" day per year, especially in the fall (peak hurricane season) • Future projections consistently indicate globally averaged intensity of tropical cyclones to shift towards stronger storms

*Based on methods Acadia National Park and adapted for Colonial NHP by A. Bryan, Climate Postdoctoral Fellow, USGS, DOI Northeast Climate Science Center.

Table 2d. Climate Projections for Sea Level Rise at Colonial National Historical Park, Virginia.

Baseline (1996-2015)	2020	2050	2100	Notes
N/A	current sea level	0.59 – 2.28' (2.1'*)	1.31 – 7.23' (3.81'*)	• Future projections (NAVD88) vary depending on selection of emissions (least change vs major change). • Historic trend = over 1.5' rise since 1927 at Sewells Point, with acceleration over last few decades • Overall range is from USACE and NOAA Sea Level Rise Calculator, and is within the range of that provide by Caffrey (2015).

* Estimates based on the high Emission scenario (RCP 8.5) of Caffrey (2015), which was used by SOP protocol and therefore used as the scenario for this assessment.

Table 3. Climate projections across three time frames at Colonial National Historical Park, Virginia.

Stressor	Metric	Exposure*		
		2020	2050	2100
Temperature	Mean annual temperature	Yes	Yes	Yes
	Daily highs	Yes	Yes	Yes
	Daily lows	Yes	Yes	Yes
	Hot days (> 95° F)	Yes	Yes	Yes
	Cold nights (< 32° F)	No	Yes	Yes
	Warm spells (3+ days of > 95 ° F)	Yes	Yes	Yes
	Cold spells (3+ days of <32 ° F)	No	No	Maybe
	Growing season length**	No	Yes	Yes
Precipitation	Mean annual precipitation	No	No	Maybe
	Days exceeding 2” precipitation	No	No	Maybe
	Peak daily precipitation	No	No	No
	Dry spell length (3+ days no rain)	No	No	No

*Defines as whether “yes” or not “no” the 20-year mean, centered on the year (2020, 2050, or 2100), is greater than the historical (1950-2005) mean plus one standard deviation. “Maybe” indicates exposure according to “major change” but not according to “least change” scenario, suggesting that exposure depends on future greenhouse gas emissions and other sources of uncertainty.

**Defined as the number of days between the last spring freeze and the first autumn freeze, where a “freeze” occurs when the daily low drops below 32 ° F.

The following current data sources for storm surge and flooding were selected; the NOAA Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model for category 3 hurricane and Federal Emergency Management Agency (FEMA) flood zones.

Caveats

This assessment uses the Caffrey (2015) projections for sea level rise, to have internal consistency with the implementation of the Facilities Assessment (NPS, in prep). These are conservative when compared to NOAA’s current modeling and what other local partners are using (NOAA, 2017; USACE 2016/2017). One major reason for the difference is that the Caffrey (2015) projections are not relative sea level rise and thus do not include subsidence, which is a substantial component for the area. It is valuable to recognize that the projections assigned to timeframes may occur significantly earlier. There is a need to revisit the assessment periodically to incorporate the best available science.

Models of projected change were only available for sea level rise, temperature and precipitation. Erosion, storm surge and flood zones were included as stressors but only included based on current conditions because there are not currently available models for how these are projected to change with higher sea level or increased heavy precipitation events. The SLOSH and FEMA models do not

include sea level rise or the potential for increased frequency of storms in the future. This limitation in these available models explains why much of the exposure does not change between time frames for facility assets. This assessment of Colonial NHP is based on a rapid assessment using existing information, but a more detailed analysis should be conducted in the future.

A stressor raised by the Facilities Workgroup that was not included in the Facilities Assessment protocol was wind (NPS, 2016). Since spatial data on differences in wind were not available, and the projections on how climate change may change wind are preliminary, WCU did not find it technically justifiable consistent with the SOP/WCU protocol to include changes in wind as a stressor for exposure. Given the qualitative nature of this method for other workgroups, there could be benefit to evaluate wind as a parkwide stressor to understand differential sensitivity to it. It should be included in future assessments if better data become available.

Though the focus of this assessment and, therefore, its exposure indicators leans towards the dynamics of the coastal area, there was interest by the park staff to better assess and highlight other resources at the park which did not attain a high vulnerability score. The primary reason for this disconnect between vulnerability scores and staff concern was elevation. Both the Historic Structures in Yorktown Village and the Band Green Spring House are farther away from the coastline and at higher elevations. Therefore, their primary source of exposure to climate related impacts would be precipitation based flooding and wind. Resources located in non-coastal areas prone to flooding during heavy precipitation events should be reviewed and incorporated into the sites' overall vulnerability analysis.

The results of the assessment are presented in the following sections highlighting the three key focal areas that Colonial NHP selected – Jamestown Island, Colonial Parkway and Glasshouse Point. This is followed by more in-depth analysis for cultural resources, natural resources, and facility assets. The general organization for each section is to describe the value and importance of the resources, present the overall vulnerability and the adaptive capacity, and finally offer recommendations for next steps or management actions. The body of the report has summary tables and examples of outputs for the Natural Resources Division, Cultural Resources Division and Facilities Division (hereafter often referred to as "the divisions"). The full dataset and supporting materials are located in the appendices for all of the resources.

Focal Areas for Integration

The three park divisions compared their vulnerability analysis results to identify focal areas for integration that would benefit from coordinated planning and action. These focal areas include Jamestown Island, Glasshouse Point and the Colonial Parkway (Figure 3). These focal areas share common features such as low-lying coastal segments and contain priority resources related to the mandate of the park. By being identified in the enabling legislation, these cultural and natural resources receive the highest priority preservation and protection. However, they differ in how climate change impacts will play out over time and the options available for management responses. By acting together, the divisions see opportunities for reducing vulnerability and/or redefining management objectives to provide clarity for joint action and combine resources to increase the likelihood of timely, efficient and effective action.

Jamestown Island

Description of Resource and Value

Jamestown Island is a 2.4 square mile island situated in the James River. The island's core is dominated by coastal plain, loblolly pine and oak forest, and is surrounded by extensive tidal marshes and small creeks that weave inland. The major facility assets on the island include the Jamestown Visitor Center, historic research center and two loop roads with four bridges that provide access to the cultural and natural resources across the island.

The earliest known human settlement of Jamestown Island occurred during the Archaic period. Over time, sea level rise caused the island to become increasingly salty and marshy, and Native American settlements on the island transitioned to seasonal hunting camps. In 1607, three ships arrived at Jamestown to create a permanent English settlement. Despite many environmental and political hardships in the early days of the colony, this settlement persisted. There were several expanded iterations of the 1607 fort, and the community finally moved off the island in 1699 and established the new colonial capital at Williamsburg. Later construction on Jamestown Island includes Civil War-Era Fort Pocahontas.

Connected to land by way of Glasshouse Point at the time of English settlement, Jamestown Island became a true island when the isthmus eroded away during a hurricane in 1775. Today, Jamestown Island is connected to the mainland and the Yorktown portion of the park by the Colonial Parkway. NPS, in partnership with Preservation Virginia, interprets the 17th century history of Jamestown Island as the beginning of English North America and the roots of American representative government by preserving sites and landscapes of this period. The island contains over 50 important archaeological sites representing approximately 10,000 years of human history. The park must balance ongoing archaeological research with interpretation, visitation, and the protection of unique natural ecosystems and landscapes on the island.

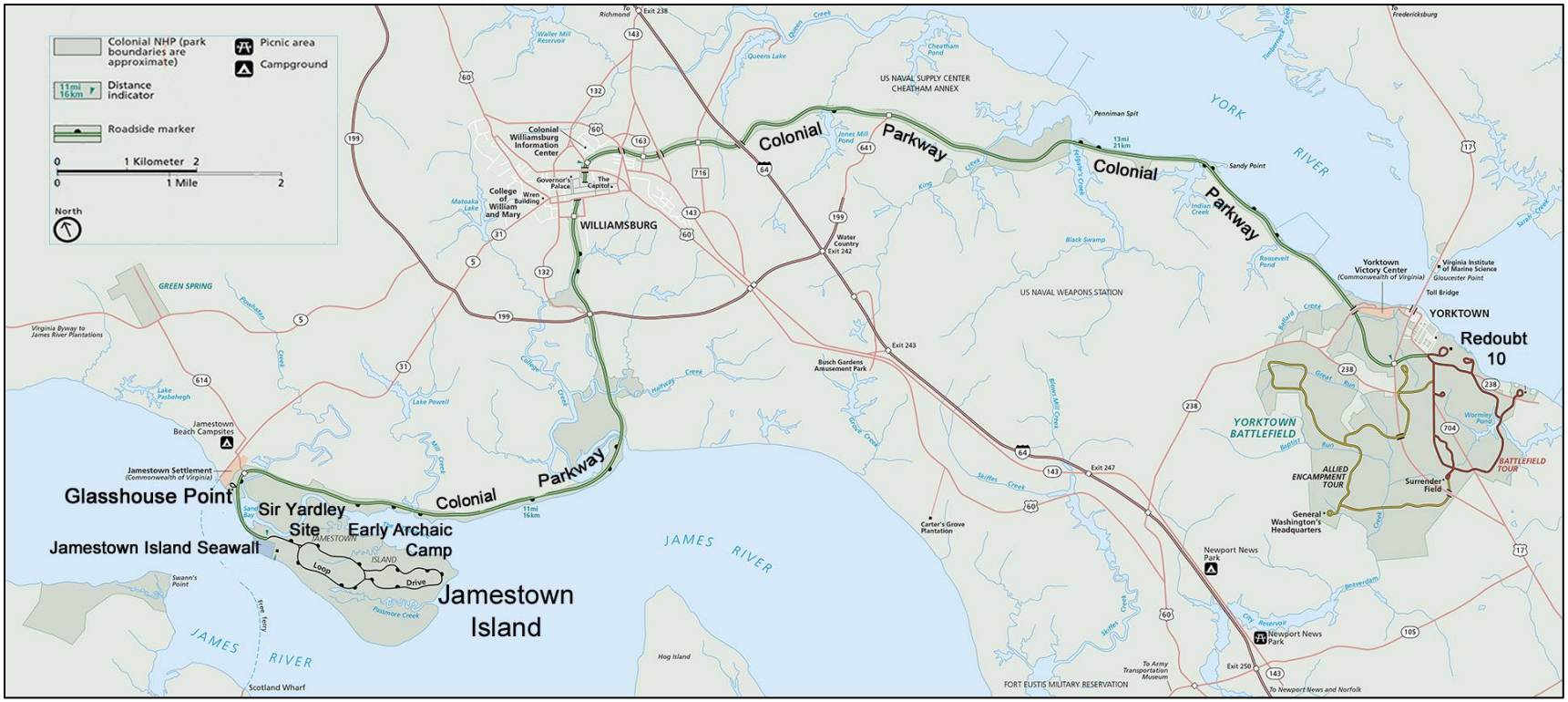


Figure 3. Location of focal areas at Colonial National Historical Park, Virginia.

Early efforts to stabilize the shoreline and protect resources include the 1900 construction of the seawall and rip rap added throughout the 20th century. In the late 1990s, the NPS commissioned studies to stabilize eroding shorelines on Jamestown Island, specifically Black Point, after the impacts of successive storms accelerated shoreline changes and damages to archeological sites (USACE 2002). A series of erosion control structures were constructed around sections of the island by 2004, which have prevented an estimated 400 feet of shore recession through 2010 (Milligan et al. 2010). As of 2013, 28% of Jamestown Island's shoreline is armored through an array of 55 structures including breakwaters, bulkheads, piers, revetments, seawalls and marsh sills (Dallas et al. 2013). These studies and activities confirm that Jamestown Island is already highly vulnerable, even before considering future impacts from climate change.

Vulnerability

The entirety of Jamestown Island is highly vulnerable to the potential impacts of climate change. Changes to the natural resources will increase the vulnerability to cultural resources and facility assets. By 2050 Jamestown Island is projected to have 50 percent of its land and wetland areas highly vulnerable to multiple exposures, including most of the tidal oligohaline marsh on its southern half and virtually all of the tidal freshwater marsh. By 2100 two-thirds of its low-lying land and wetlands will be highly vulnerable—including a sizeable fraction of the coastal plain loblolly pine forest—with the remainder stressed by erosion, storm impacts and changes to ground water including salt water intrusion. These vulnerabilities are mainly due to most of the island sitting less than three feet above current sea level.

Impacts to natural resources will have cascading impacts on cultural resources and facility assets, such as loss of resources, reduced physical access to cultural and archeological resources remaining on the island, and increased maintenance costs. Figure 4 presents the vulnerabilities of natural and cultural resources and facility assets for Jamestown Island over three time frames. Refer to Table 4 for non-geographic resources (and Appendix B and Appendix C for all Cultural Resources scores).

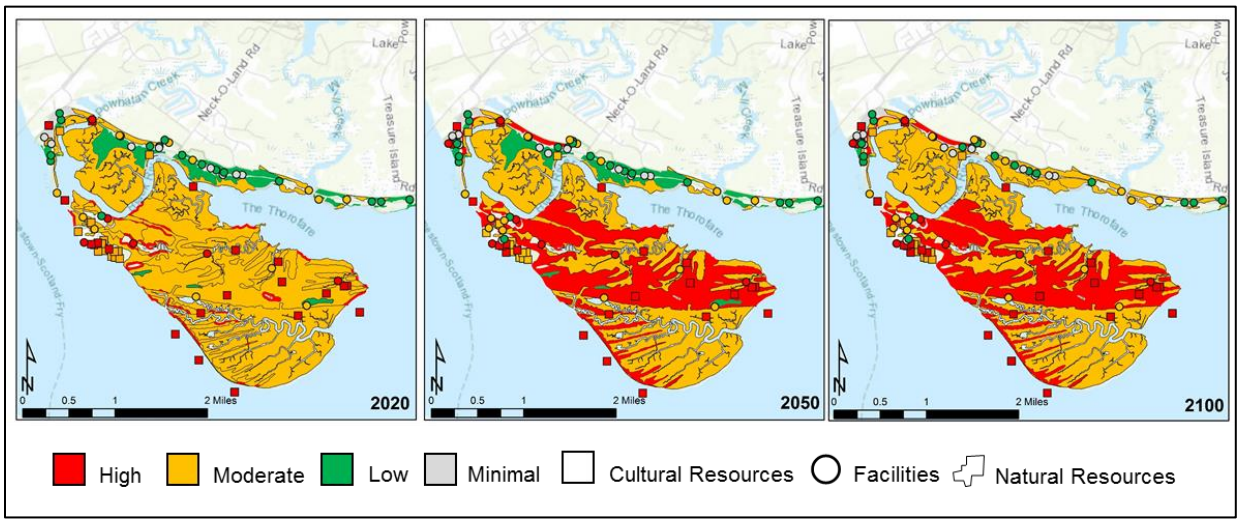


Figure 4. Vulnerability scores for facility assets, cultural and natural resources over three time frames on Jamestown Island, Virginia.

Table 4. Non-geographic resources and their vulnerability over three time frames on Jamestown Island, Virginia.

Type of Resource	Resource	2020	2050	2100
Natural Resources	Eagles	Minimal	Minimal	Minimal
	Herps (COASTAL)	Low	Low	Moderate (loss of wetlands)
	Herps (UPLAND)	Minimal	Minimal	Low
	Marsh birds	Low	Low	Moderate (loss of wetlands)
Cultural Resources: Cultural Landscape	Jamestown Island Area Cultural Landscape: Boundary	High	High	High
	Jamestown Island Area Cultural Landscape: Natural Systems and Features	High	High	High
	Jamestown Island Area Cultural Landscape: Spatial Organization	High	High	High
	Jamestown Island Area Cultural Landscape: Land Use	Moderate	Moderate	Moderate
	Jamestown Island Area Cultural Landscape: Topography	High	High	High
	Jamestown Island Area Cultural Landscape: Vegetation	High	High	High
	Jamestown Island Area Cultural Landscape: Circulation	High	High	High
	Jamestown Island Area Cultural Landscape: Buildings and Structures	High	High	High
	Jamestown Island Area Cultural Landscape: Views and Vistas	Moderate	Moderate	Moderate
	Jamestown Island Area Cultural Landscape: Small-Scale Features	High	High	High
	Jamestown Island Area Cultural Landscape: Archeological Sites	High	High	High
Cultural Resources: Ethnographic Resources	Archaeological Sites of Social, Political, or Economic Significance Composite Score	High	High	High
	Collections Composite Score	High	High	High
	Tidal and Non-Tidal Wetlands Including Marshes Composite Score	Moderate	Moderate	Moderate
	Natural Landscapes Retaining Non-developed Character	Moderate	Moderate	Moderate
	Floral and Faunal Species Specific Assessment	High	High	High

Natural resources also represent important features of the Jamestown Island cultural landscape and ethnographic resources of the island.

Archaeological sites on the island are of special concern as these sites are threatened by erosion and dispersal from rising sea levels, as well as changes in groundwater, both changing depth to groundwater and saltwater intrusion. Archaeological sites and museum collections on the island are also at risk from wind and wave action and the potential storm surge, especially that associated with a category 3 hurricane or larger. At least two archaeological sites along the shoreline and creeks of the island have eroded away entirely since 1995 (Bassett, 2016). Currently dry land areas contain numerous known and yet-to-be studied sites of archeological artifacts that may be lost to sea level rise.

The vulnerability of cultural resources is compounded by the vulnerability of facility assets on the island. Of Colonial NHP's fourteen most vulnerable transportation facility assets seven affect researcher and visitor access to sites on Jamestown Island and include the key bridges of Travis Graveyard and Isthmus, Pitch and Tar, Long, and Black Point, as well as portions of the outer loop of the Island Road.

Vehicle access to the eastern portion of the island via the loop road and its associated bridges may become constrained in the next decades due to a combination of sea level rise, storm surge and erosion that will increase the maintenance costs. There is an expected decrease in the number of days that vehicles can safely travel the loop roads; visitor safety is a priority.

Adaptive Capacity

From the overall perspective of the POSE framework, physical options are available, the organization is capable and committed to implementing them, and there is social support that has led to funding to carry out the adaptation strategy. For facilities assets, the Jamestown shoreline has a high adaptive capacity due to the strong local interest to maintain the shoreline services that would protect numerous high priority assets in the Newtown area of the island. The various vulnerable bridges that provide access to Jamestown Island have a moderate adaptive capacity. Although the technological requirements to raise, protect, or modify bridges are well understood, the expense of these projects may affect their practicability.

From a natural resources standpoint, the ecosystems of Jamestown Island have some ability to adapt. The tidal wetlands have a relatively high level of intrinsic adaptive capacity because 1) for lower rates of sea level rise they may be able to accrete vertically to keep pace with sea level rise, and 2) in places with suitable characteristics (e.g. slope) to retreat to, they can migrate inland. Oligohaline marshes can migrate upland as they become inundated; their ability to migrate inland may displace other habitat types. The forest and riparian forest cover may not be able to migrate because of different time scales and habitat requirements. The organizational component of adaptive capacity is high for most habitats, but the economic component is low, with mixed results for the social component.

The cultural resources at Jamestown Island have a low adaptive capacity. While archaeological resources may be excavated for their protection, this solution removes the resources from the landscape and from their original context. The removal of archaeological resources then requires management through museum collections. Historical structures including the Jamestown Memorial Church and Jamestown Fort have a high adaptive capacity because the public interest in these resources could contribute to the economic options for protecting or moving these structures in preparation for predicted climate change impacts. Because these resources would lose their cultural context and sense of place, moving them would be the last option to consider. Other adaptation options such as additional seawalls or riprap can affect the historical integrity of the resource and detract from the historic character of the cultural landscape.

Stewards of Jamestown Island have been coping with the impacts of storms, erosion and accelerating sea level rise for more than a century. The island geography and low elevation of Jamestown Island which makes it so vulnerable also inherently limit adaptation options and lower the adaptive capacity of many of the resources on the island. A wide range of technical solutions have been identified and implemented over time, notably the Hardaway et al. (1999) Shoreline Management Plan for Jamestown Island prepared by the VIMS and evaluated in 2002 by the USACE. NPS has been able to implement and monitor the effectiveness of these actions. The shore protection measures were designed, in part, to accommodate "additional stone and rubble in the future, as needed, in response to sea level rise at a fraction of the cost of initial construction" (USACE, 2002).

Relationship of Vulnerability to Adaptive Capacity

The assessment team prepared a matrix comparing the vulnerability and adaptive capacity of Jamestown Island (Figure 5). Each resource type has a unique dynamic between its vulnerability and adaptive capacity. In a number of cases a deeper understanding of this interplay is required. Some individual resources may be less vulnerable and more easily adapt or be adapted to physical threats; these must still be addressed within the larger context of how they affect or are affected by other resources in question on the island. There is usually the need to consider multiple resources together.

For Jamestown Island, the Facilities and Cultural Resources Workgroups independently scored the Island Drive outer loop road similarly. Most of the cultural resources fall close to the High Concern – Revisit Goals quadrant due to their location in the low-lying eastern and southern parts of the island. Facility assets, while vulnerable, had a higher adaptive capacity and thus fell into the Serious but Actionable quadrant.

In the past decade, Colonial NHP has benefited from ongoing research and studies that monitor conditions and offer updated suggestions on shore management actions. For example, the VIMS prepared a shoreline management plan for James Cook County (Hardaway et al., 2015) that makes updated erosion control recommendations for much of the Jamestown Island and nearby parkway shoreline. Nordstrom and Jackson (2016) have suggested that the riprapped areas of natural shoreline that are not clearly protecting archeological sites or visitor infrastructure could be considered for abandonment or removal in order to facilitate shoreline migration.

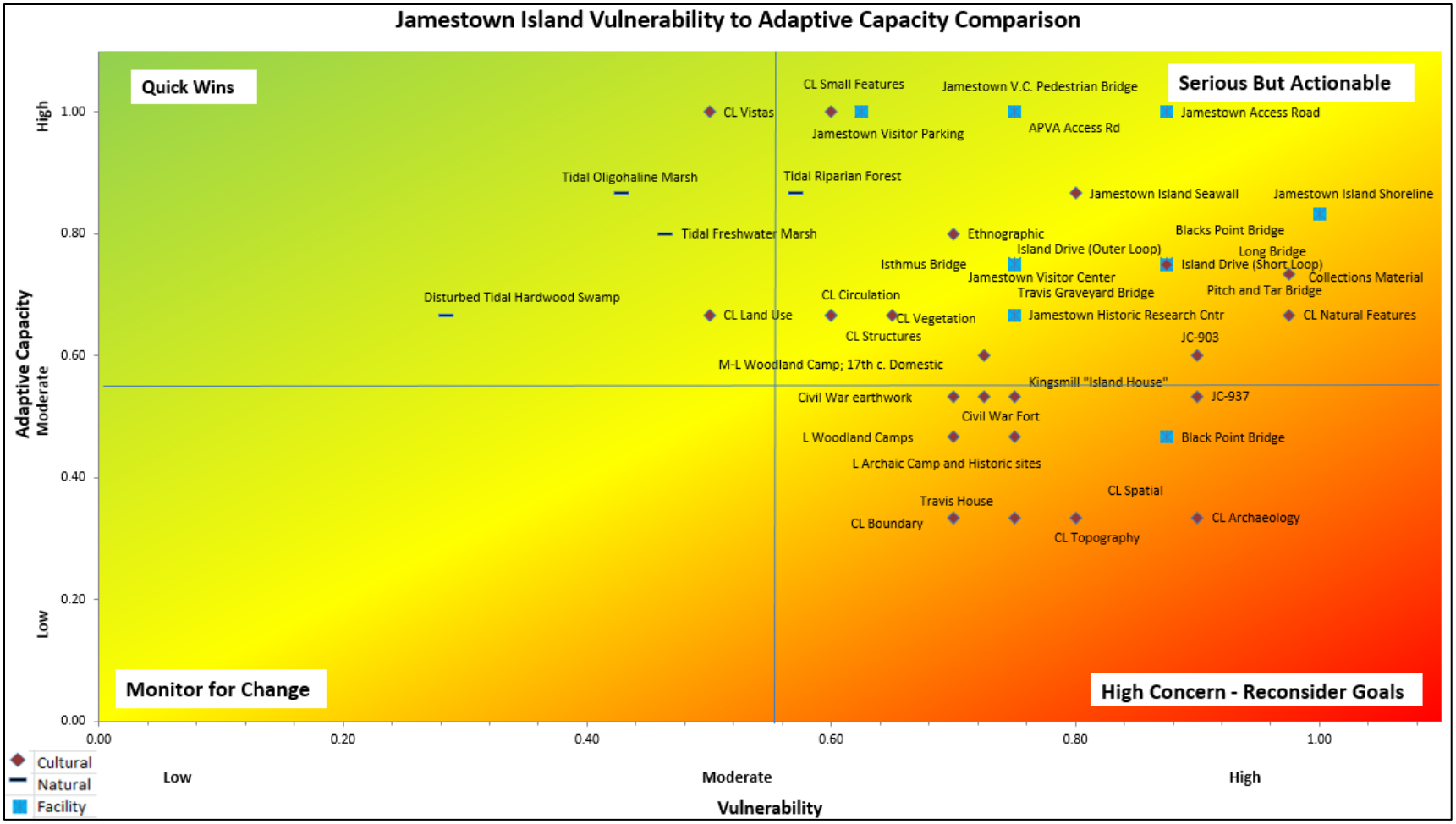


Figure 5. Relationship of vulnerability to adaptive capacity for Jamestown Island, Virginia.

Recommendations

Recommendations for addressing climate change vulnerability on Jamestown Island have been identified based on the analysis and discussions among the workgroups.

- Additional short-term measures include interpreting the ongoing change, and maintaining current access on the island, though modes of access may need to change. For example, conversion of the loop road to non-vehicle access that prioritizes pedestrian use can be augmented by kayak tours to allow visitors to see the areas of loss.

- Over the longer term, continuous environmental monitoring of the landscape and especially groundwater will provide important information about the ongoing process of change. Augmenting existing groundwater monitoring wells and augmenting the monitoring network, including technologies that can be deployed surrounding archeological sites, is a priority across divisions. Park managers may need to let some resources go rather than pursue costly interventions that would have limited long-term effectiveness. Continued documentation and excavation of sites will be needed, with timing dependent on continued monitoring of the pace and nature of shoreline and groundwater change. The way in which visits to Jamestown Island are interpreted may need to shift to make even stronger connections to the challenges which the original inhabitants and the colonists faced in living in a dynamic coastal landscape.

- The park would benefit from compiling and reviewing all recent plans and detailed proposals on shoreline protection as part of creating an Adaptation Pathway. Documents such as the shoreline management plan (Hardaway et al. 1999) for Jamestown Island may need to be completely revised to take the climate projections and findings of this vulnerability assessment into account. A better understanding is needed of sediment supply, the condition of fringing marsh in terms of its role in reducing edge erosion and developing technologies and methods that could expand the suite of options for the park to consider.

- Look into the potential to move collections to Yorktown until appropriate collections storage can be found.

- Continue to work with municipalities and other partners to understand and manage storm water and runoff.

- Monitor upland pond vegetation changes to understand the water table and the potential impacts on buried archaeological resources.

Colonial Parkway

Description of Resource and Value

The Colonial Parkway is a twenty-three-mile scenic roadway stretching from the York River at Yorktown, through Williamsburg, to the James River at Jamestown. Constructed between 1931 and 1957, the Colonial Parkway was conceived as a linear park, carefully designed to provide easy vehicular access between the region's three primary historic areas while showcasing the natural and

historic sights of the Virginia Peninsula landscape. Today, the Colonial Parkway, which has been on the National Register of Historic Places since 1966, remains an outstanding example of early NPS scenic parkway design, retaining many distinctive qualities. Characteristics of the road alignment, roadbed profile, exposed-aggregate surface, brick bridges, and arresting views of the surrounding landscape have remained largely unaltered since the road's construction.

In addition to the parkway's historical values, the road serves as the primary access route for visitors to both Jamestown and Yorktown, and an important regional travel corridor, carrying more than three million vehicles per year. In maintaining the road, the park must balance diverse management objectives, ensuring safe and efficient travel conditions while protecting the important cultural and natural values of the road and its surrounding landscape.

The Colonial Parkway is already experiencing the impacts of climate change. As sea level rises and destructive weather events become more frequent, protection and preservation of the parkway will become more difficult and costly. There will be tradeoffs between the integrity of the transportation infrastructure and the natural resources. The imminent threats of climate change, combined with the high level of historical integrity and the importance of the road as a travel corridor, make the Colonial Parkway a priority resource.

Vulnerability

Nearly half of the length of the Colonial Parkway lies immediately along the shoreline of either the York River or the James River. These shoreline portions of the Colonial Parkway are highly vulnerable to many of the projected impacts of climate change, including the loss of key sections during strong coastal storms (Figure 6). Of particular concern are shoreline erosion caused by waves and currents and the potential storm surge associated with a category 3 hurricane or larger. These two impacts will cause gradual but accelerating damage and possibly catastrophic failure of portions of the road or of individual resources associated with the road. Both erosion and storm surge will become more damaging and more likely as sea level continues to rise. In addition to shoreline impacts, increased runoff from heavy rains and urbanization of the watershed have the potential to damage culverts, bridges, road embankments, and other features of the road.

Of the fourteen highly vulnerable transportation facility assets in Colonial NHP, nine are associated with the Colonial Parkway. These include several creek bridges along the James and York Rivers, as well as the shoreline portions of the roadbed and travel surface. Many other features, including culverts, parking areas, and overpasses, are considered moderately vulnerable. Some of the tunnels along the parkway flood during heavy rain events which closes the parkway to traffic. Increases in the frequency and intensity of rainfall events will likely exacerbate this situation. Furthermore, damage to the road and its features is likely to diminish many of the qualities that contribute to the parkway's historical integrity, including the road's design and materials, scenic views, and overall character.

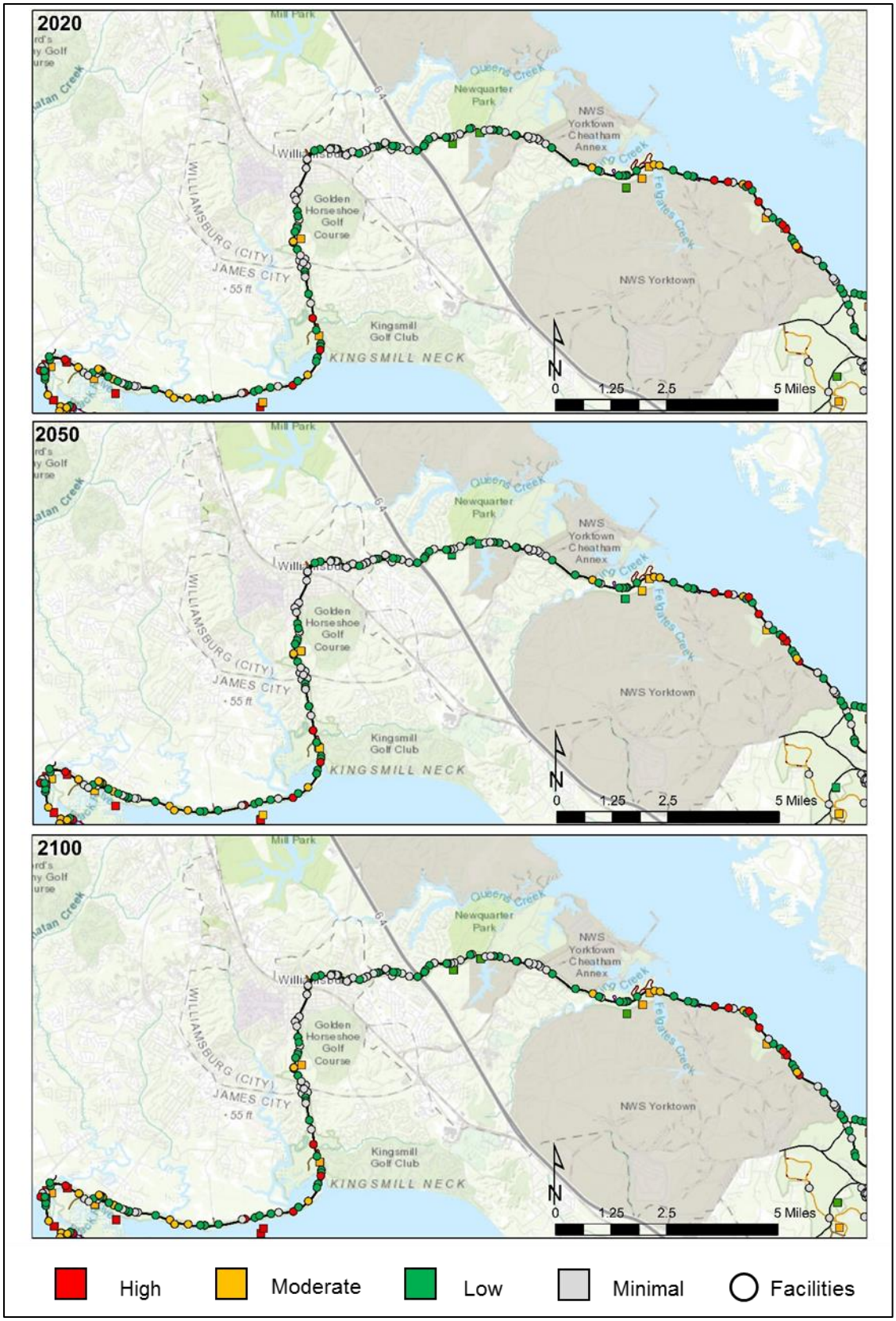


Figure 6. Vulnerability of Colonial Parkway, Virginia, in 2020, 2050, and 2100.

Facility assets with the highest vulnerability associated with the Colonial Parkway are as follows:

- Isthmus Bridge
- Felgates Creek Bridge
- Indian Field Creek Bridge
- Halfway Creek Bridge
- Powhatan Creek Bridge
- York River Shoreline
- James River Shoreline
- Kings Creek Bridge
- Mill Creek Bridge

The vulnerability of coastal bluffs, a natural resource important in terms of maintaining the integrity of facilities and cultural resources in Yorktown, is rated as low in 2020 and 2050 but moderate in 2100 due to the likelihood that severe storms and flooding could destabilize or lead to the loss of these features. Natural resources and landscape features along the parkway were also generally rated low in vulnerability, increasing to moderate by 2100. Localized impacts from shoreline armoring and other engineering measures in areas such as Yorktown, Felgates Creek, and Kings Creek are of concern to natural resources. This, however, needs to be considered in the context of a number of non-climate stressors also affecting wetland and landscape features in these areas.

Adaptive Capacity

From a Facilities standpoint, the Colonial Parkway has high adaptive capacity. Alterations may be made to the road and its features to make them more resistant or resilient to climate change impacts, including reinforcing the shoreline, raising the roadbed and bridge crossings, or utilizing more resilient materials. Additionally, there are initiatives with adjacent jurisdictions to control off site runoff to prevent flooding. Portions of the Colonial Parkway are already experiencing damage and deterioration due to erosion and periodic flooding, and the road is vulnerable to storm events that could occur at any time. Actions to protect and stabilize the most vulnerable portions of the road should be considered in the near term while a more comprehensive adaptation plan is developed. Armoring the shoreline with riprap or other methods, for example, will provide short-term protection from erosion and storm wash-out while other actions are considered, but has once done is difficult to remove and restore the natural shoreline processes. Natural resource features including beaches and some coastal wetlands will continue to be negatively impacted by adaptation actions to protect facilities and cultural landscapes. Striking the right balance among natural resources, cultural resources, and facility assets is an ongoing challenge that will become even more important to coordinate among divisions. Non-tidal wetlands found along the Parkway are considered to have a low adaptive capacity with limited options for migration or mitigation, compared to coastal wetlands

and beaches. Alterations to the parkway should consider potential new locations for non-tidal wetlands and should incorporate those natural features in treatment recommendations.

The historical values of the road, however, place additional parameters on the nature of preferred interventions. The essential qualities of the road that contribute to its significance should be considered when planning for climate change, and any alterations should be compatible with its historic character. The Cultural Landscape Report for Colonial Parkway: Part I provides an overall design history of the parkway and an evaluation of its significance and contributing landscape characteristics (McCartney et al. 1997). This document should be supplemented with a Cultural Landscape Report Part II, including updated existing conditions and treatment recommendations, before any major alterations are made to the road.

Relationship of Vulnerability to Adaptive Capacity

Most of the resources associated with the Colonial Parkway fall in the center of the vulnerability-to-adaptive capacity matrix due to moderate scores overall (Figure 7). Natural resources in general had the lowest adaptive capacity coupled with moderate vulnerability, referred to as the Monitor for Change quadrant. Facility assets were distributed across the matrix identifying the potential to start with a few assets that have higher adaptive capacity, referred to as the Quick Wins quadrant. Cultural resources were evenly distributed. There may be value in further analyzing these resources by parts of the parkway to see if there are potential coordinated adaptation strategies.

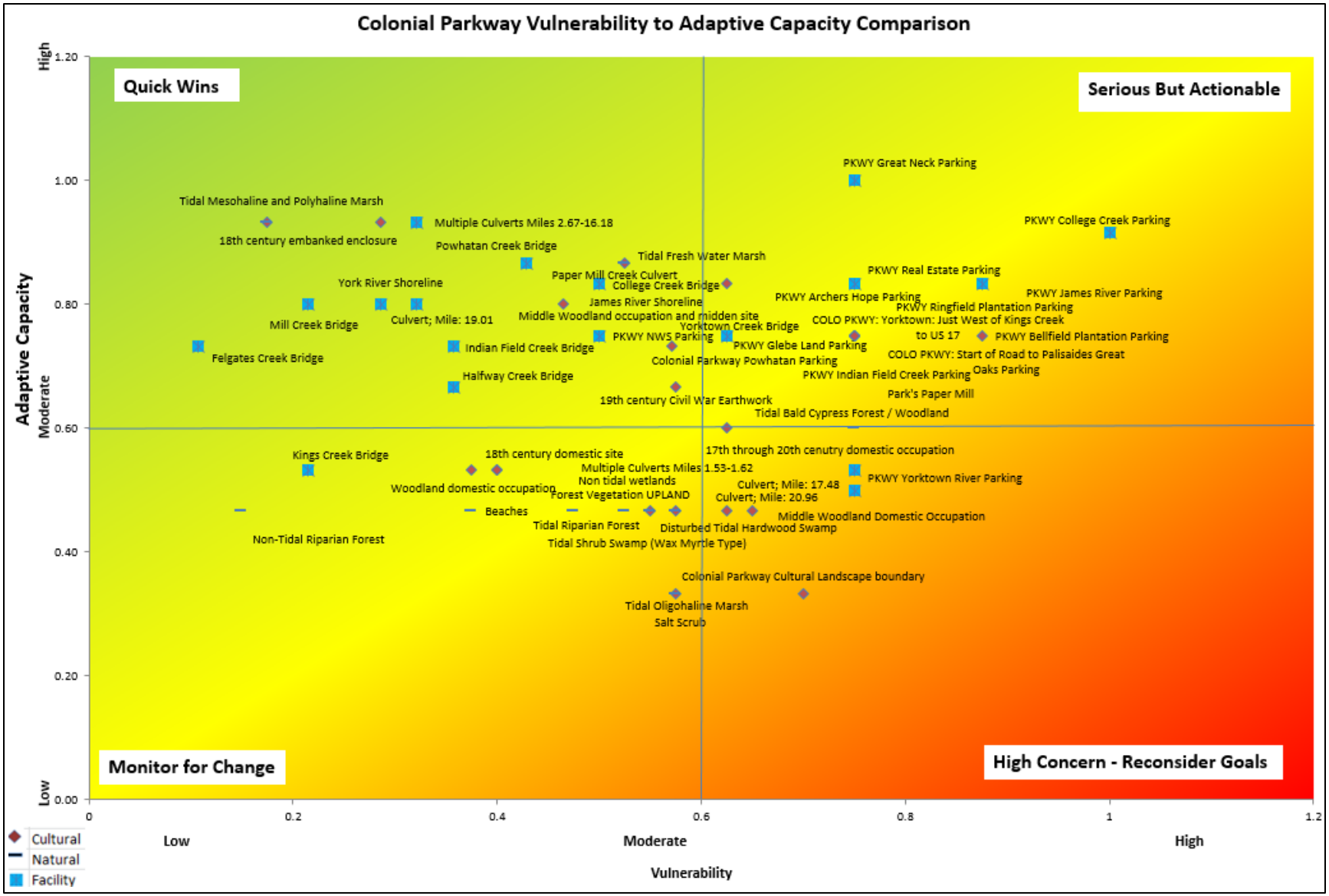


Figure 7. Relationship of vulnerability to adaptive capacity for Colonial Parkway, Virginia.

Recommendations

Preliminary recommendations for addressing climate change vulnerability of this focal area have been identified at the workshop based on the analysis and discussions among the workgroups.

- Address the immediate risk of erosion near the Colonial Parkway in sections by York River.
- Decrease stormwater runoff and revise culvert maintenance plan, including pursuing additional funding or design modifications, to reduce the likelihood of parkway flooding and closures by collaborating with adjacent jurisdictions and large landowners.
- Identify areas where natural resources or nature based features could be used to protect the parkway infrastructure.
- Coordinate analysis and planning with the Federal Highway Administration to avoid actions that reduce resilience over a longer time frame as there are only a few windows of opportunity before major investments are made that would influence adaptation options for decades to come.
- A cultural landscape report (part II) should be completed with updated existing conditions and treatment recommendations before major alterations are made to the road.

Glasshouse Point

Description of Resource and Value

Glasshouse Point once connected Jamestown Island with Neck-of-Land. The landscape today is a mixture of coastal plain forest, tidal bald cypress trees, coastal meadow, and developed space. It includes a small sandy shoreline along the western shore of the point, facing the James River, and a tidal freshwater marsh on the eastern side of the point. The glasshouse complex encompasses the natural features, archeological remains and recreated visitor facilities that tell the story of one of the earliest industries in English North America. The natural features of the area, including the sand from the beach and firewood from the forests provided the raw materials necessary to make and blow glass. Two attempts at glassmaking in the colony, first in 1608 and again in 1622 saw the arrival of foreign glassmakers to join the Jamestown settlement. Both attempts at establishing a glassmaking industry were unsuccessful, but the remains of the glasshouse emphasize the production- and business-oriented nature of the Virginia Company during this period.

Ruins of the 17th century glasshouse have been excavated and are currently exhibited in a structure on the site. Traces of the Greate Road, a compacted dirt and sand road built by settlers over a Paspahegh Indian trail to connect the glasshouse with the residential Newtown area, can still be seen at Glasshouse Point. Today, a modern structure protects the archaeological remains of the original glasshouse. A reconstructed facility nearby provides an interpretive and demonstrative space for modern artisans to craft glass objects, and an associated structure provides storage for glassblowing supplies. The complex, including natural features, archaeological ruins, and modern interpretive facilities, sits alongside Colonial Parkway.

Vulnerability

The Glasshouse Point area is low in elevation and highly vulnerable to the projected impacts of climate change (Figure 8). The forested area is facing die off due to groundwater changes, flooding, and erosion. The beach at Glasshouse Point may be impacted by ongoing and worsening erosion. The cultural resources in the area include Late Woodland and 17th and 18th century archaeological sites in addition to the covered glasshouse ruins. The location and materials at these sites are vulnerable to projected sea level rise, storm surge, and other climate factors including coastal flooding and changing soil chemistry. Facilities in the area are similarly vulnerable to sea level rise and storm surge factors. Every cultural resource and facility asset on Glasshouse Point received a high vulnerability score.

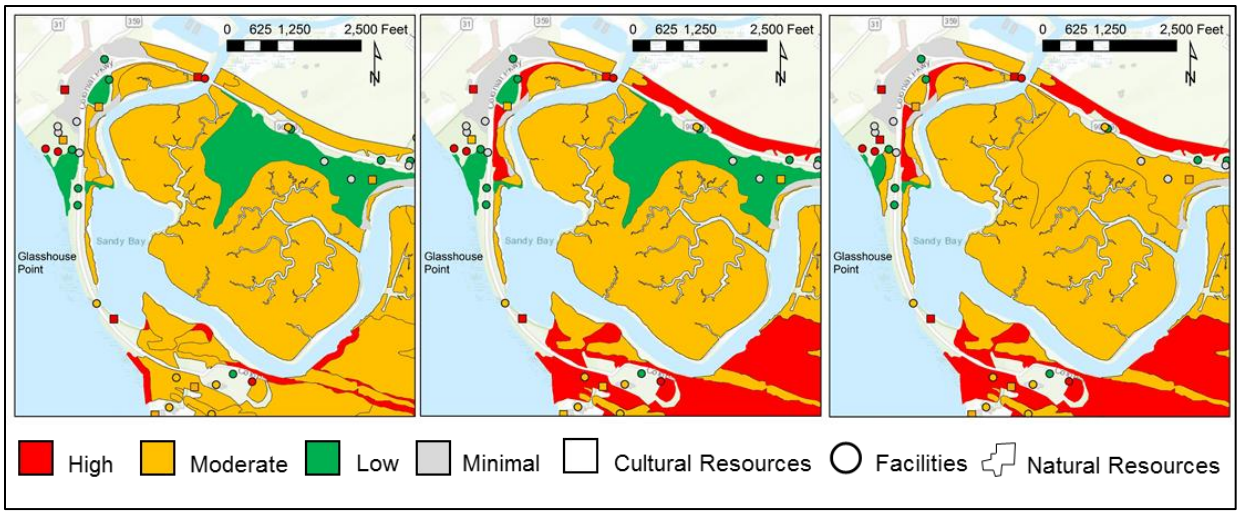


Figure 8. Vulnerability of Glasshouse Point, Virginia, in 2020, 2050, and 2100.

Adaptive Capacity

With the exception of the forested portion of the point, the natural features of the point may be able to adjust and migrate with encroaching sea levels. From a Facilities standpoint, Glasshouse Point has a high adaptive capacity. Alterations may be made to the glasshouse factory interpretive site and storage building. These structures could be moved, raised, or built to withstand flooding with minimal damage. The structure that protects the glasshouse ruins could be updated for flood protection. The area enjoys public interest and support which may increase adaptation options for targeted funding. Changes such as raising key infrastructure in these facilities above flood levels may be considered in the near term while a comprehensive management plan for the James River shoreline is developed.

The buried archaeological resources and ethnographic uses of Glasshouse Point present additional adaptation challenges and thus scored as low adaptive capacity. Buried archaeological resources lose context when they are removed from their position in the landscape. Their removal also affects the integrity of the landscape. This method of preservation is one, but not necessarily the best, option. Further examination and ongoing monitoring of the sites on Glasshouse Point may supplement decision-making on prioritization of site investigation and excavation.

Relationship of Vulnerability to Adaptive Capacity

While there are only a few resources associated with the Glasshouse Point area, there is a significant spread of vulnerability (Figure 9). The adaptive capacity is moderate to high for all of the resources. The Glasshouse ruins fell into the Serious but Actionable quadrant, because the participants accepted that most of the ruins' cultural value will be lost as pieces are moved upland for interpretation. A slight reduction in adaptive capacity would move them into the High Concern – Reconsider Goals quadrant.

Recommendations

Recommendations for addressing climate change vulnerability of this focal area have been identified based on the analysis and discussions among the workgroups.

- Maintain the natural shoreline habitat as a buffer from current storm events.
- Begin discussions with the existing concession business at the Glasshouse Factory to discuss adaptations and timing of their implementation.
- Initiate proper cultural documentation and interpretation for the Glasshouse ruins in case of an extreme storm event in the short-term, while also preparing a medium-term strategy.

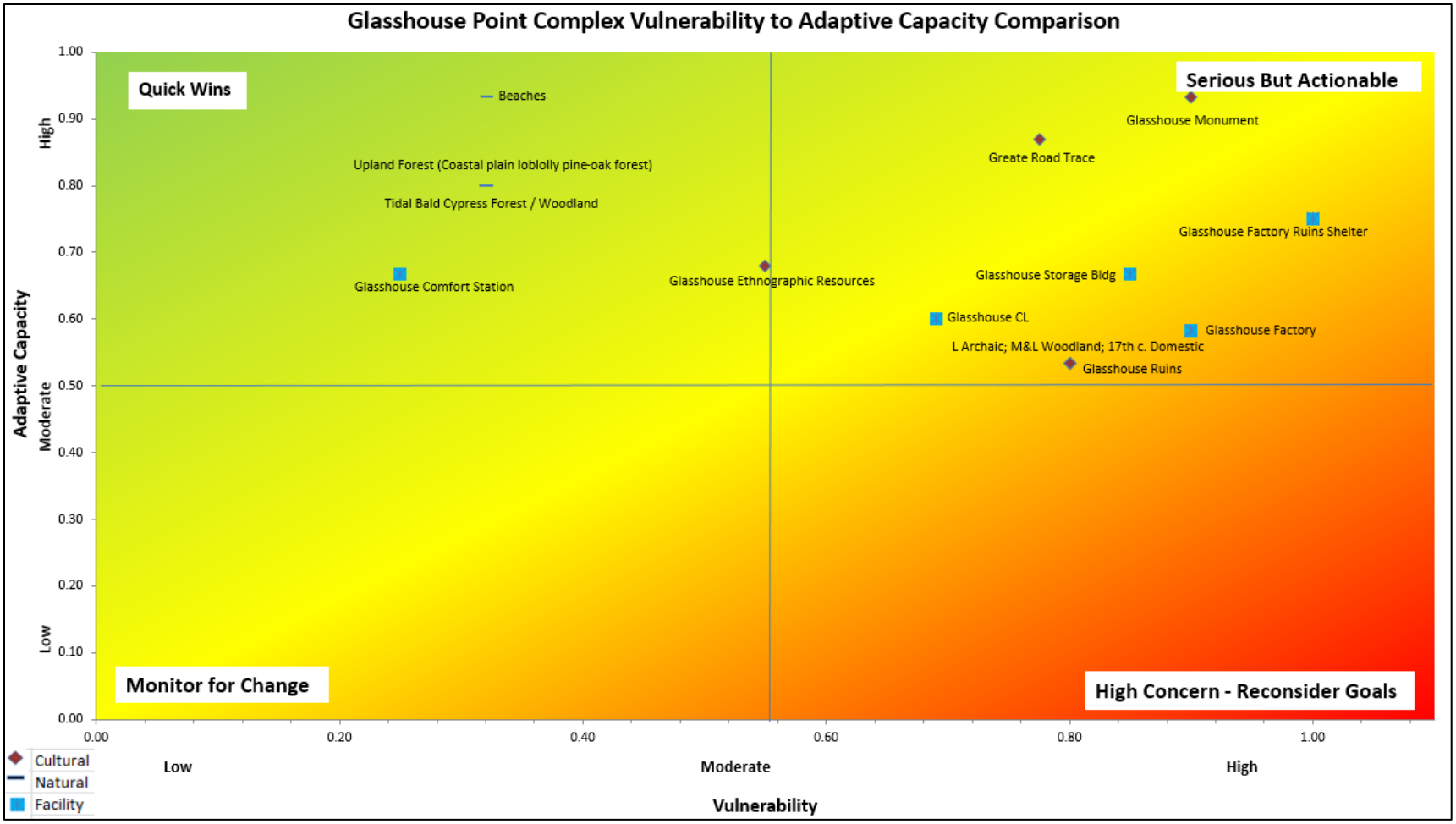


Figure 9. Relationship of vulnerability to adaptive capacity for Glasshouse Point, Virginia.

Integration of Scoring across Divisions

This assessment focused on the integration across three major divisions – Cultural Resources, Natural Resources and Facilities. Integration was achieved using a variety of techniques. First, the three workgroups shared their analysis and scoring throughout the process so they could understand how each workgroup assessed the exposure and sensitivity of the resources. Second, interactive workshop sessions for each focal area allowed the group to go deeper in the analysis of how exposure and sensitivity will play out and interact with other associated resources for a place. Finally, as the workgroups scored their respective resources they noted those which overlapped with another workgroup due to shared responsibility or direct dependence. The Focal Areas chapter highlighted how integration occurred for the top three areas of shared interest amongst the three workgroups. Below are examples of how the park can use the analysis to continue the exploration of how resources and assets are interrelated and would benefit from a coordinated adaptation planning process.

Glasshouse Ruins and Shelter

Both the Cultural Resources Division and the Facilities Division have interests related to the Glasshouse Point complex. Facilities has manageable adaptation options to protect their assets from climate change. They are looking to the Cultural Division to inform them of what they would like to do with cultural resources and when to act. When the Facilities Division scored their assets in the area, such as the Glasshouse ruins shelter, they focused on the structural elements, while the Cultural Resources Division focused on maintaining cultural values. The two divisions would benefit from discussing long-term goals for this site that protect cultural values for as long as practical while keeping maintenance costs low. The Facilities Division may want to develop a managed retreat plan to execute after a storm event accelerates the implementation timeline of adaptations.

Archer Cottage

Both Cultural Resources and Facilities rated Archer Cottage, a historic building in the Yorktown Village area, as highly vulnerable due to the low elevation location and exposure to storm surge and sea level rise. The scoring differs between the two divisions with respect to adaptive capacity. The Cultural Resources Division focused on what could be done while maintaining cultural values, while Facilities was focused on structural options to reduce flooding. Cultural Resources may need to give Facilities direction and timing for when adaptations should begin.

Yorktown Historic Structures on Bluff

Cultural Resources scored these historic buildings as moderate vulnerability due to a combination of precipitation-based flooding of the basements and original fabric deterioration, while Facilities scored them as low. This is mostly due to their high elevation which in this assessment protocol produces low exposure, but through discussions these were identified as vulnerable to stressors not included in the protocol. However, Facilities sees some flood protection opportunities such as gutters and French drains around the outside of the buildings to maintain the cultural values. Conducting engineering studies and repairing foundations would be expensive but there is the potential to address the Town of Yorktown's interests in using these historic structures as part of the local tourism

strategy. This would provide the park with the financial resources to better maintain these historic structures, and Cultural Resources would have air conditioned spaces to preserve historical artifacts and values.

Cultural Resources

Key Messages

Colonial NHP archaeological sites, historic structures, museum collections, cultural landscapes, and ethnographic resources that comprise the park are already being impacted by ongoing erosion, which is being affected by climate change. Jamestown Island and sites along tributaries are the most vulnerable (Figure 10).

Vulnerability

The two components of vulnerability in this study are resource exposure and resource sensitivity. In order to address exposure and sensitivity, the Cultural Resources Workgroup divided resources into ten distinct geographical areas:

- New Town
- Jamestown Island
- Glasshouse Point
- Neck of Land
- James River – Parkway
- York River – Parkway
- Yorktown Waterfront
- Yorktown Battlefield
- Green Springs
- Yorktown Collections

Within each of these areas, the Cultural Resources Workgroup determined a list of priority sites. Priority archaeological sites and historic structures were determined by expert judgment from park and regional staff. Cultural landscapes were identified using the CLI. To assess the vulnerability of ethnographic resources in the park, this study considered four factors: archaeological sites of social, economic, or political significance, tidal and non-tidal wetlands including marshes, landscapes retaining a non-developed character, and key plant and animal species. These factors were developed by expert judgment with consultation in between the workshops from the Pamunkey Tribe Historic Preservation Officer.

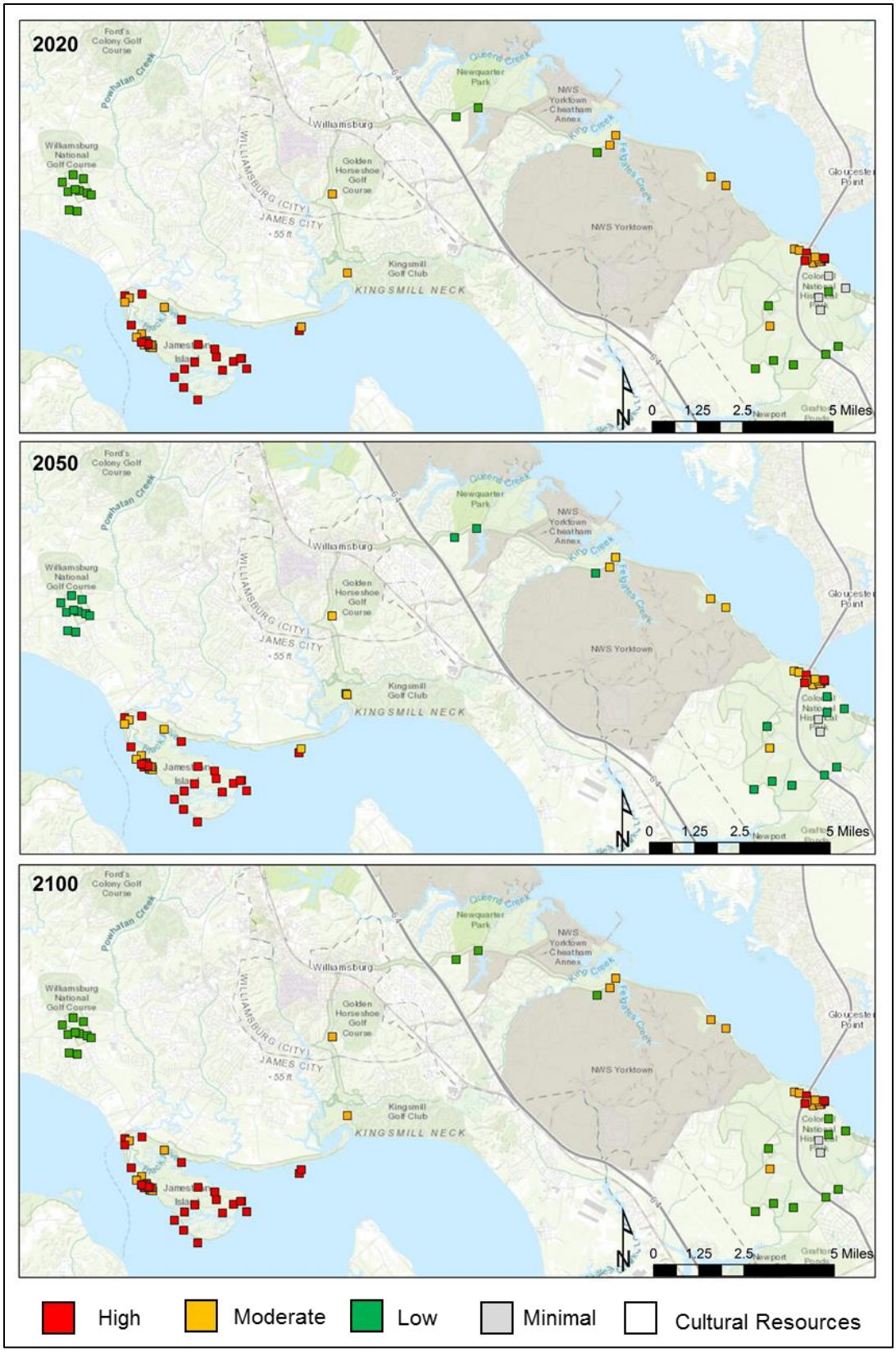


Figure 10. Vulnerability of Cultural Resources in 2020, 2050, and 2100 at Colonial National Historical Park, Virginia.

Once priority resources were identified, the Cultural Resources Workgroup assessed the exposure and sensitivity of each resource to ten separate stressors of climate change. These ten stressors include the same ones as the other groups as well as three additional stressors unique to Culture Resources:

- Increases in High Wind Events
- Runoff
- Humidity

The exposure and sensitivity of each resource to these ten factors were assessed in two ways. For sites that had specific geographic locations, exposure to these factors was determined by GIS mapping. For resources without unique geographic locations, a binary Yes/No response for each stressor within each focal area was given by subject experts. For sensitivity, the Cultural Resources Workgroup used a qualitative high, moderate, or low scoring system based on the State of the Parks scoring system. In this system, a score of 'high' meant the resource warranted significant concern given the sensitivity to the climate stressor, 'moderate' meant the resource warranted moderate concern, and 'low' indicated that the resource did not warrant additional concern beyond the normal level of care and maintenance. Each of the five types of cultural resources had different considerations for exposure and sensitivity. Vulnerability was calculated by normalizing (through binning) the raw exposure and sensitivity scores and then adding them together. They were binned first since sensitivity had a larger scoring range than exposure.

Archaeological Sites

In addition to concerns about sea level rise, storm surge, and coastal flooding, changing groundwater levels, wind, runoff, and changing precipitation intensity also pose threats to archaeological sites. (For additional information on the risks posed by these factors see Cultural Resource Climate Change Strategy pages 20-25.) For instance, sea level rise can cause site erosion and artifact redeposition. Wind events can cause tree falls which may be very damaging to buried archaeological resources. Changing precipitation will be moderated by stable groundcover, but torrential downpours in areas with steep topography, could negatively affect site context. Sites with few underground artifacts may not be affected by groundwater changes; however, sites that have been identified but not thoroughly investigated for subsurface deposits are at risk from various groundwater and sea level rise factors. Temperature and humidity are not a significant concern for archaeological resources. The archaeological resources at Colonial NHP are largely buried resources protected by soil and vegetation and earthwork features and park experts determined that other climate change risk factors to be more salient issues at Colonial NHP. Potential adaptation actions include changing the vegetation or ground cover in these areas which could benefit the archaeological sites. Wind events cause tree falls which are very damaging to the context of archaeological sites. Changing precipitation can be moderated by stable groundcover, but torrential downpours in areas with sloped topography, could also negatively affect site context. Sites with few underground artifacts may not be affected by groundwater changes; however, sites that have been identified but not thoroughly investigated for subsurface deposits are at risk from various groundwater and sea level rise factors.

Historic Structures

In addition to geographically-specific considerations such as sea level rise and storm surge, increasing intensity of rain may overwhelm rain gutter systems and cause water damage to structures. Increasing humidity or increasing sustained humid conditions may affect the biological growth of harmful organisms, damaging historic materials or increasing maintenance cycles.

Museum Collections

Concerns about museum collections' exposure and sensitivity to climate change were two-fold. First, direct impacts of climate change may affect the integrity of storage facilities. Soil chemistry or salt water intrusion may affect the foundations of buildings, which could have implications on the long-term viability of the storage facilities. For collection materials, the most important factor is the ability to maintain appropriate temperature and humidity conditions during storm events when electrical power is lost. Second, archeological collections are expanding rapidly at both Jamestown and Yorktown, requiring more curatorial storage space. In Jamestown alone, current projections suggest that the collections could double by 2050. This would greatly affect how this collection is managed and impact the park's finances and management.

Cultural Landscapes

To assess the totality of factors that comprise cultural landscapes, the Cultural Resources Workgroup divided cultural landscapes into boundary, natural systems and features, spatial organization, land use, topography, vegetation, circulation, buildings and structures, views and vistas, small-scale features, and archaeological sites. The sensitivity of these various features was determined through consultation with the five existing CLI reports. For cultural landscapes that have been identified, but not yet documented, sensitivity of the cultural landscape boundary was addressed using expert judgment. Not every potential cultural landscape in the park has a formal inventory. Because cultural landscapes include both natural and man-made features, the exposure and sensitivity vary greatly from built structures to natural features.

Ethnographic Resources

Through consultation with the Pamunkey Tribe, a list of indicators for the exposure and sensitivity of ethnographic resources was narrowed to archaeological sites of social, economic or political importance, tidal and non-tidal wetlands including marshes, landscapes maintaining a non-developed character, and key floral and faunal species (including sweet grass, rice grass, turkeys, raptors (eagles), marsh birds, beaver, turtle, fish and corn).

Adaptive Capacity

Cultural resources represent a diverse collection of materials, structures and sites with diverse preservation requirements and limited adaptation strategies in the face of climate change. While natural resources may have intrinsic abilities to adapt to change, man-made sites and memorialized viewscapes may not have the same flexibility. NPS guidance recognizes that resource adaptation may include a range of options from loss to reconstruction. The ability of site managers and partners to aid in the protection of cultural resources from the impacts of climate change represents one type of adaptive capacity. The decision to handle adaptive capacity separately was informed by the work supporting the NPS Cultural Resources Climate Strategy (Rockman et al. 2016) though the decision

was made at the first workshop prior to that document being published. Table 5 shows key considerations for each type of cultural resource, in each of the five categories of adaptive capacity. The table also indicates categories and resource types for which the Cultural Resource assessment was advised by Natural Resources and Facilities adaptive capacity scores. Although the table below shows key considerations, the adaptive capacity of each priority site, structure and feature in this study was scored individually.

Table 5. Cultural resource adaptive capacity (AC) guidelines developed for this pilot vulnerability assessment at Colonial National Historical Park, Virginia.

Resource Type	Physical AC: Intrinsic	Physical AC: Technological	Organization-al AC	Social AC	Economic AC
Archaeological Resources	Default value = Low Archaeological resources have little or no ability to adapt without human intervention.	Maximum value = Moderate Excavation, etc. saves the story, but not the site and context.	Default value = Moderate Sites with potential for partnerships.	Minimum value = Moderate Well-known, or important sites may receive more support for adaptation.	Default value = Low Adaptation actions for archaeological resources are very expensive.
Historic Structures	Default value = Low Historic structures have little or no ability to adapt without human intervention.	Historic structures may be protected through a combination of historic and modern preservation techniques. Interventions must consider preserving the historic integrity.	Organizational capacity may depend on historic preservation staff. Scores advised by facilities scores.	Structures with associated community groups may have higher adaptive capacity.	Structures with concession or adaptive reuse potential may have higher adaptive capacity.
Cultural Landscapes	Natural features may have intrinsic adaptive capacity. Scores advised by natural resource scores.	Varies by landscape feature.	Organizational capacity may depend on park and regional cultural landscape expertise.	Certain parts of the landscape may have advocacy groups while others do not.	Economic adaptive capacity of cultural landscapes may depend on integrated projects among NPS divisions.
Collections	Default value = Low Collections have little or no ability to adapt on their own.	Collections resources may already be protected in climate controlled facilities.	Organizational capacity to protect consolidated collections is generally high.	Social desire to protect consolidated collections is generally high.	Climate adaptations to collections buildings may be expensive.

Table 5 (continued). Cultural resource adaptive capacity (AC) guidelines developed for this pilot vulnerability assessment at Colonial National Historical Park, Virginia.

Resource Type	Physical AC: Intrinsic	Physical AC: Technological	Organization-al AC	Social AC	Economic AC
Ethnographic Resources	Natural features may have intrinsic adaptive capacity. However, changes to natural features may impact the ethnographic use of the resource.	Varies by ethnographic resource type.	Ethnographic resources may not be well-documented, which may present organizational challenges.	Modern uses may conflict with historic ethnographic uses.	Varies by ethnographic resource type.

Overall, archaeological sites had a low adaptive capacity due to the low intrinsic ability of the resource to adapt and the high expense of existing adaptation options. Certain sites with high significance such as the Ambler House on Jamestown Island had a higher adaptive capacity. Historic structures including the Jamestown Church Tower, Jamestown Fort and structures in the Glasshouse Point area scored high on the adaptive capacity scale due to the social interest in these sites and the potential for partnership projects with Preservation Virginia to protect these resources. The historic Jamestown seawall also scored a high adaptive capacity due to the importance of this structure in protecting other sites along the western portion of Jamestown Island.

The various features that comprise cultural landscapes have different adaptive capacities. The natural features of landscapes may have some intrinsic ability to adapt; however, planted gardens and other manicured landscapes may be negatively affected by changing climate. Features such as the topography and spatial organization of sites have low adaptive capacities, while the views and vistas and small scale features associated with these sites have a high adaptive capacity. In order to score the adaptive capacity of landscapes, we worked through individual features with varying adaptive capacities. However, for the sake of assessment usability, these various adaptive capacities are reported as an individual score in many places.

Museum collections were found to have a moderate adaptive capacity to climate change. This score was based on the high technological capability of these sites to adapt, but the moderate social interest and expense of these adaptations.

The adaptive capacity of ethnographic resources was directly informed by the Cultural Resources Workgroup's assessment of the adaptive capacity of the archaeological sites and cultural landscapes, and the Natural Resource Workgroup's assessment of natural features and species' adaptive capacity. While other Cultural Resource and Natural Resource scores informed the adaptive capacity scores of ethnographic resources, the ethnographic resource adaptive capacity scores may differ from these root scores due to what features were determined to be key components of the ethnographic resource. The marshes and non-developed character of the landscape have high adaptive capacities (this was

based on the Natural Resource's overall wetland score), while the archaeological sites and species that comprise the ethnographic resources had lower adaptive capacities.

The Cultural Resources Workgroup found it challenging to determine the economic adaptive capacity of individual resources because while funding may be available, the use of economic resources on one site may mean they are no longer available for use at another site. Although each individual structure may be able to adapt, without understanding how much funding was set aside for other sites, it was very challenging to score this. Another challenge the workgroup faced associated with scoring adaptive capacity came in trying to separate sites that may be dependent on other structures for physical protection. For example, many of the sites in New Town are dependent on the historic seawall for protection from storm surge, erosion, and sea level rise. The workgroup found it difficult to discuss the adaptive capacity of individual sites and structures without knowing the future of the seawall.

Comparing the vulnerability of Cultural Resources to adaptive capacity provides additional insights into the areas of concern and how they could be linked to other resources when considering actions (Figure 11). From a cultural landscapes perspective, Jamestown and Colonial Parkway landscapes have high vulnerability and low adaptive capacity. The Cultural Resources Workgroup scored Archer Cottage as low adaptive capacity due to the loss of cultural significance if the structure is moved. This contrasts with the Facilities Workgroup that scored the same resource as highly adaptive from a structures standpoint.

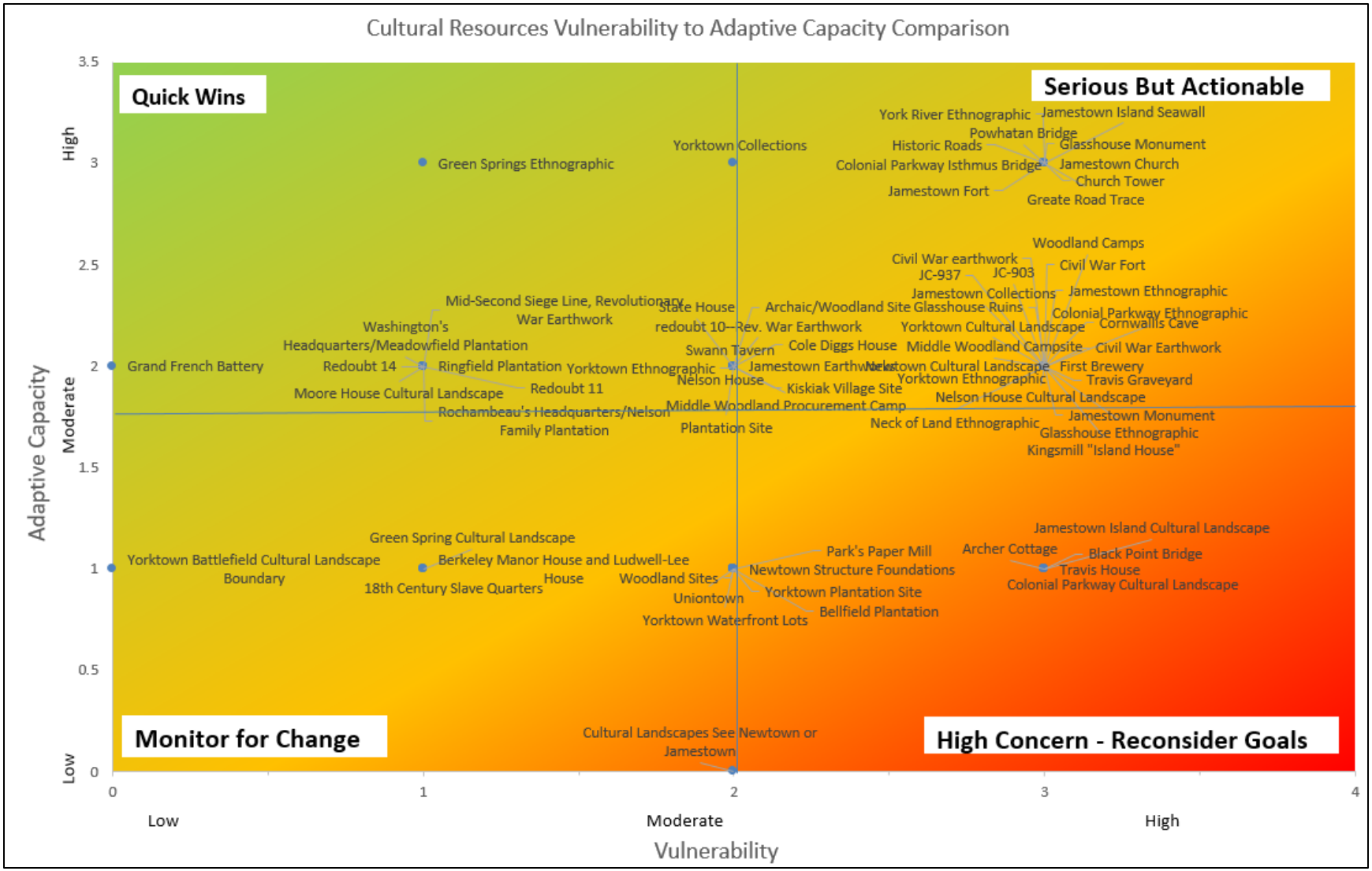


Figure 11. Comparison of Vulnerability to Adaptive Capacity for Cultural Resources at Colonial National Historical Park, Virginia, in 2100.

Highlighted Resources

This study identified Jamestown Fort archaeological site, Jamestown museum collections, archaeological sites on Glasshouse Point, and ethnographic resources on Glasshouse Point as the most vulnerable cultural resources in Colonial NHP.

While the resources described above are the most vulnerable to climate change, the analysis of vulnerability alone does not distinguish which sites are the top priority sites, have the highest historic significance, or are part of ongoing projects or opportunities for the park to work across divisions. Integrating significance and resource vulnerability is a key decision making guidance point for prioritizing resources in the NPS Policy Memo on *Climate Change Stewardship of Cultural Resources* (NPS 2014). While it was beyond the scope of this assessment and a systematic way to assess significance is not currently available, the Cultural Resources Workgroup highlighted five sites of particular significance with resource narratives (below.) These sites are:

- Early Archaic Campsite (archaeological site)
- Sir Yeardley Site (archaeological site)
- Yorktown Redoubt 10 (archaeological site)
- Jamestown Seawall (historic structure)
- Jamestown Island Cultural Landscape

Highlighted Resource: Early Archaic Camp

During an island-wide survey between 1994 and 1996, archaeologists uncovered one of Jamestown's oldest cultural resources on the eastern end of the island (Blanton et al. 2000). This Early Archaic Camp, identified as site 44JC903, was occupied by Virginia Indians between 8000 BC and 6000 BC. The site likely functioned as both a hunting camp and stone tool production site, and represents one of the first human occupations of the landform that would later become Jamestown Island.

Significance

Now a low-lying coastal peninsula, site 44JC903 was once the peak of a tall ridge overlooking lowlands surrounding a small stream that would eventually become the James River. At this time, small groups of hunter-gathers traveled along Virginia's creeks and rivers, setting up camps while following deer and other large mammal populations. Small, peripheral camp sites, such as 44JC903, were established and seasonally revisited for hunting and stone tool production, among other subsistence tasks in support of a larger mobile population at a central camp.

Small Archaic camp sites typically occupy former high ground with wide view sheds, and contain the artifact remains of stone tool production, small fires, and hunting-related objects. While the island-wide survey of Jamestown located four archaeological sites with Early Archaic components, only 44JC903 possessed intact, subsurface layers of human occupation (Blanton et al. 2000). Therefore, both the age and integrity of this resource define the site as one of the most significant spaces on the island for telling the long-term human history of the region.

Vulnerability

The Early archaic camp is highly vulnerable to climate change (Table 6). A 2016 assessment of Jamestown Island's archaeological resources identified site 44JC903 as one of 27 sites with active destruction from the effects of sea level rise (Bassett, 2016). Airborne LiDAR (Light Detecting and Ranging) measurements suggested that 65.45% of the site had been lost to erosion and inundation, while subsequent ground-truthing confirmed upwards of 77.9% of site loss since 1995 (ibid.). In just two decades, approximately 1070.95 m^2 of the Archaic camp site has been lost to rising waters, either destroying or shifting the majority of the site to the jurisdiction of the State-owned waterway. While portions of the site likely survive underwater (Blanton, 2000), the costs of underwater approaches to archaeology are prohibitively expensive. Therefore, with each year, recovery of the site's archaeological remains becomes more challenging, both logistically and economically.

Adaptive Capacity

As with all archaeological sites threatened by the effects of sea level rise, the immobility of the resource limits adaptive capacity (Table 7). Site accessibility poses a particularly problematic issue for strategies implemented to halt or delay threats. While shoreline protection would temporarily mitigate the effects of erosion, inundation may soon submerge the site despite these protective efforts. Therefore, this limits the adaptation strategies to further archaeological testing, and subsequent data recovery if necessary.

Table 6. Vulnerability scores for highlighted Cultural Resources at Colonial National Historical Park. H=High, M=Moderate, L=Low, Y=Yes, N=No.

Resource/ (Overall Vulnerability)	Stressors	FEMA_ A	ERO- SION	Sea Level Rise	SURGE_ CAT3	Precipi- tation	Wind	Soil Chem- istry	Run- off	Temper- ature	Humidity	Total Cumu- lative Score
44JC0903 Early Archaic camp/ (High)	Exposure	Y	Y	Y	Y	N	Y	Y	N	N	N	Moderate
	Sensitivity	H	H	H	H	H	H	H	H	H	H	High
44JC928 Sir Yeardley Site/ (High)	Exposure	Y	Y	Y	Y	N	Y	Y	N	N	N	Moderate
	Sensitivity	H	H	H	H	H	H	H	H	H	H	High
Redoubt 10 Earthwork/ (High)	Exposure	0	Y	0	Y	Y	Y	Y	0	Y	0	Moderate
	Sensitivity	H	H	H	H	H	H	M	M	L	L	High
Jamestown Island Seawall/ (High)	Exposure	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High
	Sensitivity	H	H	H	H	M	L	H	M	L	L	High
Jamestown Island Cultural Landscape: Boundary/ (High)	Exposure	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High
	Sensitivity	H	H	H	H	L	L	L	L	L	L	Moderate
Jamestown Island Cultural Landscape: Natural Systems/ (High)	Exposure	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High
	Sensitivity	H	H	H	H	H	M	H	H	H	H	High
Jamestown Island Cultural Landscape: Spatial Org./ (High)	Exposure	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High
	Sensitivity	H	H	H	H	L	L	H	H	L	L	High
Jamestown Island Cultural Landscape: Land Use/ (Moderate)	Exposure	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High
	Sensitivity	L	L	L	L	L	L	L	L	L	L	Minimal

Table 6 (continued). Vulnerability scores for highlighted Cultural Resources at Colonial National Historical Park. H=High, M=Moderate, L=Low, Y=Yes, N=No.

Resource/ Overall Vulnerability	Stressors	FEMA_ A	ERO-SION	Sea Level Rise	SURGE_ CAT3	Precipi-tation	Wind	Soil Chem-istry	Run-off	Temper-ature	Humidity	Total Cumu-lative Score
Jamestown Island Cultural Landscape: Topography/ (High)	Exposure	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High
	Sensitivity	H	H	H	H	L	M	L	M	L	L	Moderate
Jamestown Island Cultural Landscape: Vegetation/ (High)	Exposure	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High
	Sensitivity	M	M	M	M	L	M	M	L	L	L	Moderate
Jamestown Island Cultural Landscape: Circulation/ (High)	Exposure	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High
	Sensitivity	M	M	M	M	L	L	L	L	L	L	Low
Jamestown Island Cultural Landscape: Structures/ (High)	Exposure	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High
	Sensitivity	M	M	M	M	L	L	L	L	L	L	Low
Jamestown Island Cultural Landscape: Views and Vistas/ (Moderate)	Exposure	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High
	Sensitivity	L	L	L	L	L	L	L	L	L	L	Minimal
Jamestown Island Cultural Landscape: Small-Scale Features/ (High)	Exposure	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High
	Sensitivity	M	M	M	M	L	L	L	L	L	L	Low
Jamestown Island Cultural Landscape: Archeological Sites/ (High)	Exposure	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High
	Sensitivity	H	H	H	H	H	H	H	H	L	L	High

Table 7. Adaptive capacity scores for highlighted Cultural Resources at Colonial National Historical Park, Virginia.

Resource	Physical-Intrinsic	Physical-Technological	Organizational	Social	Economic	Overall Adaptive Capacity
44JC0903 Early archaic camp	Low	Moderate	Low	High	Moderate	Moderate
Sir Yeardley	Low	Moderate	Low	High	Moderate	Moderate
Redoubt 10	Low	Low	Moderate	High	Low	Low
Jamestown Island Seawall	Low	High	High	High	High	High

Recommendations

In early 2016, the condition and vulnerability assessment of Jamestown's archaeological resources categorized 44JC903 as one of twelve archaeological site requiring "immediate" action, predicting near-complete loss in less than five years (Bassett, 2016). Archaeological mitigation must therefore begin within the next year to provide enough time for data recovery if determined necessary. The possibility of partnering with Preservation Virginia or other organizations for the excavation of this site should be explored. The importance of this largely unknown site cannot be stressed enough. With the loss of its Early Archaic deposits, Jamestown Island would lose nearly 4,000 years of its history, severely limiting our record of the peopling of this region.

Highlighted Resource: Sir Yeardley Site

Between 1994 and 1996, an island-wide survey of Jamestown Island uncovered an additional 58 archaeological sites beyond James Fort and New Town (Blanton et al. 2000). Of these newly registered sites, 17 possessed 17th-century components of varying significance. Designated as site 44JC0928 by archaeological survey, this area contains two distinct concentrations of artifacts dating to the first half of the 17th century (*ibid.* pp. 156-158). The larger of the two concentrations spanned approximately 260 feet of the Back River shoreline. The highest density of artifacts, however, occurred in a 130 x 32-foot area in the center of this span.

The documentary record suggests that this section of Back River was claimed by Sir George Yeardley in 1620, patented in 1624, and served as his primary residence through his death in 1627 (McCartney, 2000). George Yeardley arrived in Virginia in May of 1610, after being shipwrecked on the island of Bermuda with Christopher Newport and Sir Thomas Gates, among other passengers of the *Sea Venture*.

Large concentrations of roofing tile uncovered in this area in 1995 parallel findings from the likely site of Yeardley's 1620s manor house and fort site at Flowerdew Hundred (Barka 1976; Deetz 1993). Given its location upon Back River, the shoreline artifact concentration likely represents an ancillary space to a house and/or warehouse on this lot around the time of Yeardley's occupation. Given the deep-water access of this area, it is possible that this artifact scatter represents a 17th-century wharf or

similar structure for the property. If so, this component of 44JC928 is potentially one of the most significant sites on the island given current initiatives surrounding race and democracy for the 1619 anniversary. If associated with this particular occupation, this site represents one of the very few known spaces of labor for eight of the first "20 or odd" Africans in English America, owned by Sir George Yeardley.

Vulnerability

The Sir Yeardley site is highly vulnerable to climate change (Table 6). In 2016, a LiDAR assessment and ground survey measuring the effects of sea level rise on Jamestown Island's archaeological resources identified site 44JC928 as one of 27 sites with active destruction from the effects of sea level rise (Bassett, 2016). This survey measured 75.89 m^2 of site area loss to erosion over a 21-year period (*ibid*. p. 10). When compared to the 17th-century occupation of this multi-component site, this represents destruction of 19% of the site in two decades, a rate of 3.6 m^2 per year.

Recently, shoreline erosion has disturbed the context of the site, depositing 17th-century material into Back River. As the shoreline erodes and 17th century materials become visible or are redeposited in the Back River, this process may draw attention to the resources or encourage the looting of material resources from their new positions in the river. This site is vulnerable to looting and/or complete loss to erosion in the coming years. Therefore, immediate mitigation of the site along the shoreline is necessary to prevent further loss of this resource.

Adaptive Capacity

The Sir Yeardley site has moderate adaptive capacity (Table 7). Jamestown Rediscovery recommends closing-in the intervals of Blanton et al.'s (2000) shovel-test-pit survey in this area from 20-meter to 5-meter intervals. This would involve the addition of at least 36 shovel-test-pits between STP-5093 and STP-5060, to define the site's spatial and temporal boundaries. If these additional shovel-test-pits yield artifact assemblages dating to the first half of the 17th century, phase II targeted investigation is warranted. If excavation of this site is warranted, funding from the Civil Rights Initiative, which funds research into African American sites, including antebellum free black sites, may be available. This funding could allow for expedited support of this project as this site is an important location under this initiative.

Highlighted Resource: Yorktown Redoubt 10

Redoubt 10 (LCS #000226), located along the Yorktown Bluffs, was originally constructed as part of the British Outer Defenses intended to protect the extreme left flank of the Inner Defense Line established to protect Yorktown and maintain naval control of the river. Hamilton's attack on the night of October 14, 1781 along with that of the French on Redoubt 9 helped to achieve decisive victory in the Battle of Yorktown.

The role of African Americans and Native Americans in the attack on Redoubt 10 adds to the historical importance of the site. The American assault on Redoubt 10 included the 1st Rhode Island Regiment, mustered into Service in 1778 and light infantry companies from various other regiments, including those of the state of Connecticut (Sullivan, 1952). The Rhode Island Assembly voted to allow "every able-bodied negro, mulatto, or Indian man slave in this state to enlist into either of the

Continental Battalions being raised." The assembly further stipulated that "every slave so enlisting shall, upon his passing muster before Colonel Christopher Greene, be immediately discharged from the service of his master or mistress, and be absolutely free." While not exclusively African American, it has been estimated that as many as three quarters of 1st Rhode Island Regiment were African American.

In addition to African Americans, it is documented that Native Americans served in the Rhode Island Regiment and in several Connecticut regiments at Yorktown. Members of the Pequot tribe enlisted in the Continental Army in Connecticut as soon as the war started. Several Pequots are documented as serving at Yorktown in the light infantry companies of their respective regiments. All of the Pequot light infantrymen with documented service at Yorktown took part in the successful assault on Redoubt 10.

Redoubt 10 has already suffered serious erosion over the years and is a partial reconstruction of the original British earthwork. Reconstruction during 1955-56 was based on archaeological investigations. The redoubt today is in the form of a V-shaped redan, approximately 80 feet long and 110 feet wide. The earthwork is composed of 6- to 7-foot high parapet walls with replica fraises fashioned from concrete extending forward from the parapet wall. It is surrounded by chain link fencing to protect visitors from attempting to access the dangerously steep slopes along its northern edge. An interpretive wayside provides information about the redoubt for visitors. Information from the integrity assessment should inform adaptation prioritization along with its interpretive value.

Vulnerability

Redoubt 10 is located precariously along the Yorktown Bluffs and has already experienced significant loss to erosion. The redoubt is highly vulnerable to many of the predicted effects of climate change (Table 6). Both erosion from heavy storm events and storm surge affecting the base of the cliffs will be more damaging and more likely as sea level continues to rise.

Adaptive Capacity

From a cultural resource standpoint, Redoubt 10 has low adaptive capacity (Table 7). It is a critical landscape feature for the interpretation of the role of African Americans and Native Americans in the Revolutionary War and in the decisive victory of Yorktown and offers a unique opportunity for interpretation. Maintaining the presence of healthy vegetation would help to combat the effects of heavy rains and storm events. Opportunities to fund shoreline stabilization as designed in the park's York River shoreline protection plan should be a priority to prevent further loss of Redoubt 10.

Highlighted Resource: Jamestown Island Seawall

The Jamestown Island seawall is a product of early-twentieth-century efforts to prevent erosion of the island shoreline and protect historic resources of the Jamestown Settlement site. Constructed by the USACE in coordination with the Association for the Preservation of Virginia Antiquities (APVA), the embanked concrete-block wall originally extended along the Old Town shoreline, continuing around the west end of the island to Sandy Bay. Western portions of the wall were removed or buried during the construction of the isthmus and Colonial Parkway. Following the acquisition of New Town by the National Park Service in the 1930s, Civilian Conservation Corps

workers built a riprap wall eastward beginning at the east end of the concrete seawall and extending just east of Orchard Run, a length of approximately 1,400 feet. Since then, riprap has been added to the island shoreline in numerous locations as needed to prevent erosion.

The historic 1890s Jamestown Island seawall includes the concrete portion along Old Town within the eastern NPS land, and continues along the western edge of the island, crossing back into NPS land, and ending in the Back River shoreline. The seawall is considered a cultural resource, significant for its association with the development of historic preservation practices on the island as initiated by the APVA in the 1890s. It is also significant for its association with early development of eastern historical parks and designed landscapes for interpretive purposes. The seawall is on the LCS and is a contributing resource of the Jamestown Island Area Cultural Landscape. The adjacent rip rap seawall on NPS land was put in much later and is not historic.

Today, the seawall continues to provide critical protection for the resources of the original fort and Old Towne by reducing erosion and protecting against wave damage. However, ongoing deterioration from environmental impacts threaten the integrity of the wall itself as well as the resources it protects. Further damage to the wall would have detrimental effects on the many of Jamestown Island's core resources.

Vulnerability

By virtue of its location at the water line of the James River, the Jamestown Island seawall is highly vulnerable to the shoreline impacts of climate change, including sea level rise, storm surge, coastal flooding, erosion and groundwater intrusion (Table 6). These impacts are already causing gradual but significant deterioration in the condition of the seawall, and as sea level rises and the frequency of damaging storms increases, the likelihood of significant damage or failure of the wall increases.

Adaptive Capacity

In the short term, repairs can be made to the Jamestown Island seawall to bring it into good condition and ensure it continues to provide protection to the western edge of the Jamestown Island shoreline (Table 7). Modifications using historic construction techniques and materials could also be made to increase the resilience of the seawall without significant impacts to its historic integrity. Maintaining the wall in good condition can help prevent erosion of the shoreline and disruption to archeological sites, landscape features and structures. As sea level rises, however, water levels will exceed the top of the wall more frequently, causing inundation and erosion, and the capacity to make structural modifications without substantially altering the historic character will diminish. Partnerships with Preservation Virginia, the VIMS, and the USACE may provide support and funding for repairs to the seawall.

Highlighted Resource: Jamestown Island Area Cultural Landscape

The Jamestown Island, Glasshouse Point and Neck of Land inventory unit is approximately 1,561 acres in size. Twenty-two and one-half acres of the Jamestown Island are owned by the APVA and are designated as the Jamestown National Historic Site.

Jamestown Island, Glasshouse Point and Neck of Land contain both natural and cultural resources. These landscapes are bounded by the James and Back Rivers and support a variety of plant and wildlife ecosystems. A majority of the project area is situated on Jamestown Island, which is mostly level and covered in pine-oak forest and wetlands. Glasshouse Point and Neck of Land are part of the mainland and are connected to the island by the isthmus. The project area also has historic vernacular landscapes and historic sites where historical events, cultural activities, and social trends were manifested over time in the physical appearance of the landscape. The importance of these landscapes can be seen in the archeological investigations that include the fortifications and remnant glassmaking operations, as well as in extant Civil War earthworks, grave sites and intact early Mission 66-era designs.

Vulnerability

The Jamestown Island Area cultural landscape comprises some of the most vulnerable resources in Colonial NHP. The entire cultural landscape lies within a few feet of the water line of the James River and is subject to regular flooding, erosion, elevated groundwater, storm surge, wind damage and sea level rise (Table 6).

For the colonial period, much of the landscape's integrity is manifested in the archeological resources and structural ruins, which convey the historic spatial organization, circulation and land use of the early Jamestown settlement; and in the natural systems and features of the island, which retain the broad patterns of the landscape as experienced by the island's first inhabitants. The impacts of climate change could cause profound changes to both of these resource categories, threatening the ability of the landscape to convey its significance. Furthermore, damage to nineteenth and twentieth century structures, including Civil War earthworks, early-NPS and APVA development, and Mission 66 park landscape features, reduces the integrity of the landscape as it relates to these historic periods.

Adaptive Capacity

The adaptive capacity of the overall Jamestown Island Area cultural landscape is an amalgamation of the adaptive capacity of the various landscape characteristics and features of the landscape (Table 8). Some characteristics, such as small-scale features and vegetation, have more available options for adapting to climate stressors they are likely to be exposed to. The core characteristics that contribute most to the landscape's integrity, however, possess little capacity for adapting to changing conditions. Archeological sites, natural systems and features, buildings and structures, and topography will be significantly impacted by frequent flooding and erosion, changing groundwater and soil salinity, and strong storms. As sea level rises, there will be fewer available options to ensure the preservation of these resources.

Table 8. Adaptive capacity scores for highlighted Cultural Resource - Jamestown Island Cultural Landscape, Virginia.

Resource	Boundary	Natural Systems	Spatial Org.	Land Use	Topo-graphy	Vege-tation	Circu-lation	Struc-tures	Views and Vistas	Small-Scale Features	Archae-ology Sites	Adaptive Capacity
Jamestown Island Cultural Landscape	Low	Mod	Low	Mod	Low	Mod	Mod	Mod	High	High	Low	Mod

Recommendations

The Cultural Resources Workgroup observed that sites are already being lost to erosion and climate change factors. As such, the workgroup's overall recommendation is that adaptation actions need to be implemented alongside ongoing planning processes. Recommendations from the workgroup at the conclusion of this process fall into two categories: planning and action. The following planning recommendations focus on documentation of existing resources and applying for funding:

- Vulnerability and adaptive capacity information from this study need to inform research questions, planning and funding moving forward.
- Planning for adaptation actions needs to start at least four years before project funding is expected or needed.
- Seek partnerships without funding to potentially speed up the process.
- Act on an existing historic structure report.
- Ensure there is a full inventory of what is in the park, and all information is updated and georeferenced.
- Compile a complete list of archaeological sites; for those that have been impacted by erosion or inundation, re-evaluate the National Register eligibility of the resources and re-nominate sites as appropriate.

The following action-oriented recommendations focus on developing collaborative plans with partner organizations:

- Re-evaluate existing shoreline stabilization structures and redesign as proposed in a new shoreline protection plan.
- For some resources, Historic American Buildings Survey and the Historic American Engineering Record level documentation or phase III archaeological excavation may be required.
- Prioritize existing funding to study archaeological resources that are already being affected.

- Determine how to compete well for funding; actions undertaken by the park need to allow the park to successfully compete for project funding.
- Improve collaboration among NPS divisions and with partner organizations to maximize research and action.

Natural Resources

Key Messages

Jamestown Island is at high risk of loss or transition of tidal marsh and tidal riparian forest to other landscape types. Tidal riparian forest is at severe risk throughout the park.

The goals for natural resources must be revised to incorporate the significant changes suggested by the three scenarios used in this assessment.

- Support ecosystem integrity and biodiversity, recognizing habitats are going to transition.
- Support resilience of bird habitats and herps.
- Slow the loss of marsh ecosystems on Jamestown Island to maintain priority habitats and cultural landscape features.

The park seeks to protect ecosystem integrity while recognizing that some habitat types will be reduced and transition. The park views this transition as an opportunity to interpret climate change and management response to changes as part of the visitor experience. The park plans to continue to protect herps, bird habitats and marsh ecosystems on Jamestown Island as long as practical. Continued monitoring and research are a crucial element in achieving these revised goals.

Vulnerability

The landscape is classified into four broad habitat types: forests, tidal and non-tidal wetlands and grassland, according to the Natural Resource Condition Assessment (NRCA) published by the NPS in 2012 (Lookingbill et al. 2012). The Natural Resources Workgroup took a park-wide examination on the first three habitat types. Several additional natural resources where geospatial data are not available are included: eagles, marsh birds, and herps (amphibians and reptiles) which were divided into two sub-categories, coastal and upland. The study aimed to be “useful for subsequent park-level climate change studies and planning efforts”. Another important source of information is Vegetation Classification and Mapping in Colonial National Historical Park, Virginia (Patterson, 2008), which includes some insights on climate change effects. Table 9 summarizes the main characteristics of the general habitat types in the park which were evaluated by the Natural Resources Workgroup during the vulnerability assessment. The vulnerability score from the 2050 scenario is provided, along with an integrated adaptive capacity score. The method for developing both of these is explained below.

Table 9. Summary of natural resources habitat examined in the vulnerability assessment for Colonial National Historical Park.

Resource	Summary Characteristics (primarily from Lookingbill et al., 2012)
Forest Vegetation (Upland)	Upland forest comprises the largest vegetation classification in the park (Patterson 2008). The majority of forestland consists of Successional Tuliptree–Loblolly Pine Forest. The other 18 types include locally or globally rare communities.
Tidal Riparian Forest	Tidal riparian forest includes Coastal Plain Loblolly Pine – Oak Forest as the dominant vegetation type of Jamestown Island and surrounding area, in low-lying areas or sandy soils surrounded by tidal wetlands.
Non-Tidal Riparian Forest	This category was generated by creating a 100 foot buffer in forested habitats along non-tidal streams.
Non-tidal wetlands	There are seven different types of non-tidal wetlands located within the park. They include saturated forests, swamps, ponds and depressions fed by ground water.
Tidal wetlands	This is a generalized category that summarizes the six specific types described below. It is not mapped.
Disturbed Tidal Hardwood Swamp	"Disturbed Tidal Hardwood Swamp habitat, on Jamestown Island, has been cut off from tidal creeks by roads or berms. It receives periodic flooding from storm surge."
Tidal Bald Cypress Forest / Woodland	"The globally rare Tidal Bald Cypress Forest/Woodland occurs in the transition zone between open tidal water and tidal marsh. Salinity conditions range from oligohaline to fresh."
Tidal Freshwater Marsh	Tidal Freshwater Marsh occurs where freshwater input allows fresh water species to dominate.
Tidal Oligohaline Marsh	Tidal oligohaline marsh is characterized by salinity concentrations of 0.5-5 parts per thousand (ppt). Dominant vegetation types include tidal forbs, big cordgrass and non-native Phragmites. This wetland type covers the most area of any wetland type in the park.
Tidal Mesohaline and Polyhaline Marsh	Tidal Mesohaline and Polyhaline Marsh are wetlands characterized by salinity concentrations 15-30 ppt. They include the Low Salt Marsh and Transitional Marsh cord grass species.
Beaches	Beaches are sand based habitats along shorelines, perhaps with some shrubby vegetation.
Salt Scrub	Salt Scrub is a fringing transitional marsh shrub community, with Eastern baccharis (*Baccharis halimifolia*), Jesuit's bark (*Iva frutescens*), and smooth cordgrass (*Spartina alterniflora*) as typical species.
Herps (COASTAL)	The park distinguishes between reptiles and amphibians found within coastal habitats. A study including location data of individual terrapins, sliders and snapping turtles, northern water snakes and cottonmouth snakes is underway, but geospatial data were not available for mapping.
Herps (UPLAND)	The park distinguishes between reptiles and amphibians found within upland habitats, which include box turtles and black snakes. As with coastal herps these are not mapped.
Eagles	Bald Eagles live and nest within the park. Geospatial data were not available so these are not mapped.
Marsh birds	Breeding and migratory birds which depend on marsh habitats such as rails, herons and marsh wrens. Geospatial data were not available so these are not mapped.
Bluffs (Yorktown)	Coastal bluffs along the Yorktown shore are included as a habitat type vulnerable to climate change. These are mapped based on park topography.

By 2050 transformational loss of several habitat types due to sea level rise, storm surge and groundwater changes is expected.

The Natural Resources Workgroup initially scored the climate change exposure and sensitivity of each resource for the entire park geography. After examining the results of the overall assessment, the workgroup noted that the climate impacts expected for Yorktown appeared to be overestimated, while those for Jamestown Island failed to capture the workgroup's concern about effects on tidal riparian forests. The workgroup concluded that the park-wide assessment did not sufficiently reflect the greater degree of exposure and differing sensitivity of resources located on Jamestown Island and the relatively lower exposure in the Yorktown area. The workgroup revisited the scoring for these two sub-geographies with several resources receiving different scores. The revisions appear in Figure 12 and in the tables in Appendix D.

The exposure scoring combines scores for seven climate change related stressors: sea level rise, groundwater change, severe storms and flooding, erosion, precipitation, drought and temperature. These were all treated equally and not weighted differently, even though sea level rise might present a greater long-term impact. Projected sea level rise change alone possesses a major threat to wetlands throughout the island as well as tidal riparian forest, however the workgroup determined that the upland forest vegetation was even more vulnerable not only from sea level rise but also increased salinization of ground water, storms, and erosion.

The vulnerability scores for each time frame (2020, 2050 and 2100) are shown in Table 10. Vulnerability is based on the workgroup's scores (scoring of Minimal, Low, Moderate, High) of exposure and sensitivity of the resource to each climate stressor. The exposure and sensitivity scores for each time frame is shown in Appendix D.

These simple scenarios are based on a 'bathtub model' analysis that represents sea level rise as a change in contour level of the shore. It does not incorporate the dynamic nature of habitat response to environmental changes nor the increased impact of storm surge as sea level rises. If tidal wetlands convert to mudflats or migrate inland over time, riparian and upland forest may become more vulnerable as they are squeezed by migration of tidal wetlands or are exposed to more direct storm surge, erosion and increased changes in ground water including salt water intrusion.

Table 10. Natural Resources Vulnerability scores by time frame at Colonial National Historical Park, Virginia.

Resource	2020	2050	2100
1. Forest Vegetation (UPLAND)	Low	Low	Moderate
1. Jamestown Forest Vegetation (UPLAND)	Moderate	High	High
1.Yorktown Forest Vegetation (UPLAND)	Low	Low	Low
2a. Non-Tidal Riparian Forest	Minimal	Minimal	Low
2a. Jamestown Non-Tidal Riparian Forest	Minimal	Minimal	Low
2a. Yorktown Non-Tidal Riparian Forest	Minimal	Minimal	Minimal
2b. Tidal Riparian Forest	High	High	High
2b. Yorktown Tidal Riparian Forest	Low	Low	Moderate
3. Non-tidal Wetlands	Low	Low	Low
3. Yorktown Non-tidal Wetlands	Minimal	Minimal	Low
4. Tidal Wetlands (In General)	Moderate	Moderate	Moderate
4a. Beaches	Low	Low	Low
4b. Disturbed Tidal Hardwood Swamp	Low	Low	Moderate
4b. Jamestown Disturbed Tidal Hardwood Swamp	Low	Low	Moderate
4c. Salt Scrub	Low	Low	Moderate
4d. Tidal Bald Cypress Forest / Woodland	Low	Low	Low
4e. Tidal Freshwater Marsh	Moderate	Moderate	Moderate
4f. Tidal Mesohaline and Polyhaline Marsh	Low	Low	Low
4g. Tidal Oligohaline Marsh	Moderate	Moderate	Moderate
4g. Yorktown Tidal Oligohaline Marsh	Minimal	Minimal	Minimal
4h. Tidal Shrub Swamp (Wax Myrtle Type)	Low	Low	Moderate
4h. Yorktown Tidal Shrub Swamp (Wax Myrtle Type)	Low	Low	Low
5. Herps (COASTAL) e.g. turtles, water snakes	Low	Low	Moderate
6. Herps (UPLAND)	Minimal	Minimal	Low
7. Eagles	Minimal	Minimal	Minimal
8. Marsh Birds	Low	Low	Moderate
9. Bluffs (Yorktown)	Low	Low	Moderate

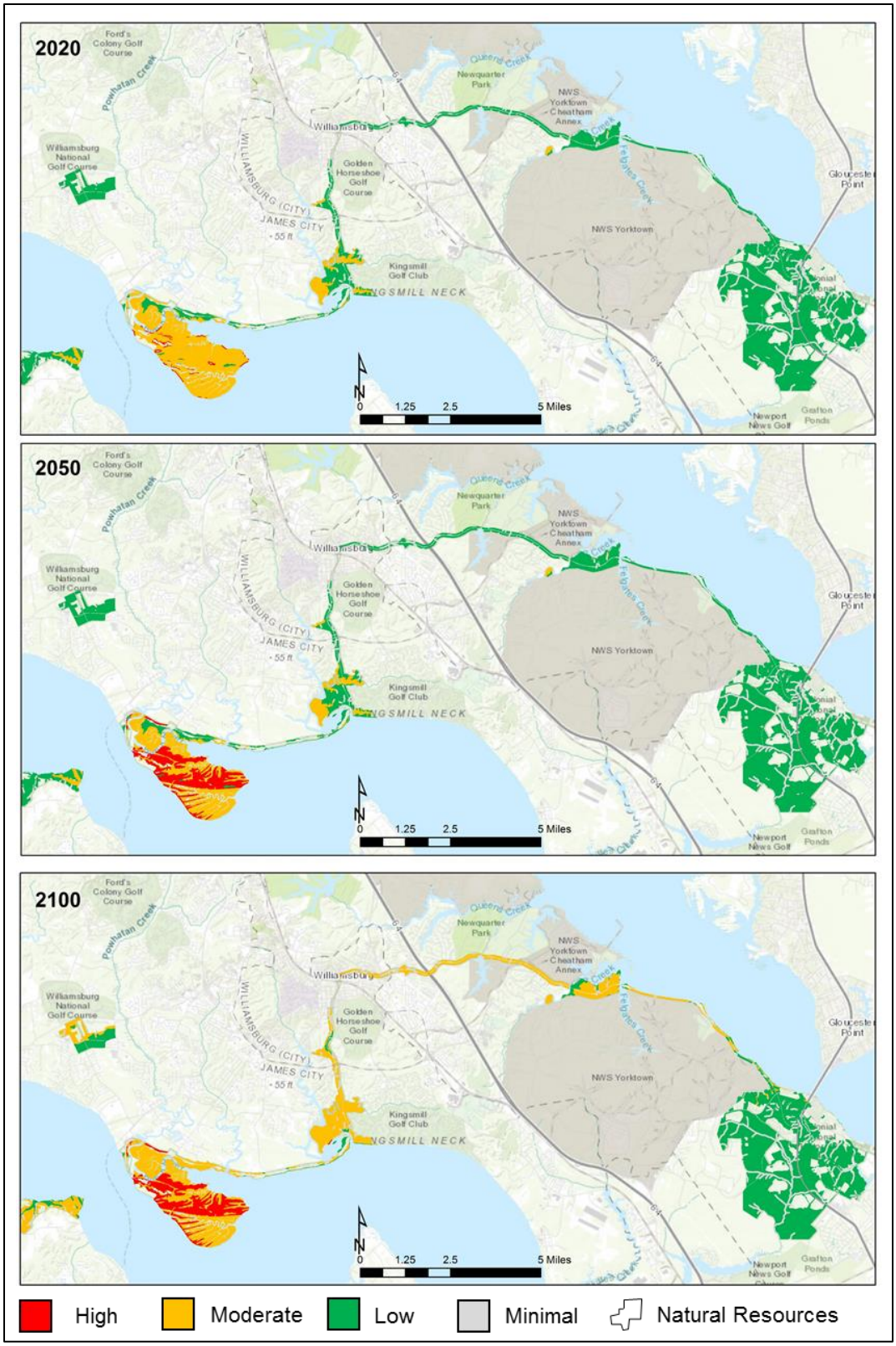


Figure 12. Vulnerability of Natural Resources in 2020, 2050 and 2100 at Colonial National Historical Park, Virginia.

Adaptive Capacity

Natural resources differ from most other resources in adaptive capacity by the intrinsic ability to adapt. Within the Physical category of the POSE framework, intrinsic adaptive capacity was captured separately from the physical-technology component under the physical category in case it was to be handled separately in future analysis (i.e. as the method was being developed, it was considered whether to include within vulnerability for natural resources). The summary of adaptive capacity for natural resources in Table 11 highlights the two sub-sections to the physical category. See Appendix E for full adaptive capacity data set.

Table 11. Detailed scoring of Adaptive Capacity for Natural Resources at Colonial National Historical Park, Virginia.

Resource	Adaptive Capacity
1. Forest Vegetation (UPLAND)	Moderate
1. Jamestown Forest Vegetation (UPLAND)	Moderate
1. Yorktown Forest Vegetation (UPLAND)	Moderate
2a. Non-Tidal Riparian Forest	Moderate
2a. Jamestown Non-Tidal Riparian Forest	Moderate
2a. Yorktown Non-Tidal Riparian Forest	Moderate
2b. Tidal Riparian Forest	Moderate
2b. Yorktown Tidal Riparian Forest	Moderate
3. Non-tidal Wetlands	Low
3. Yorktown Non-tidal Wetlands	Low
4. Tidal Wetlands (In General)	High
4a. Beaches	High
4b. Disturbed Tidal Hardwood Swamp	Moderate
4b. Jamestown Disturbed Tidal Hardwood Swamp	Moderate
4c. Salt Scrub	Moderate
4d. Tidal Bald Cypress Forest / Woodland	Moderate
4e. Tidal Freshwater Marsh	Moderate
4f. Tidal Mesohaline and Polyhaline Marsh	High
4g. Tidal Oligohaline Marsh	Moderate
4g. Yorktown Tidal Oligohaline Marsh	Moderate
4h. Tidal Shrub Swamp (Wax Myrtle Type)	Moderate
4h. Yorktown Tidal Shrub Swamp (Wax Myrtle Type)	Moderate
5. Herps (COASTAL) e.g. turtles, water snakes	Moderate
6. Herps (UPLAND)	Low
7. Eagles	High

Table 11 (continued). Detailed scoring of Adaptive Capacity for Natural Resources at Colonial National Historical Park, Virginia.

Resource	Adaptive Capacity
8. Marsh Birds	Moderate
9. Bluffs (Yorktown)	Low

Comparing Natural Resources vulnerability to adaptive capacity (Figure 13) shows that most of the resources fall within the Quick Wins or Serious but Actionable quadrants of moderate to high adaptive capacity. Tidal riparian forest stands out on the matrix within the Serious but Actionable quadrant.

Priority Natural Resources

The vulnerability scores for each habitat type are mapped in Figure 14. There are several habitats of moderate concern which occur along the Colonial Parkway including Swann's Point and Kings Creek, the greater concern is along College Creek and the shoreline of The Thorofare, Mill Creek, and the park entrance. The tidal portion of College Creek has large areas of Tidal Freshwater Marsh and Tidal Oligohaline Marsh with high vulnerability scores. Most of Jamestown Island will be highly vulnerable by 2050.

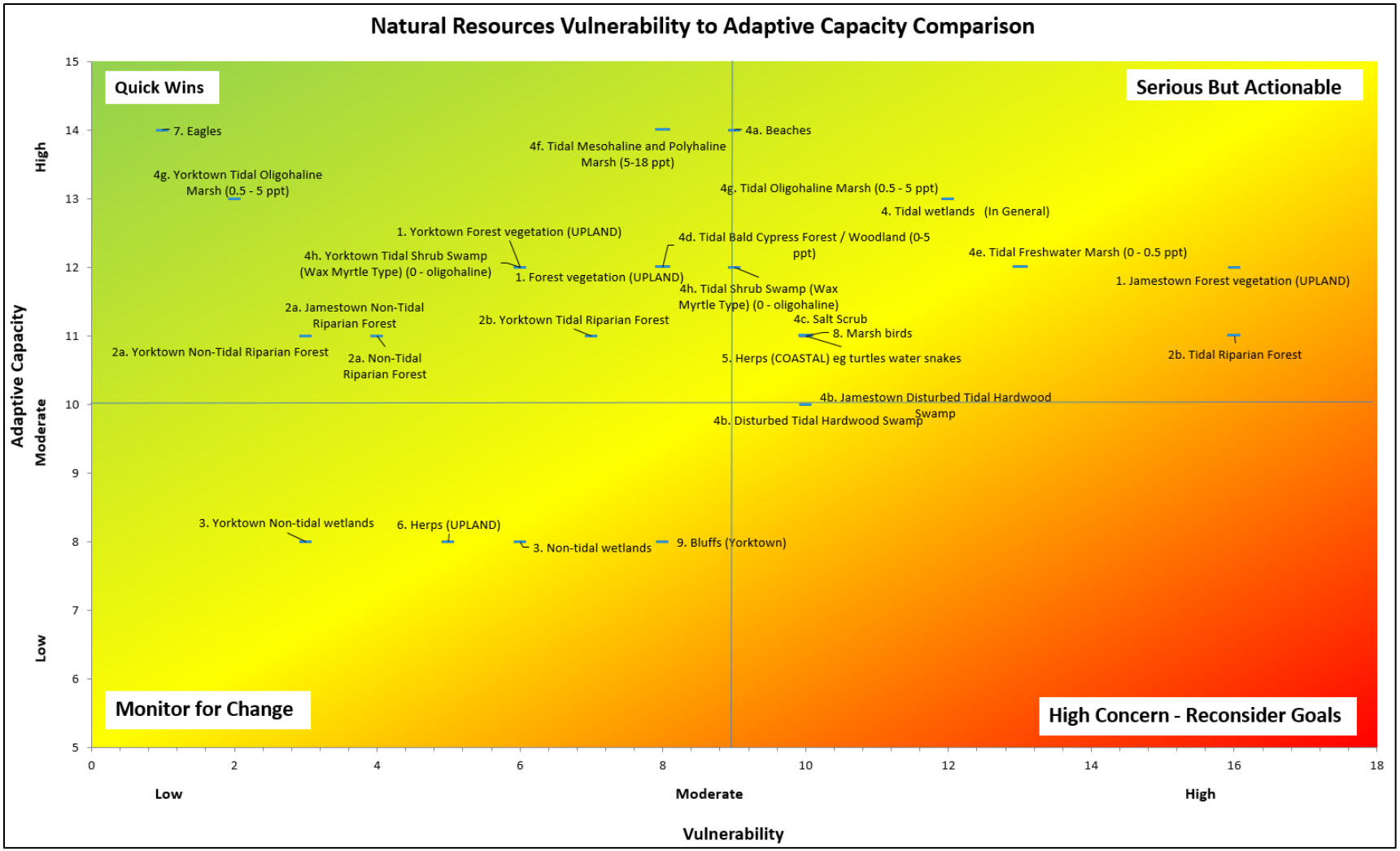


Figure 13. Comparison of Vulnerability to Adaptive Capacity Natural Resources at Colonial National Historical Park, Virginia, in 2050.

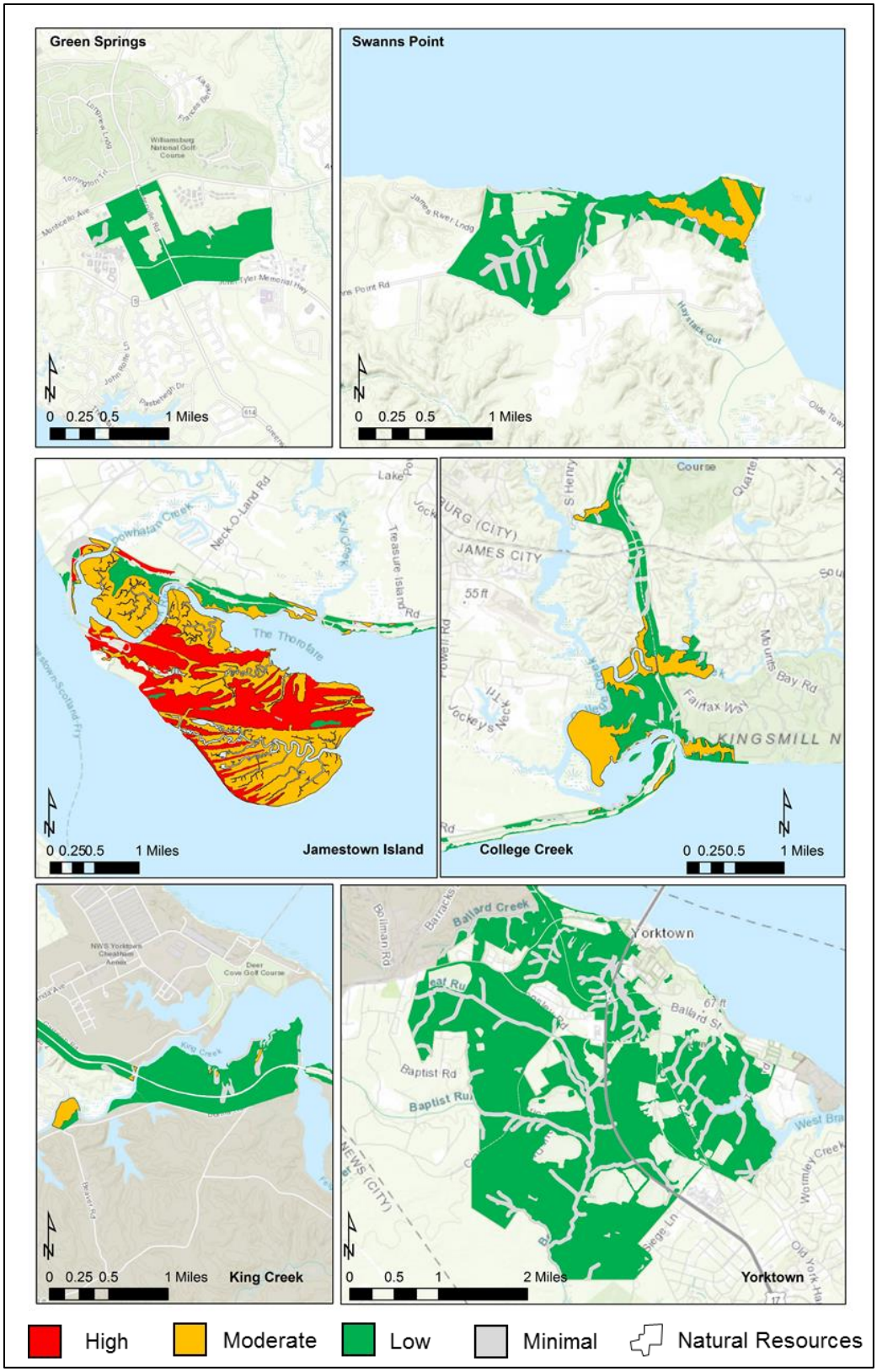


Figure 14. Vulnerability scores in 2050 of natural resources by geographic area at Colonial National Historical Park, Virginia.

Recommendations

Many of the recommendations related to Natural Resources were related to needs for other divisions. As habitat transitions continue, an opportunity emerges to interpret climate change and management response to changes as part of the visitor experience. Maintaining access to habitats essential to the cultural landscape and visitor experience as long as practical is a priority, with the recognition that access may be different in the future than what now exists.

Additional monitoring and research needs were highlighted in order to address uncertainties for particular exposure stressors and sensitivity indicators as well as potential adaptation options. Monitoring upland pond vegetation and water level change would help to understand the conditions facing archeological sites. The available methods to identify and map floodplain riparian forest areas were insufficient given available data layers; a buffer method was used, but more accurate methods were identified that could be a priority follow up.

Better stormwater management was identified as a management option that could slow the loss of wetlands, reduce erosion and improve water quality.

Controlling invasive species to prevent loss of native species is a continuing need. Patches of Phragmites in Jamestown Island are of particular ongoing concern.

One recommendation from the integrated discussions was to update the shoreline management plan; there is a need to compile and review all recent plans and detailed proposals on shoreline protection. This would involve examining the impacts and effectiveness of existing shoreline protection structures and the proposed best practices, such as in the James City County shoreline management plan. The update should also involve looking at recent scientific and management literature including the recent geologic resources inventory report (Thornberry-Ehrlich, 2016). A better understanding is needed of sediment supply to the island, the condition of fringing marsh in terms of edge erosion and the many new technologies and designs that could expand the suite of options for the park to consider. It was recommended to continue to work with York County to enforce storm water management measures to protect Yorktown's non-tidal riparian forest. More broadly the maintenance of runoff control facilities is an important priority. The park needs to work with partners including localities and counties, to inform responsible parties of legal requirements for maintaining culverts and drainage ways.

Facility Assets

Key Messages

Facility assets in Colonial NHP play a critical role in protecting and providing public access to the valued cultural and natural resources at the park. Due to the topography of most of the park, with the exception of Jamestown Island, a majority of the assets are less exposed to climate change. It is important to keep in mind that many of these assets are still susceptible to precipitation-based flooding. A low percentage (16% overall, 9% of structures, 18% of transportation) of facility assets, under this study's conservative projections, rated as moderate or high vulnerability (Table 12). However, these assets represent a current replacement value of over $238,000,000. It is important to note that there was only a single change in vulnerability scores between 2020, 2050 and 2100 for facility assets - the Jamestown Island Outer Loop road changes from moderate to high vulnerability between 2020/2050 and 2100.

Continued flooding of roadways and structures will stretch facility resources and require long range planning to avoid maladaptation that expose assets to extreme weather events that can cause significant damage.

Areas of concern for Facilities include the Jamestown loop roads, and the York River section of the Parkway due to erosion (Figure 15). An opportunity exists to improve flood protection of the historic buildings in Yorktown village to protect them from deterioration and enable the NPS to lease the buildings. Leasing buildings is a priority for the park: it preserves the buildings, provides income to the park, and brings activities to Main Street.

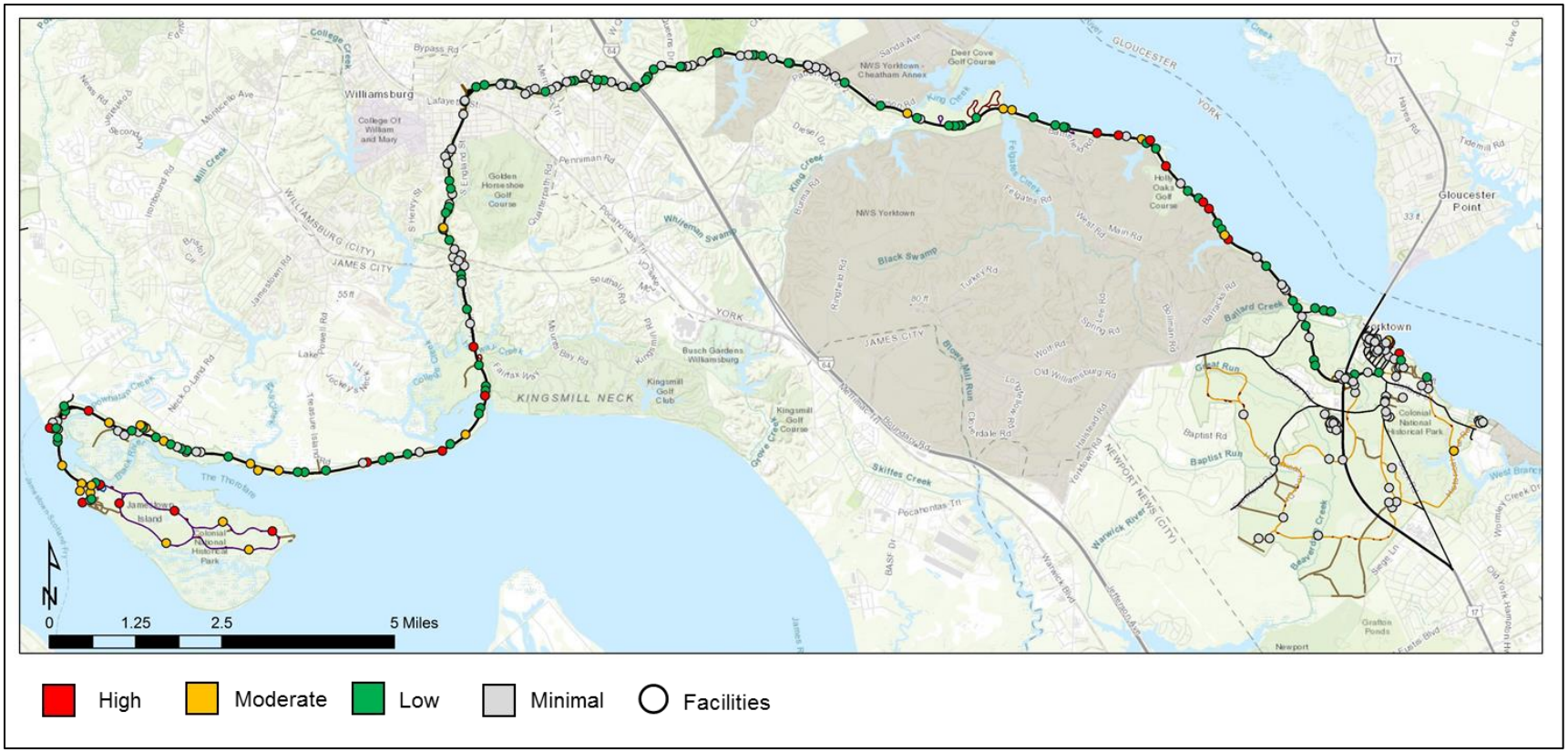


Figure 15. Vulnerability of Facilities by 2100 based on climate projections at Colonial National Historical Park, Virginia.

Table 12. Facility assets that scored moderate or high vulnerability in 2050 at Colonial National Historical Park, Virginia. Current Replacement Values (CRV) comes from the NPS FMSS.

Vulnerability	#	%	CRV
High Vulnerability	24	8%	$132,223,306
Moderate Vulnerability	25	8%	$106,526,103
TOTAL High and Moderate Vulnerability	49	16%	$238,749,409

Vulnerability

To assess vulnerability of facility assets, the following indicators were used based on the SOP/WCU protocol.

Exposure Indicators

- Flooding potential
- Extreme Event Flooding
- Sea Level Rise Inundation
- Shoreline Change
- Reported Coastal Hazards

Sensitivity Indicators

- Flood Damage Potential (Elevated)
- Storm Resistance and Condition
- Historical Damage
- Protective Engineering
- Additional Sensitivity Indicators for Bridges (From National Bridge Inventory)
    - Bridge Clearance
    - Scour Rating
    - Bridge Condition
    - Bridge Age

A majority of facility assets have minimal exposure to climate change (85% of structures and 65% of transportation) (Table 13). Following the SOP/WCU protocol, this assessment categorizes those assets that did not score exposed for any of the exposure indicators as minimal. Those assets with

minimal exposure scores were not analyzed for sensitivity. Those with moderate and high exposure (18%) were concentrated on Jamestown Island, Glasshouse Point and along the riverfront portions of the Colonial Parkway. The one asset that had a change in exposure was the Jamestown Outer Loop Road which went from moderate to high exposure (and thus vulnerability) between 2050 and 2100.

Table 13. Facility assets' exposure results summary for 2020 and 2050 at Colonial National Historical Park, Virginia. Sum of percentages may not be equal to 100 due to rounding. Between time frames there was only one change in exposure for a transportation asset from moderate to high from 2020 to 2100. Culverts were added to this analysis which resulted in a greater number of transportation assets assessed compared to the SOP/WCU protocol.

	High Exposure		Moderate Exposure		Low Exposure		Minimal Exposure		
Assets	**#**	**%**	**#**	**%**	**#**	**%**	**#**	**%**	**Total #**
Structures	2	3%	5	7%	4	5%	63	85%	74
Transportation	22	9%	27	11%	34	14%	156	65%	239
All Facility Assets	24	8%	32	10%	38	12%	219	70%	313

For those assets that scored low to high exposure, they were then assessed for their sensitivity. 74% of facility assets (that have some exposure) scored as moderate to high sensitivity, a majority of them coming from transportation (n=91) (Table 14). This is of concern and merits attention considering the ongoing challenges to fund annual maintenance and the potential for extreme weather events that go beyond the scope of the exposure analysis.

Table 14. Facility assets' sensitivity results summary at Colonial National Historical Park, Virginia. Sum of percentages may not be equal to 100 due to rounding.

	High Sensitivity		Moderate Sensitivity		Low Sensitivity		Total # Analyzed	Excluded * (Min. Exposure)	
Assets	**#**	**%**	**#**	**%**	**#**	**%**		**#**	**%**
Structures	2	17%	10	83%	0	0%	12	62	84%
Transportation	35	28%	56	44%	36	28%	127	112	47%
All Facility Assets	37	27%	66	47%	36	26%	139	174	56%

* Assets with minimal exposure (in no climate stressor areas) were excluded from the sensitivity and adaptive capacity analysis. Total # analyzed is different for compared to exposure and vulnerability.

Of the 313 facility assets assessed (including all items in the Facility Management Software System (FMSS) plus culverts), 49 assets (~16%) scored high or moderate vulnerability. A slight majority of assets (54%) are scored as minimal exposure to the climate stressors analyzed in this assessment (Table 15). Assets on Jamestown Island, in the Glasshouse complex and along the York River were the most vulnerable (Table 16). A detailed analysis of facility assets excluding the culverts can be found in the SOP/WCU protocol (NPS, 2016) and the full vulnerability data set can be found in

Appendix F. That report focused only on projections for the 2050-time frame though almost all assets stayed the same across the three time frames. Table 17 lists the transportation assets that scored high vulnerability as well as the scores for the Island Drive; the outer loop of Island Drive was the only asset with a vulnerability score that changed from moderate to high between 2050 and 2100.

Table 15. Facility assets vulnerability results summary for 2100 at Colonial National Historical Park, Virginia. Percentages are based on total assets (analyzed plus the excluded) for each asset type. Sum of percentages may not be equal to 100 due to rounding.

	High Vulnerability		Moderate Vulnerability		Low Vulnerability		Excluded * (Min. Exposure)		Total # Analyzed
Assets	**#**	**%**	**#**	**%**	**#**	**%**	**#**	**%**	
Structures	3	4%	4	5%	5	7%	62	84%	74
Transportation	22	9%	20	8%	91	38%	106	44%	239
All Facility Assets	25	8%	24	8%	96	31%	168	54%	313

* Assets with minimal exposure (in no climate stressor areas) were excluded from the sensitivity and adaptive capacity analysis. Total # analyzed is different for compared to exposure and vulnerability.

Table 16. Summary of vulnerability scores for facility asset structures at Colonial National Historical Park, Virginia. Structures that scored minimal are not shown. Scores are the same for all three time frames. Full data set is in Appendix F.

ID	Location	Exposure	Sensitivity	Vulnerability Score
9	Glasshouse Factory	Moderate	High	High
12	Glasshouse Factory Ruins Shelter	High	Moderate	High
59	Archer Cottage	High	Moderate	High
6	Jamestown Maintenance Fire Cache/Storage	Moderate	Moderate	Moderate
60	Archer Cottage Outbuilding	Moderate	Moderate	Moderate
62	Jamestown Historic Research Center	Moderate	Moderate	Moderate
63	Jamestown Visitor Center	Moderate	Moderate	Moderate
5	Jamestown Maintenance Office / Eq Storage	Low	Moderate	Low
72	Redoubts 9 & 10 Fortifications	Low	Moderate	Low
75	Fusilers & French Trench Fortifications	Low	Moderate	Low
76	Glasshouse Factory Support Building	Low	Moderate	Low

Table 17. Summary of the vulnerability for facility transportation assets at Colonial National Historical Park, Virginia. Only transportation assets that scored a high vulnerability are shown as well as the island loop roads. Full data set is in Appendix F.

ID	Location	Exposure		Sensitivity	Vulnerability	
		2020/ 2050	2100		2020/ 2050	2100
122	York River Shoreline	High	High	High	High	High
123	James River Shoreline	High	High	High	High	High
124	Jamestown Island Shoreline	High	High	High	High	High
3	Colonial Parkway: Jamestown: Colonial Pkwy Real Estate Parking to Just North of College Creek Bridge	High	High	Moderate	High	High
11	Colonial Parkway: Yorktown: Just West of Indian Field Creek Bridge to Colonial Pkwy Yorktown River Parking	Moderate	Moderate	High	High	High
12	Colonial Parkway: Yorktown: Colonial Pkwy Yorktown River Parking to Mine Depot Overpass	High	High	Moderate	High	High
16	Halfway Creek Bridge #4290-022P	High	High	Moderate	High	High
17	Powhatan Creek Bridge	High	High	Moderate	High	High
36	Jamestown Access Road Rt 011	Moderate	Moderate	High	High	High
39	Pitch and Tar Bridge	High	High	Moderate	High	High
40	Blacks Point Bridge #4290-029P	High	High	Moderate	High	High
42	Long Bridge #4290-031P	High	High	Moderate	High	High
78	Yorktown Beach Parking Rt 0924	High	High	Moderate	High	High
79	Cornwallis Cave Parking Rt 0925	High	High	Moderate	High	High
125	Swans Point Shoreline	Moderate	Moderate	High	High	High
177	Culvert; Mile: 16.18	High	High	Moderate	High	High
192	Culvert; Mile: 2.67	Moderate	Moderate	High	High	High
205	Culvert; Mile: 3.1	Moderate	Moderate	High	High	High
206	Culvert; Mile: 3.22	Moderate	Moderate	High	High	High
210	Culvert; Mile: 4.49	Moderate	Moderate	High	High	High
211	Culvert; Mile: 4.74	Moderate	Moderate	High	High	High
38	Island Drive (Outer Loop)	Moderate	High	Moderate	Moderate	High
37	Island Drive (Short Loop)	Moderate	Moderate	Moderate	Moderate	Moderate

Adaptive Capacity

Assets that received exposure scores above minimal were assessed for adaptive capacity (see Appendix G for full data set). In general, a great majority (75%) of the assets exposed to climate stressors have high adaptive capacity to reduce vulnerability (Table 18). The remainder of assets had moderate adaptive capacity. This is due to a combination of high organizational (NPS ownership of the assets), economic (likely access to funding) and social (the importance of these assets to meeting cultural and natural resource mandates) capacities. On the economic component of adaptive capacity, it is unclear as to whether the NPS will be able to raise the funding over the coming decades for incremental maintenance and adaptation when other coastal areas are facing similar challenges. This larger regional and national perspective was not used to score adaptive capacity but certainly will be a factor. The one asset with low adaptive capacity is the Colonial Parkway Ringfield Plantation Parking due to it being closed to the public and thus likely low interest in investing resources to reduce vulnerability.

Table 18. Facility assets adaptive capacity (AC) results summary at Colonial National Historical Park, Virginia. Sum of percentages may not be equal to 100 due to rounding.

	High AC		Moderate AC		Low AC		Total # Analyzed	Excluded * (Min. Exposure)	
Assets	#	%	#	%	#	%		#	%
Structures	5	42%	7	58%	0	0%	12	63	85%
Transportation	144	77%	42	22%	1	1%	187	52	22%
All Facility Assets	149	75%	49	25%	1	1%	199	115	37%

* Assets with minimal exposure (in no climate stressor areas) were excluded from the adaptive capacity and sensitivity analysis. Total # analyzed is different for compared to exposure and vulnerability.

Looking at the vulnerability and adaptive capacity in combination provides additional insights into the areas of concern and how they could be linked to other assets when considering actions. From a structures standpoint (Figure 16), the Glasshouse Point assets are most vulnerable with only moderate adaptive capacity, especially for the ruins which would lose context and affect the integrity of the cultural landscape if removed from the ground. For transportation assets there are a significant number of assets in the moderate to high vulnerability area of the matrix (Figure 17). While most of them have moderate to high adaptive capacity, success will depend on adaptation actions being taken in a timely and effective manner. Colonial NHP should track these assets carefully as the climate changes and extreme events occur. This process should be revisited to rescore adaptive capacity every five to ten years in light of changing political, ecological and economic contexts. The cumulative number of assets needing action and their linkages across individual assets is a critical aspect to keep in mind when considering adaptation options.

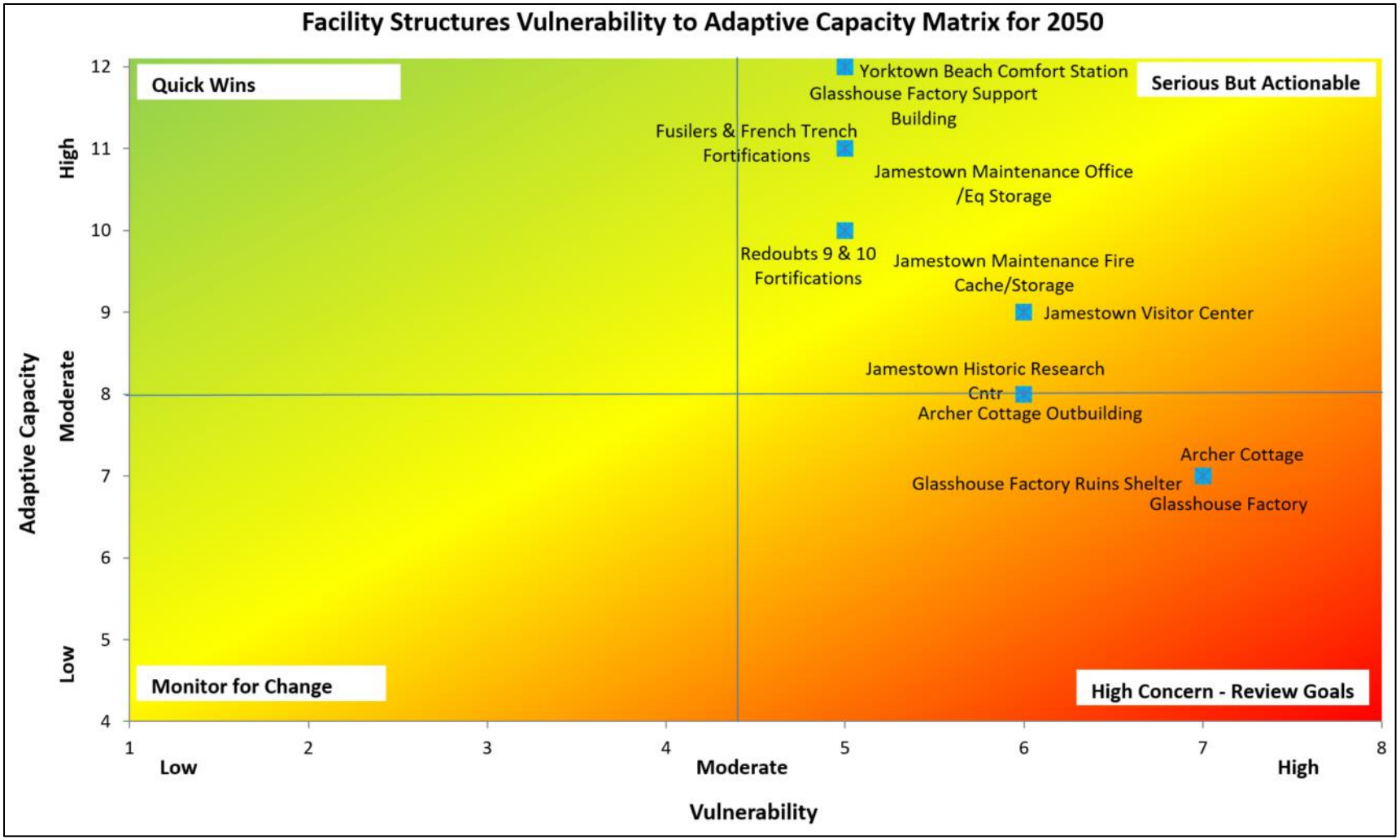


Figure 16. Comparison of vulnerability to adaptive capacity for structural facility assets in 2050 at Colonial National Historical Park, Virginia. Excludes 62 structural assets that scored minimal exposure and didn't get sensitivity or adaptive capacity scores.

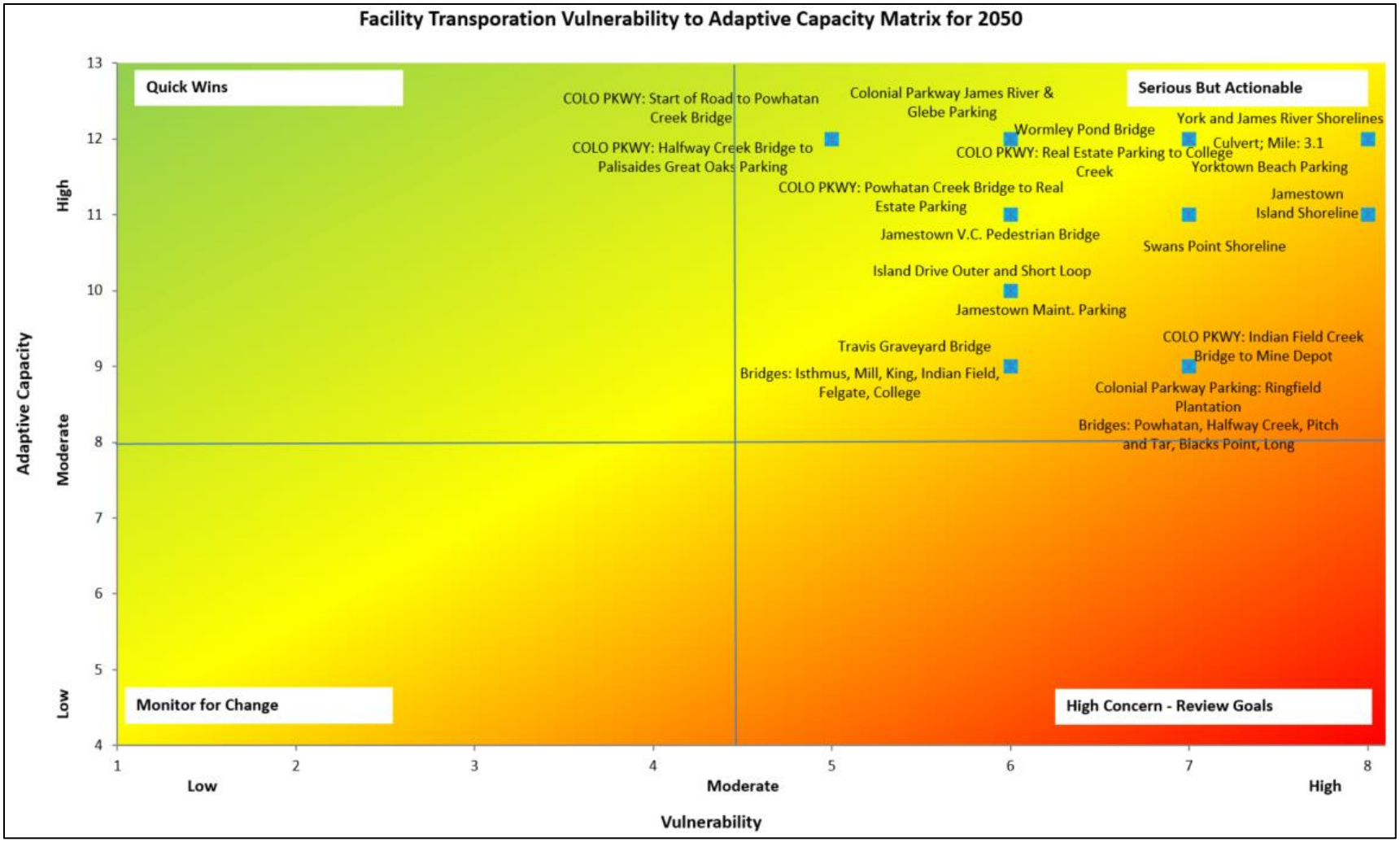


Figure 17. Comparison of vulnerability to adaptive capacity for transportation facility assets in 2050 at Colonial National Historical Park, Virginia. Excludes 164 transportation assets that scored minimal exposure and didn't get sensitivity or adaptive capacity scores.

Priority Facility Assets

Colonial NHP's Facilities Workgroup identified priority issues based on how assets that were scored as a high or moderate vulnerability would influence their ability to achieve their stated mandates and management goals (Table 19). This approach allowed combining scores for individual assets into groupings based on their ability to provide a service.

Table 19. Priority issues for facility assets at Colonial National Historical Park, Virginia.

Priority Issues	Reasoning	Timing	Data Needs
Maintaining the safety and functionality of the Colonial Parkway complex of roads and bridges: Isthmus, Powhatan Creek, Mill Creek, College Creek, Halfway Creek, Felgates Creek, Kings Creek, Indian Field Creek.	This is a major commuter roadway and a historic cultural resource that was cited in the Foundation Document.	Medium term as most of the bridges and road surfaces have recently been updated.	Monitor impacts during extreme weather events
Stabilize the York River shoreline along the Colonial Parkway	Steep bluffs are encroaching on the roadway and turnoffs	Near term for some locations where erosion is less than 10 feet from the road. Delay factors require proactive timing.	Soil and engineering studies for most at risk areas. Monitoring of changes for other areas.
Stabilize the James River shoreline as Jamestown Island changes	Bio-physical changes will accelerate as Jamestown Island gets inundated and reduces protection to the mainland shoreline near the Parkway. Could impact a major commuter roadway.	Near term to begin outlining a series of studies	Hydrodynamics and sediment transport for James River shoreline if Jamestown Island is eroded
Maintain and retrofit culverts along the Colonial Parkway to handle extreme precipitation events and increased stormwater runoff	Clogged or damaged culverts result in roadway closures and cause damage to road surfaces. Annual cleaning to maintain capacity for storm runoff. .	Immediate for cleaning culverts and monitoring functionality	Hydrology data as part of larger parkway study mentioned above and to support redesign or replacement of undersized culverts.
Accelerate the protection and removal of artifacts in the Jamestown Collections	Paper collections have been removed though artifacts remain.	Immediate for removing valuable collections	This is an integrated issue but repeated here for emphasis.

Table 19 (continued). Priority issues for facility assets at Colonial National Historical Park, Virginia.

Priority Issues	Reasoning	Timing	Data Needs
Flood proof historical structures in Yorktown Village to protect assets and enable leasing buildings	Though not exposed to coastal flooding which resulted in low vulnerability scores, these houses get flooded from rain events which increases the damage to cultural resources and prevents them from being occupied. Yorktown has shown great interest in these houses for tourism.	Immediate	Designs for French drainage systems
Reduce the vulnerability of Archer Cottage from storm surge	Archer Cottage has a history of storm damage and needs a plan for raising or relocation	Medium term based on the priority of Cultural division	Study of options (flood-proofing, elevation or relocation) for addressing impacts to Archer Cottage.
Maintenance Plan for the Jamestown Island Loop Road System	A long-term plan is needed to guide the maintenance strategy and allow a phased retreat of uses and services in line with the rest of the island.	Medium term	Review road sealing strategy in seven years. Link with long-term Jamestown Island retreat study
Relocate the Glasshouse Factory and Factory Ruins Shelter complex to allow for natural shoreline retreat	Sea level rise and storm surge will impact the Glasshouse structures in the medium to long term. Options exist to maintain and enhance the services.	Long term	Study of options for how to relocate structures to maintain natural shorelines

Recommendations

- Coordinate with Cultural Resources and Natural Resources Divisions on the integration issues.
- Review the priority list and sort by timeline, available resources and sequencing. Seek win-win options with other divisions and partners to reduce barriers for change.
- Fully develop the decision points (see next chapter for explanation) that add in the lag time between initiating planning and funding processes, unique to the Facilities and transportation sector, to stay ahead of the changes in climate.
- Fully assess the state of culverts and prioritize activities including replacement, redesign and enlargement. Build off of the existing database produced by the Federal Highway Administration to prioritize which culverts need modifications to reduce vulnerabilities to climate change. The North Atlantic Aquatic Connectivity Collaborative has a program that

offers prioritization tools and culvert assessment protocols that need to be reviewed for compatibility with Federal Highway Administration assessments.

Incorporating Goals and Adaptation Pathways

What are the implications of the vulnerability scores for Colonial NHP to achieve its goals and how should adaptation happen? For the goals that need to be revised based on the likely climate changes, what are the right adaptation actions to take and when to do them? This section of the report looks at how to respond to the vulnerability assessment in light of park goals. Then potential methods for conducting adaptation planning using the vulnerability results are explored.

Goals at Risk

A next step in the Climate Smart Conservation framework after a vulnerability assessment is to reconsider conservation goals in light of climate change (Stein et al. 2014). At the start of the assessment, each workgroup was asked to articulate the current goals that determine current priorities and management actions. At the third workshop, with the vulnerability and adaptive capacity in mind, the group as a whole revisited these goals. Part of the learning process was realizing that some of what had originally been listed as goals were more like methods, so time was spent refining the current goals, before assessing which of those may need to be revised in light of vulnerability, and whether any of them will no longer be attainable in the future or if new goals will be needed. The integrated discussion demonstrated where there are overlapping goals, and the important role of interpretation and communication. A summary of the goals and the ideas for which ones may need to be revised are in Table 20. The language of the goals and revised goals would need to be further refined if they are intended to be used beyond this initial exercise. It should be noted that the planned method was to rely on goals from the Foundation Document, but that was not complete at the time of the workshop, and the draft language did not lend itself to goal format.

There is another critical reason for revisiting the goals with results from a vulnerability assessment. There is a need for criteria or thresholds in order to interpret the meaning and consequences of the vulnerability results. A risk assessment is a common tool for incorporating these elements to put potential vulnerabilities into a decision-making framework. Identifying the specific thresholds for risk analysis are challenging for many organizations. Therefore using a combination of vulnerability scores, decision points, adaptation pathways and goal statements, the group were able to weave together an analysis that builds off of existing materials and organizational processes. This also balances the quantitative measurements from the vulnerability assessment with the qualitative interpretation and expert judgement of the adaptation pathways and reflection on goals.

Table 20. A summary of the goals and potential revised goals based on the findings of the vulnerability assessment for Colonial National Historical Park, Virginia.

Workgroup	Initial Goals	Revised Goals
Cultural Goals	Preserve integrity of historic resources	Preserve integrity of historic resources where possible. Recognizing there are archeological resources at risk of loss of integrity, prioritize most vulnerable sites, and identify which resources are best preserved in place versus removed.
	Ensure understanding of the ethnographic resources present in the park	Ensure understanding of the ethnographic resources important to the park, recognizing that resources may transition outside of park.
	Effectively preserve and manage collections	Effectively preserve and manage collections. Build support to move Jamestown Island collection to a less vulnerable location before it becomes urgent.
	Preserve sites' information in archeological record and make available in archeological collections in perpetuity and make available to future researchers for study and interpretation	Maintaining goal is appropriate for projected future conditions
Natural Goals	Support ecosystem integrity and biodiversity	Support ecosystem integrity and biodiversity, recognizing habitats are going to transition.
	Protect herps and bird habitats	Increase resilience of bird habitats and herps.
	Protect marsh ecosystems on Jamestown Island to maintain habitat for all species and the cultural landscape.	Slow the loss of marsh ecosystems on Jamestown Island to maintain priority habitats and cultural landscape features.
Interpretation Goals	Interpret cultural and natural resources	N/A
	Establish and maintain communication with the public	Maintain communication with the public, including communicating impacts of climate change on the park.
Facility Goals	Maintain facility assets' condition and capacity	N/A
	Maintain adequate access to visitors, staff, and partners	N/A
	Maintain access to cultural structures and sites	Maintain facility assets' condition and capacity where possible, and increase resiliency of structures at risk of deteriorating condition.

Adaptation Pathways

Climate change increases the level of uncertainty and risk, which makes the transition to significant long-term action challenging. Therefore, new frameworks are needed to bridge the current state to significant changes over time. The adaptation pathways framework is a promising and well tested approach for addressing these needs by combining aspects of vulnerability, risk and sequential adaptations (Haasnoot et al. 2013; Barnett et al. 2014). This approach differs from classical planning by beginning with identifying impacts that the system can't cope with and then marking those tipping points where changes are necessary.

> An **adaptation pathway** is a decision strategy that entails a vision for the entity exposed to climate risks, to be met through a sequence of manageable steps over time, each of which is triggered by a change in environmental (or, as we argue social) conditions. These triggers may be thought of as adaptation **decision points**. The points in time when adaptation actions cease to be effective and new actions are required. In this approach, adaptation is as much about actions in time as in space. (Barnett et al. 2014)

Recognizing that adaptation planning was not the focus of this assessment, but that applying the vulnerability assessment for that purpose is the major motivation behind doing one, the process included an example exercise to identify potential decision points for select focal areas to brainstorm potential adaptation pathways that could meet long-term goals.

The outputs from this exercise were only meant to explore and practice the concepts. The content shared below is only exploratory and not meant to signify the park's official position and plans going forward. Depending on the decision, more involved stakeholder and compliance processes will be needed.

The first tool tested was the application of identifying decision points for focal areas – Jamestown Island, Colonial Parkway and Glasshouse Point. By narrowing the scope to select focal areas the three divisions were able to go deeper in their discussions of how the resources will interact over time as the climate changes. The first step was to identify those resources from our assessment that are related to a focal area. The second step was to look at the vulnerabilities at the three time frames to discern when major impacts were likely to occur across the system. Some decision points may need to be made ahead of expected impacts in order to avoid resource damage. Other decision points could be the result of an extreme weather event like a hurricane or the collapse of a structure and may prepare for a trajectory of change. Decision points are a way to establish qualitative thresholds for acceptable change or risk beyond which action would be required. As one park participant stated in the workshop, a decision point could be a lead-up time frame where a decision needs to be made before an impact is felt. Infrastructure projects are a classic example of the time lag between planning and implementation.

The second tool used was Adaptation Pathways. Building off of the Decision Point exercise, the workgroups were provided a menu of potential adaptation options based on Rockman et al. (2016) for cultural resources and Stein et al. (2014) for natural resources and brainstormed others. Each option was assessed for how long it might be effective based on climate change projections. Based on

the options developed, a simple pathways graphic was produced to highlight the menu of options and how the NPS might sequentially adapt over time as the climate changes (Figures 18 and 19).

Examples of how these two tools were tested are presented below.

Jamestown Island Adaptation Pathways

There are some clear and significant vulnerabilities to Jamestown Island as time and events unfold. While there is high uncertainty when these events will occur, the likely sequence of changes and potential adaptation options can be discussed in advance. Table 21 summarizes the workshop participants' initial brainstorming.

Table 21. Decision points for Jamestown Island, Colonial National Historical Park, Virginia.

Decision Points (listed in columns, not in any order):	**Southeast Jamestown Island inundated**	**Eastern Jamestown and Loop road compromised**	**Old Town seawall compromised and overtopped**	**Isthmus Bridge and roadway compromised**	**Museum Collections flooded and exposed during storms**
Resources / Assets Linked to DP:	Tidal oligohaline marsh; coastal plain-loblolly pine-oak forest	disturbed tidal hardwood swamp; Tidal oligohaline marsh; coastal plain-loblolly pine-oak forest	Archaeological sites, archeaearium, historic structures, seawall shoreline	Isthmus bridge, wooden shoreline stabilization structures, roadway	Most archaeology / text collections, building structure
Goals / Strategies at Risk	Protecting marsh systems, bird habitat and ecosystem integrity	Protecting marsh systems, bird habitat and ecosystem integrity	Maintain the seawall which is a historical structure and avoid additional visual impairments to the site.	Ensure access to Jamestown Visitor Center during most weather events	Protect the collections in place until they can be safely moved to higher ground off the island.
Currently Doing to protect:	Wetlands and shoreline protection structures around the island. James City County shore plan	Wetlands and shoreline protection structures; James City County shore plan	Maintain existing seawall in historical context	Bridge and roadway maintained and recently upgraded above floodplain where possible.	Finding a suitable location to move collection off the island. Removing some items.

Table 21 (continued). Decision points for Jamestown Island, Colonial National Historical Park, Virginia.

Decision Points (listed in columns, not in any order):	Southeast Jamestown Island inundated	Eastern Jamestown and Loop road compromised	Old Town seawall compromised and overtopped	Isthmus Bridge and roadway compromised	Museum Collections flooded and exposed during storms
Adaptation Pathway Options	Improve monitoring; Update the shore management plan to include climate scenarios; redeploy materials, marsh stabilization to higher priority sites; new forms of access to shore areas, revise interpretation	Improve monitoring; Reinforce Black Point protection structure, marsh stabilization; new forms of access to wetlands; revise interpretation	Continue stabilizing and repairing the seawall, increased earthen wall on the landside of the seawall	Stabilize shoreline, raise the roadway and bridge	Remove all text collections from the island

While a full adaptation analysis was not part of this vulnerability assessment, the participants did brainstorm potential options for addressing the key vulnerabilities on Jamestown Island. Below are some examples of the medley of options for each issue (shoreline Figure 18 and loop road Figure 19). The figures propose how long actions could last, based on the projections and transfer points (represented by the overlaps in time) to change strategies over time. The time frames roughly aligned with those of the assessment, with near term discussed as within the next 5 years, mid-term as mid-century and long-term as end of century or beyond. These options and pathways are only examples for how to potentially think through the integrated nature of the issues and to facilitate an open dialogue for making changes over time in step with impacts. These serve as exploratory examples and are not NPS findings.

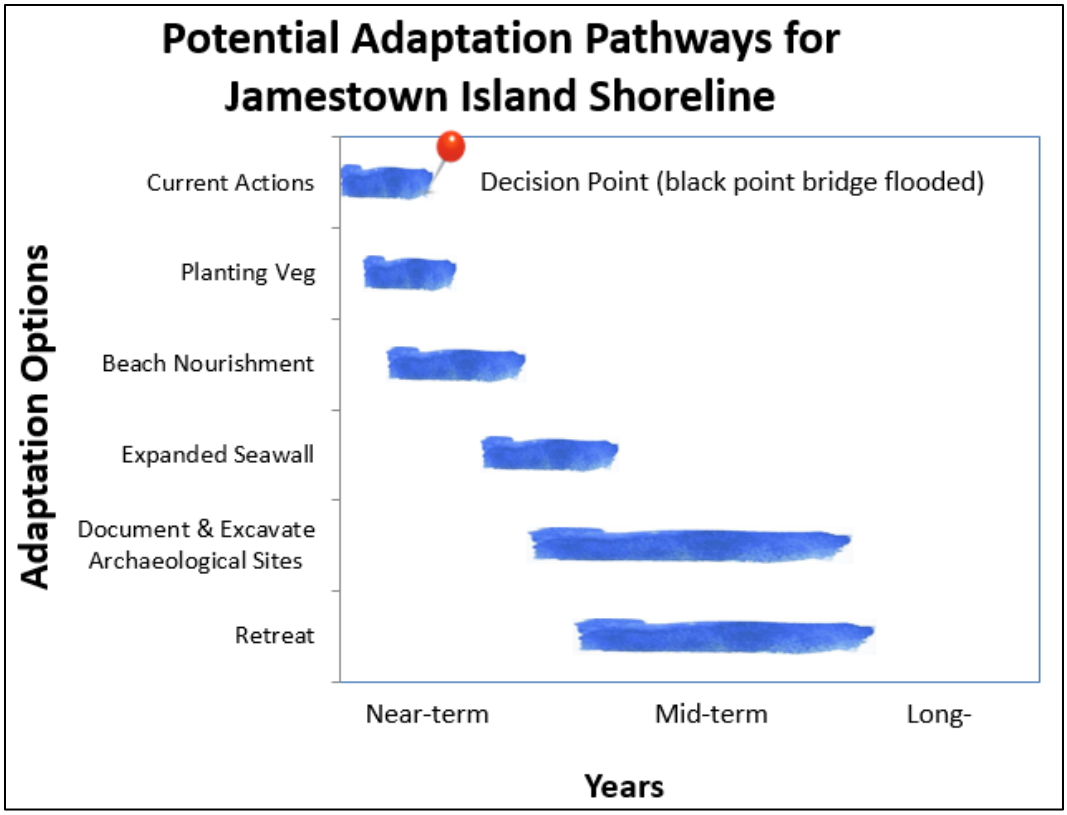


Figure 18. Illustrative adaptation pathway for the shoreline of Jamestown Island, Colonial National Historical Park, Virginia.

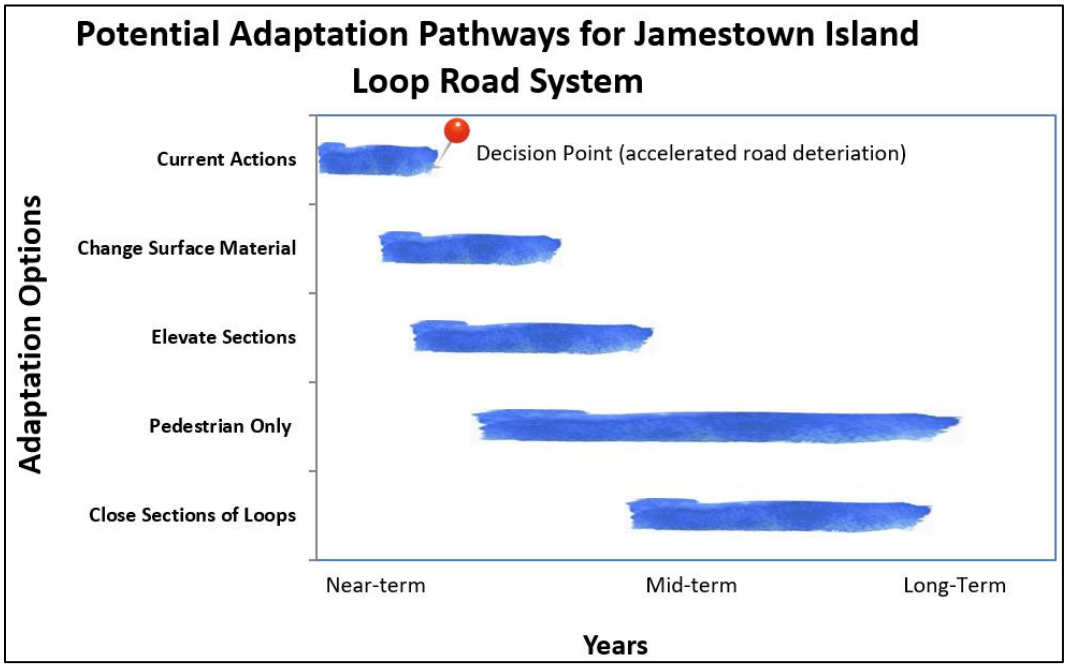


Figure 19. Illustrative adaptation pathway for Jamestown Island loop road system, Colonial National Historical Park, Virginia.

Colonial Parkway Adaptation Pathways

The participants identified two key decision points for the Colonial Parkway and a variety of potential adaptation options. The one significant decision would be to reconsider whether the parkway should continue being maintained for daily commuter pathway (Table 22, Figure 20).

Table 22. Decision points for Colonial Parkway, Colonial National Historical Park, Virginia.

Decision Points (listed in columns, not in any order):	**Intense rain storms create increased stormwater runoff that deteriorates road base and culverts**	**Shoreline erosion cuts into roadway**
Resources / Assets Linked to DP:	Parkway, on-ramps, parking lots, culverts, natural habitats	Parkway, parking lots, natural habitats
Goals / Strategies at Risk	Maintain the parkway as a historic roadway and as a commuter pathway through partnerships with local government	Maintain the parkway as a historic roadway and as a commuter pathway through partnerships with local government
Currently Doing to protect:	Clean out culverts, repave road surface, upgrade bridges	Stabilizing shorelines through natural and hard infrastructure, measuring erosion areas
Adaptation Pathway Options	Reduce stormwater runoff, lengthen and raise road/bridges, change purpose of road system	Shoreline hardening, change the purpose of the road

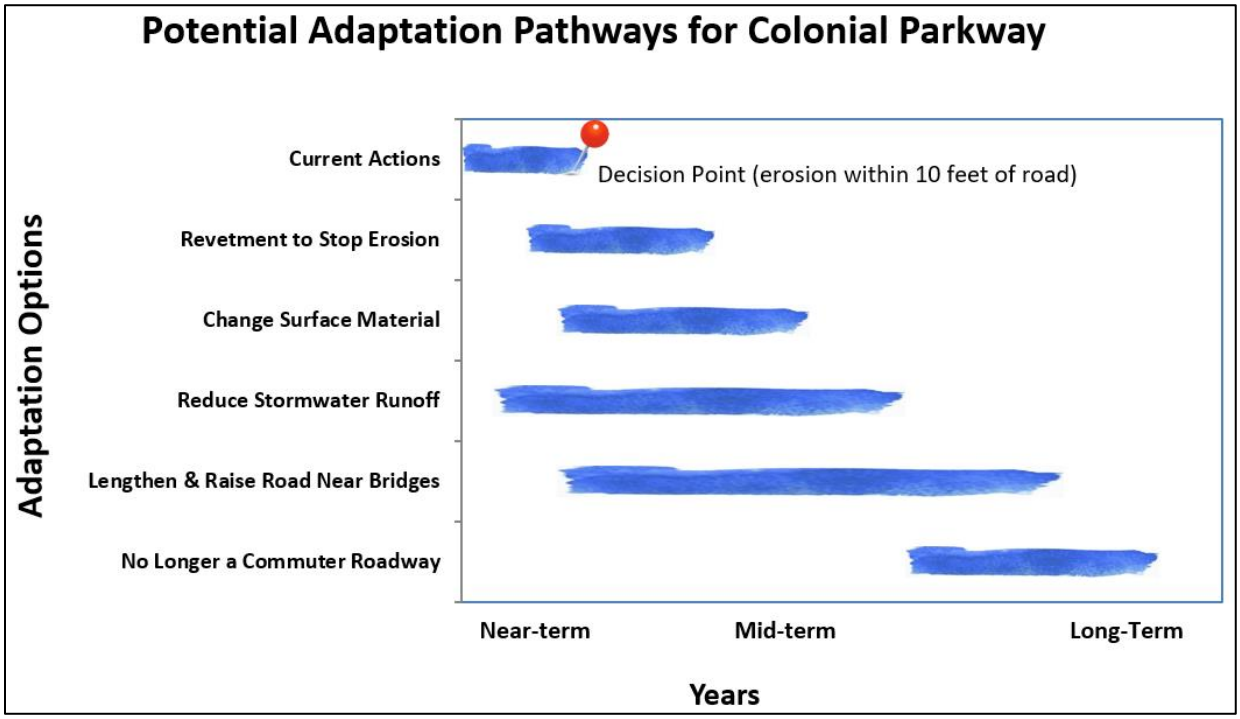


Figure 20. Illustrative adaptation pathway for the Colonial Parkway, Colonial National Historical Park, Virginia.

Glasshouse Point Adaptation Pathways

The participants identified two key decision points for the Glasshouse Point that are related to flooding – initially from storm surge and later by consistent sea level rise. The staff seems to have a clear adaptation pathway with the timing being the key variable. (Table 23, Figure 21).

Table 23. Decision points for Glasshouse Point, Colonial National Historical Park, Virginia.

Decision Points (listed in columns, not in any order):	**Extreme storm event inundates ruins and facilities**	**Sea level rise inundates marsh and ruins/buildings due to increased frequency of flooding**
Resources / Assets Linked to DP	Glasshouse ruins, Glasshouse Shelter, beach, tidal cypress swamp, trails, elevated marsh grass	Glasshouse ruins, Glasshouse Shelter, beach, tidal cypress swamp, trails, elevated marsh grass
Goals / Strategies at Risk	Preserve and interpret the Glasshouse point complex while maintaining a natural landscape	Preserve and interpret the Glasshouse point complex while maintaining a natural landscape
Currently Doing to protect	Sandbags along beach, monitoring changes, close up in storms	Sandbags along beach, monitoring changes, close up in storms
Adaptation Pathway Options	Sediment management, revegetation of shoreline, redesign ruins shelter, seawall, remove ruins and interpret – leave the rest in place	Sediment management, revegetation of shoreline, redesign ruins shelter, seawall, remove ruins and interpret – leave the rest in place

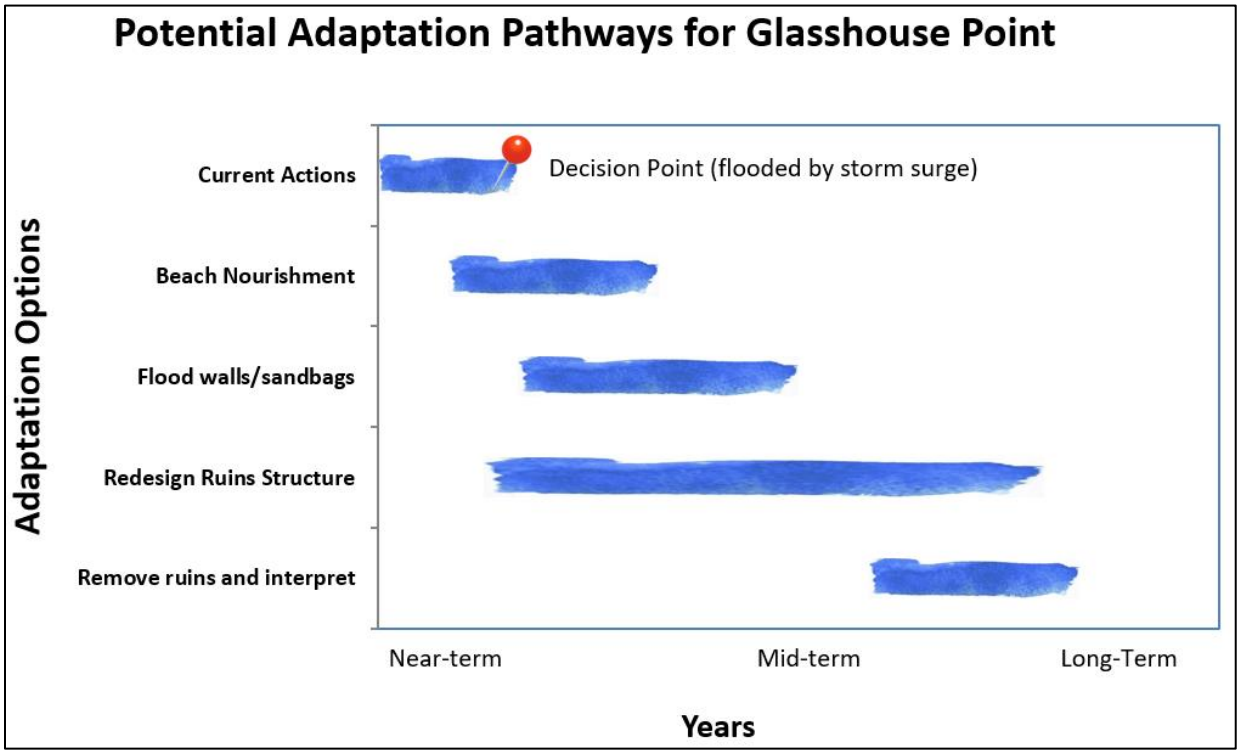


Figure 21. Illustrative adaptation pathways for Glasshouse Point, Colonial National Historical Park, Virginia.

Reflections and Next Steps

Conducting a rapid climate change vulnerability assessment is just the beginning of a long-term process for adapting to changes originating from climate and non-climate sources. At the last workshop participants reflected on the assessment experience then outlined some potential next steps for moving forward.

Reflections

The following summarizes the reflections on the process, tools and outputs of this assessment.

Results

- Most of the vulnerability results for cultural and infrastructure were not surprising. However, when both workgroups looked at the impacts that weather, increased rain events and temperature has on historic structures, they realized that these buildings will see the need for shorter repair cycles, which increases preservation costs. They are also at increased risk of losing original fabric.

- Park staff recognized how unprepared they are for addressing the climate changes in the medium to long-term. An updated shoreline management plan and additional research to inform it is needed for Jamestown Island. There are significant gaps in management knowledge including a lack of knowledge of what is being lost already in some areas.

- Need to revisit vulnerability process at site level as part of developing adaptation strategy.

Benefits of Integrated Vulnerability Assessment

- The assessment provides a generalized screening tool that assesses vulnerability in a consistent framework across divisions to spur discussions of how to use vulnerability and adaptive capacity to adapt to climate change parkwide. The park may need to revisit an issue highlighted through this process in a more detailed vulnerability process at site level as part of developing an adaptation strategy.

- Park staff recognizes the need to prepare for addressing climate change in the medium to long-term. There are significant gaps in management knowledge including a lack of knowledge of what is already being lost in some areas and this process highlighted areas to prioritize filling gaps.

Integration

- The assessment can be used to provide input to various planning processes used by park staff for today's programing and future planning. These include:

    - Mainstream climate and vulnerability information into other planning processes

    - Foundation document updates

    - Resource stewardship strategy

    - Annual and 5-year work plans for divisions
    - Environmental Impact Statements.
    - Capital Investment Strategy
    - Hurricane Preparedness Planning
    - Support for partners and collaboration on efforts
    - Baseline and existing conditions report (NRCA, Cultural Resource Stewardship Assessment)
    - Section 106 and 110 – Cultural resources that are on or eligible for the National Register of Historic Places
    - Develop and prioritize archaeological research.

- The importance of discussing facility assets, cultural and natural resources within the same process became obvious to all: they are interdependent. This being said, it was apparent that all resources and assets (across divisions or even within divisions) are not necessarily valued in the same way or for the same reasons.

- The process reveals differences among the three divisions (and even within the divisions) illustrating the varying stages of awareness, methods of assessment, and adaptation approaches. This provides opportunities for lessons to be learned across divisions and within a park staff.

- There are numerous areas of overlap among divisions, in particular for Cultural Resources and Facilities. For instance, when both workgroups looked at the impacts of increased rain events and temperature on historic structures, they realized that these buildings will likely have shorter repair cycles, which increases maintenance and preservation costs. They are also at increased risk of losing original fabric.

- Engaging across disciplines in focal areas lends itself to interpretation, which can help articulate the integration and tell a story of the past, present and future.

- The process benefits the Cultural Resources Workgroup as it facilitates a complex discussion about vulnerability and adaptive capacity across archeological resources, buildings & structures, museum collections, ethnographic resources and cultural landscapes. Cultural Resources are often the most important resources therefore understanding how they interact with the other divisions, and that different Cultural Resource types have different needs, is important.

Framework

- Formulating and applying a common framework across divisions is a challenge, given the different issues and opportunities. Similarly, the Cultural Resources Workgroup alone found its different subdivisions struggling at the outset to come to agreement on a common analytical approach. The process enabled them to agree upon common exposure and sensitivity features to assess and evaluate. The human dimension of adaptive capacity was very important to the Facilities and Cultural Resources Workgroups, and was also worthwhile to the Natural Resources Workgroup once undertaken. Employing the POSE adaptive capacity framework brought to the fore the realities of how society and economics could impact efforts to develop adaptation plans.

- The methodology keeps adaptive capacity separate from vulnerability. It is important to assess both of these concepts in a vulnerability assessment, but it was determined that combining in a single metric takes away from our understanding of the system and the applicability to adaptation. Park staff was in need of a vulnerability score, without modifications from adaptive capacity, that could be helpful in targeting research questions, prioritizing research efforts, selecting adaptation methods, and allocating funding. This builds on previous Facilities and Cultural Resource vulnerability assessment methods development that identified concerns about the adaptive capacity scoring in the original framework that was based on frameworks from the natural resource conservation community (e.g. Glick et al. 2011), where a high adaptive capacity score would reduce an overall vulnerability score.

- It is challenging to assess cultural resources' adaptive capacity due to the complications surrounding the concepts of significance and priorities. Significance was a challenge to define, though once understood it was then added to the factors of the POSE framework. There was a larger question related to prioritization. Vulnerability alone does not determine priority for adaptation actions, it needs to be a combination of significance and vulnerability, but it is beyond the scope of this effort to evaluate significance of each resource (Rockman et al. 2016). Developing methods to do so will be an important next step. One potential source to learn from another park doing this for historical structures is Fatoric and Seekamp (2017) and planning is underway to transfer that framework to archeological sites.

Process

- Workgroups bring in expert judgement directly related to the park, broader expertise from partners and is complemented by National and Regional NPS perspectives. The effectiveness is improved with strong local leadership, such as by having park staff lead each workgroup, though this is not always feasible depending on staff capacity. There are significant benefits from conducting the assessment internally with the staff and partners that can't be matched by contracting consultants to do the analysis.

- Conducting much of the assessment over the course of three face-to-face workshops builds trust and buy-in among and within the resource divisions. It also reduces fears of the process,

allowing equal footing and better understanding of perspectives and priorities among divisions.

- A significant portion of the work is done outside of the workshops via conference calls. The success of the workgroups is enhanced by the opportunities to discuss materials and issues as a group during calls to prepare for as well as analyze the results of the three workshops. Cultural Resources Workgroup can be more efficient by creating subgroups. It is important to include enough time and funding to allow for a multi-stage process in the vulnerability assessments.

- Identifying stressors (for each division) enables each workgroup to deal with multiple facets of the climate change issue that are affecting their resources, not just sea level rise. This makes the process more relevant for coastal and inland parks alike. One limitation of this process is it treats all stressors equally, as there was not a simple way to weight the most important stressors differently than the secondary ones.

- Workshop exercises drill down to particular geographic areas of concern (focal areas) are where the integration happens; the integration was more about the adaptation than the vulnerability. This is an effective way for the three divisions to work together to combine expertise and yielded a number of viable adaptation ideas that in many cases reinforced and supported adaptation needs of mutual benefit.

Projections

- Numerical projections that are detailed and downscaled for variables such as sea level rise, temperature, and precipitation are produced early in the assessment. The specific sea level rise projections and associated timeframes are essential elements of mapping and analysis. It was sufficient to use precipitation and temperature trends that did not vary spatially across the park to assess vulnerability (i.e. warming in all seasons, longer wet spells) due to the limited variations across the park area. This willingness to use generalized trends may have been due to the fact that sea level rise was the prevailing threat (i.e. Jamestown Island) and that the impact is very visible in the field and on the maps. This should be considered as the methodology considers future assessments and determine the appropriate level of granularity for the projections.

- Selecting three time frames of 2020, 2050, and 2100 balance the short-term demands, a moderate term of mid-century and the climate projections over a much longer time frame. A time frame of 2020 is within the five year planning window for NPS. The 2050-time horizon can be viewed as part of the long term planning for park investments. This also may be seen as a term of an NPS professional career, which provides some resonance with those participating. Then 2100 is important to see a longer trajectory of what long term impacts can be projected, in the “for future generations” spirit of the NPS mission.

Communication

- In addition to developing a communication plan for sharing the results of this assessment through the Interpretation and Education programs, articulating key messages and climate stories were part of the workshop process. It is important to convey both the vulnerability and the adaptive capacity through climate stories, and the "Every Park Has a Climate Story" exercise was done at the third workshop (Rockman et al. 2016; Rockman and Masse 2017).

Partnerships

Local partners will be key in implementing adaptation pathways for parks. In conducting an integrated assessment each park will determine which partners need to be involved in the assessment and at what stage. Including other key stakeholders (i.e. local organizations, community planners, Sea Grant extension agents), can benefit from diverse information gathering, honest discussion about issues and opportunities to build partnerships and get buy-in for taking next steps.

- **Incorporate into other NPS documents/processes:** Park staff envisions the results of the vulnerability assessment being incorporated into other existing planning documents and processes of the NPS. This will increase organizational acceptance of the results and knowledge of how to apply the actions into ongoing short-term and long-term management planning. Specific documents to incorporate these results include the Foundation Document, the General Management Plan (if updated in the future), Federal Highway Administration's 10 year repavement plan, York River Shoreline Protection Plan, and the James City County Shoreline Protection Plan.

- **Disseminate with NPS Staff and Partners:** A core principle of this vulnerability assessment is that understanding and acting on the results depend as much on NPS and park staff organizational capacity as it does on the specific technical findings. Thus all park staff should be informed and engaged in application of these vulnerability results. The assessment began with the three divisions of Cultural Resources, Natural Resources, and Facilities. There are other divisions that were involved who should be updated and involved in navigating strategies for adaptation planning. These include interpretation, law enforcement, and administration.

- **Initiate Adaptation Planning Process:** Building on the first two steps above, there should be an integrated adaptation planning process. There are several guides available that are suitable including the NPS supported Climate-Smart Conservation guidebook on adaptation planning for conservation sites (Stein et al. 2014), NPS's Coastal Adaptation Strategies Handbook (Beavers et al. 2016), and NPS' Cultural Resources Climate Change Strategy (Rockman et al. 2016).

Key to moving forward is engaging partnerships with local governments, neighboring associations as well as national groups that share an interest.

The vulnerability assessment data and maps can be a valuable resource for jumpstarting the adaptation planning process. They can be used to bring onboard new partners and help them appreciate the underlying vulnerability issues and changes over time.

The adaptation pathways and decision points presented in this report were example exercises to help the group envision how to apply the vulnerability results to adaptation planning. It is recommended that the park evaluates these tools and adapts them as needed; there are other tools available and it is worth looking to other parks for examples. They provide a nice, simple visual for telling a deeper story of calculated incremental change over time.

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Appendix A. Climate Projections Used in Assessment at Colonial National Historical Park.

Climate Summary - Colonial National Historical Park

The following materials were provided to workshop participants as part of a handout summary of climate projections at workshop 1.

Temperature

- Warming in all seasons
- Fewer nights below freezing, especially in fall
- Daily lows warming fastest in warm season
- More hot summer days (>95 ^{0}F)
- Longer heat spells (consecutive days >95 ^{0}F)
- More frequent heat waves (>95 ^{0}F) for 3+ days

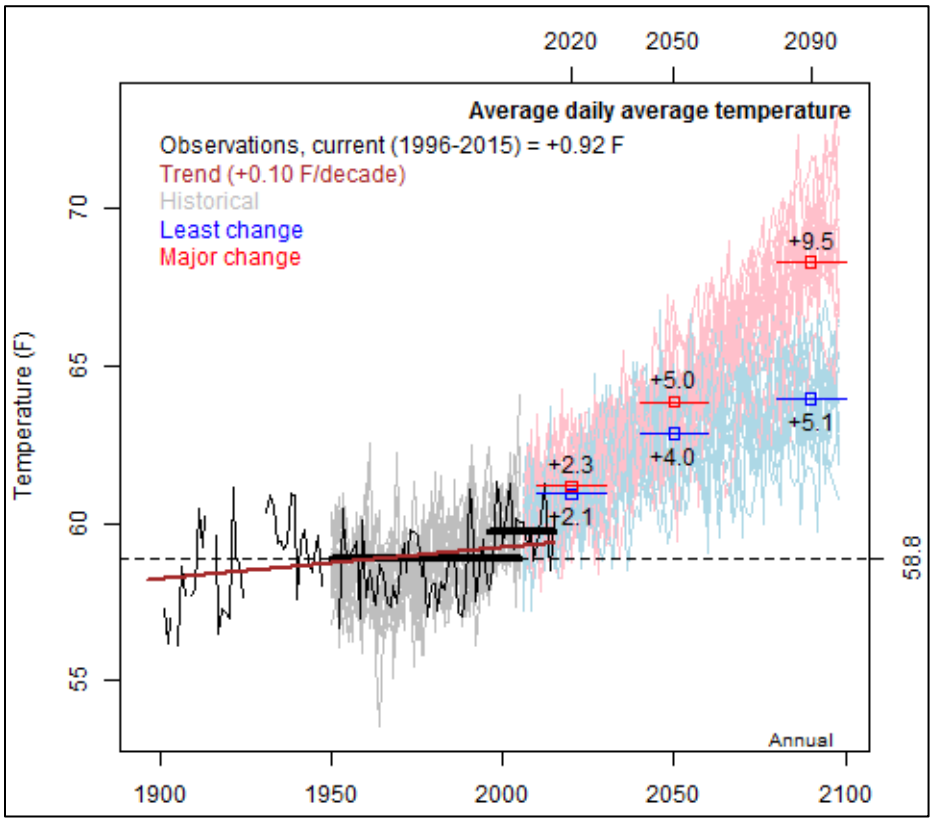


Figure A-1. Temperature trend and projections for Colonial National Historical Park, Viginia.

Table A-1. Temperature metrics for Colonial National Historical Park, Viginia.

Metric	Baseline (1950-2005)	Current Average (1996-2015)	Least Change (2050)	Major Change (2050)	Least Change (2100)	Major Change (2100)
Mean Annual Temperature	58.8 ºF	+0.92 ºF	+2.1 ºF	+2.3 ºF	+4.4 ºF	+8.6 ºF
Daily Highs	70 ºF	-0.15 ºF	+2.2 ºF	+2.4 ºF	+5.6 ºF	+9.6 ºF
Daily Lows	47.7 ºF	+1.98 ºF	+2.0 ºF	+2.2 ºF	+3.7 ºF	+7.7 ºF
Hot Days (>95 ^{0}F)	4 days	+3.45 days	+8.9 days	+10.3 days	+31.3 days	+82.3 days
Cold Days (<32 ^{0}F)	78.2 days	-16.43 days	-11.9 days	-12.8 days	-10 days	-31 days
Warm Spells (3+ days of >95 ^{0}F)	0.32 spells	+0.73 spells	+ 1.1 spells	+ 1.3 spells	+4.9 spells	+6.4 spells
Cold Spells (3+ days of <32 ^{0}F)	9.9 spells	-1.98 spells	-1.1 spells	-1.2 spells	-1.3 spells	-3.7 spells

Precipitation

- Precipitation amounts increasing, especially in fall; decreases in summer
- Intensity is increasing, especially in fall
- Longer wet spells, especially summer and fall

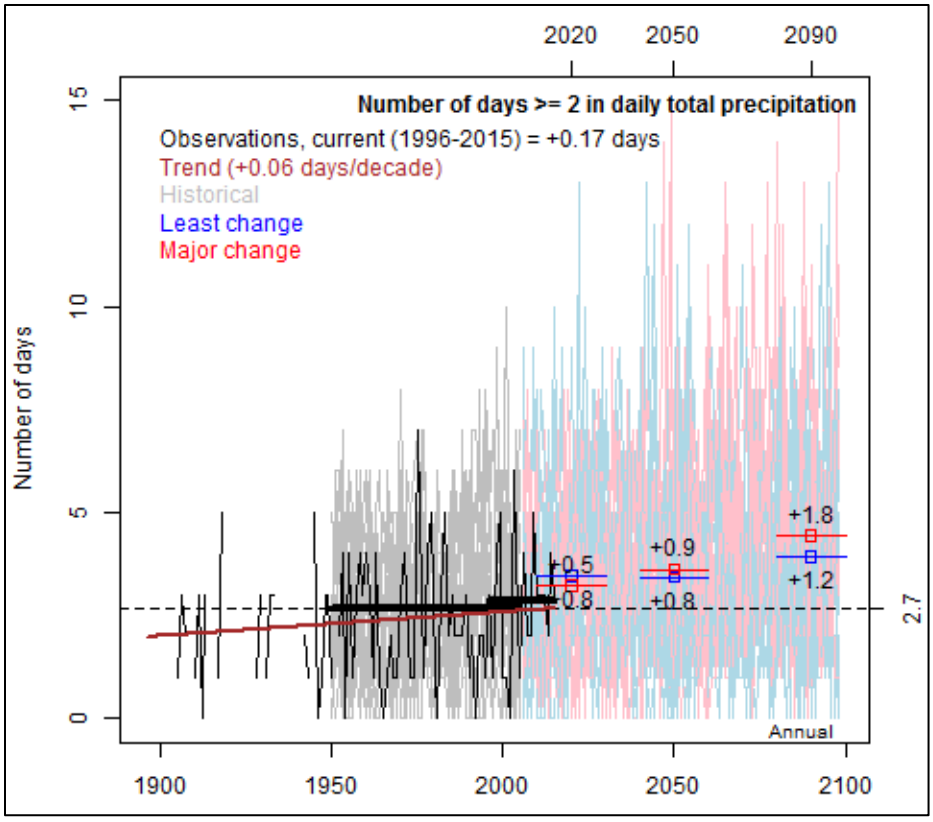


Figure A-2. Precipitation trend and projections for Colonial National Historical Park, Virginia.

Table A-2. Precipitation metrics for Colonial National Historical Park, Virginia.

Metric	Baseline (1950-2005)	Current Average (1996-2015)	Least Change (2050)	Major Change (2050)	Least Change (2100)	Major Change (2100)
Mean Annual precipitation	49.8 in/decade	+1.70 in	+ 4.4 in	+3.7 in	+ 7.8 in/decade	+8.8 in/decade
Days exceeding 2” precipitation	2.7 days	+0.17 days	+0.8 days	+0.5 days	+1.2 days	+1.6 days
Peak daily precipitation	3.8 in/decade	+0.89 in	+0.5 in	+0.2 in	-0.1 in/decade	0 in/decade

Sea Level Rise

- Sea level rise is accelerating over time.
- Historic trend = 4.59 mm/yr (1927- 2015) = 1.51 feet over 100 years.

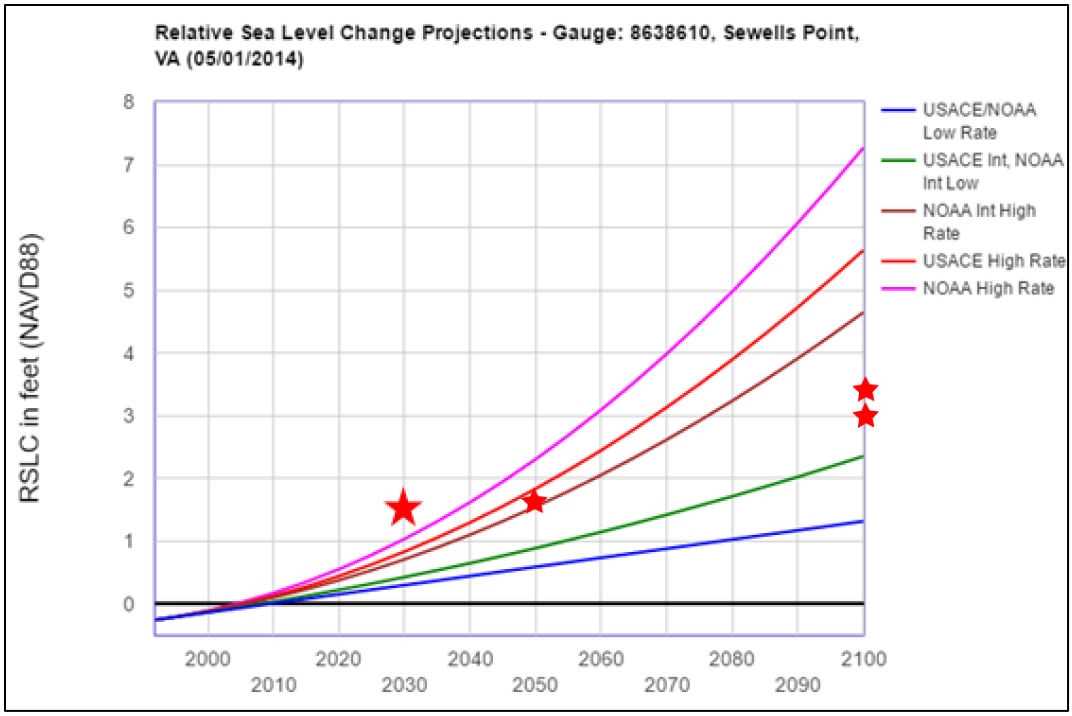


Figure A-3. Relative sea level rise projections from USACE Sea Level Curve Calculator for Sewells Point, Virginia. Stars mark scenarios used in vulnerability assessment for Colonial National Historical Park, Virginia.

Table A-3. Sea level rise scenarios for Colonial National Historical Park, Virginia, based on Caffrey (2015). Baseline year is 1992.

Datum	Least Change (RCP 4.5) (2030)	Major Change (RCP 8.5) (2030)	Least Change (RCP 4.5) (2050)	Major Change (RCP 8.5) (2050)	Least Change (RCP 4.5) (2100)	Major Change (RCP 8.5) (2100)
MHHW	0.49 ft.	0.49 ft.	0.92 ft.	0.95 ft.	2.10 ft.	2.66 ft.
NAVD88	1.64 ft.	1.64 ft.	2.07 ft.	2.10 ft.	3.25 ft.	3.81 ft.

Historic Wind & Water Levels Summary

Wind

- 18 tropical storms, depressions, and subtropical storm paths within 10 miles of the park (1842-2011)
- Hurricane Isabel– sustained at 65 mph, 90-mph gusts @ VIMS (Hardaway et al., 2006)
- Increase in the “windiest” day per year, especially in the fall (peak hurricane season)
- Future projections consistently indicate globally averaged intensity of tropical cyclones to shift towards stronger storms (Knutson et al., 2010)

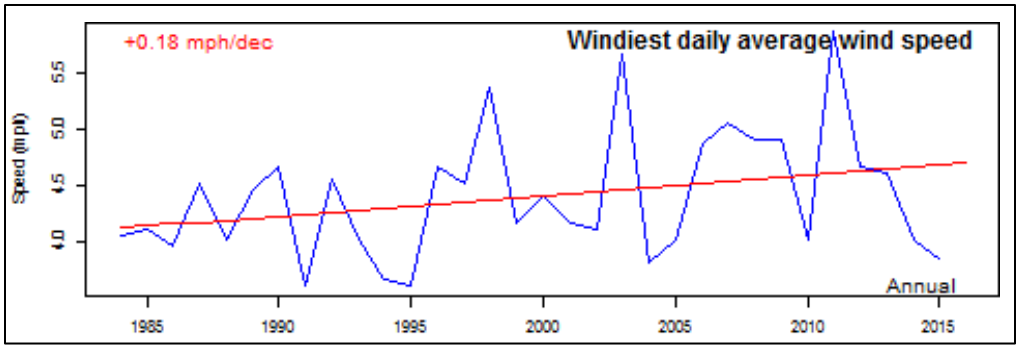


Figure A-4. Trend in wind speed for Colonial National Historical Park, Virginia.

Extreme Water Levels

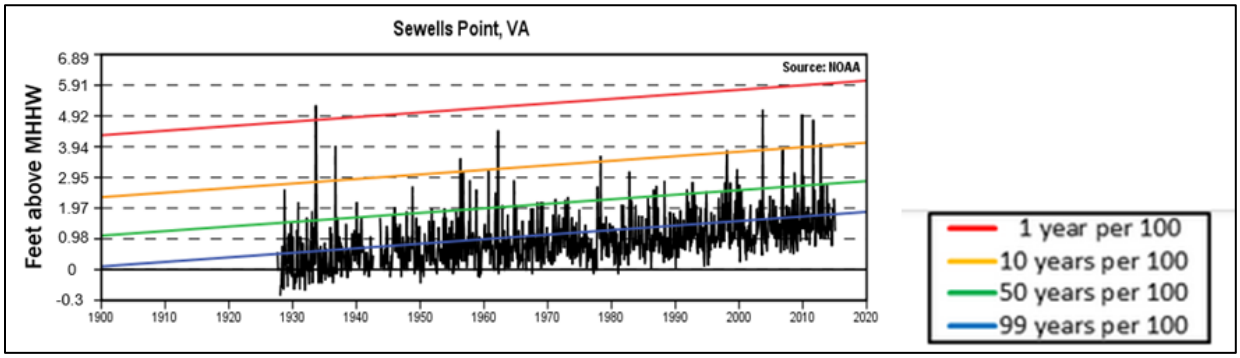


Figure A-5. Trend in extreme water levels for Sewells Point, Virginia NOAA tide gauge.

Table A-4. Extreme Water Levels (Relative to MHHW) at Sewells Point, Virginia. Data provided by USACE Sea Level Curve Calculator (5/1/2014) and NOAA Tides and Currents (2016).

Return frequency	Water level (ft)
100 Yr (1%):	5.64
50 Yr (2%):	5.00
20 Yr (5%):	4.21
10 Yr (10%):	3.66
5 Yr (25%)	3.14
2 Yr (50%)	2.43
Yearly (100%):	1.44
Hurricane Isabel:	5.13

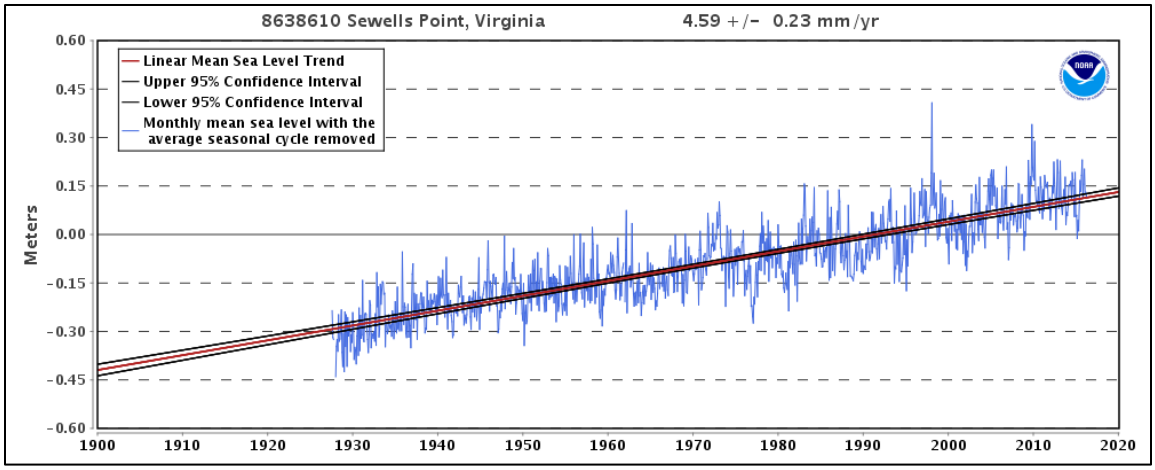


Figure A-6. Mean sea level trend at Sewells Point, Virginia NOAA tide gauge from 1927 to 2015 which is equivalent to a change of 1.51 feet in 100 years.

Resources

- **NOAA** Sea Level Rise trends and station data

  https://tidesandcurrents.noaa.gov/sltrends/

  http://tidesandcurrents.noaa.gov/stations.html?type=Water+Levels

- NOAA Sea Level Rise Viewer

  http://coast.noaa.gov/digitalcoast/tools/slr

- SLOSH

  http://www.nhc.noaa.gov/surge/slosh.php

- NPS SLOSH mapping

  https://www.flickr.com/photos/125040673@N03/sets/

- **US Army Corps of Engineers** Sea Level Change Curve Calculator

  http://corpsmapu.usace.army.mil/rccinfo/slc/slcc_calc.html

Appendix B. Cultural Resources Vulnerability Assessment Data Set

Table B-1. Cultural Exposure 2020 at Colonial National Historical Park, Virginia.

Resource/Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2020	SURGE_ CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
19th & 20th c. components; Civil War earthwork	1	0	0	0	1	0	1	1	0	0	0	4	4	High
Jamestown - Structure 8 / 9 [18th century gentry house/townstead North of warehouse area; part of Travis Farmstead]	–	0	0	0	1	0	1	1	0	0	0	3	2	Low
Jamestown - Rowhouse Structure 17	–	1	1	0	1	0	1	1	0	0	0	5	2	Low
Jamestown - Jackson House Structure 24	–	1	1	0	1	0	1	1	0	0	0	5	2	Low
Jamestown - May Hartwell House	–	1	0	0	1	0	1	1	0	0	0	4	2	Low
Jamestown - KSP (William Sherwood House/Richard Kemp House)	–	0	0	0	1	0	1	1	0	0	0	3	2	Low
Jamestown - Ambler (LCS #76J640A1)	1	0	0	0	0	0	1	1	0	0	0	3	4	High
Jamestown - Gov. Harvey Structure 112	–	0	0	0	1	0	1	1	0	0	0	3	2	Low
Jamestown - Warehouse	1	0	1	0	1	0	1	1	0	0	0	5	4	High
Jamestown - Rowhouse Structure 115	–	0	0	0	1	0	1	1	0	0	0	3	2	Low
Jamestown - Swann Tavern	–	0	0	0	1	0	1	1	0	0	0	3	2	Low
Structure 110-First Brewery in English North America	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
State House Structure 141	–	0	1	0	1	0	1	1	0	0	0	4	2	Low
Jamestown Church	–	0	0	0	1	1	1	1	1	1	1	7	3	Moderate

Table B-1 (continued). Cultural Exposure 2020 at Colonial National Historical Park, Virginia.

Resource/Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2020	SURGE_ CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
Church Tower	–	0	0	0	1	1	1	1	1	1	1	7	3	Moderate
Jamestown Fort	–	0	0	0	0	1	1	1	1	1	1	6	3	Moderate
Jamestown Monument	–	0	0	0	0	1	1	1	1	1	1	6	3	Moderate
Travis Graveyard	–	1	0	0	1	1	1	1	1	1	1	8	4	High
Boundary Berms	–	1	1	1	1	1	1	1	1	1	1	10	4	High
The Back Street	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Highway Close to the Great River	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Great Road Trace	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Natural Systems and Features same for all 4 areas Newtown, Jamestown, Neck of Land, Glass Point	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Topography	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Circulation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Spatial organization	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Vegetation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Views and Vistas	–	1	1	1	1	1	1	1	1	1	1	10	4	High

Table B-1 (continued). Cultural Exposure 2020 at Colonial National Historical Park, Virginia.

Resource/Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2020	SURGE_ CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Small Scale Features	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Archaeological Sites of Social, Political, or Economic Significance to Tribes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Natural Landscapes Retaining Non-developed Character	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Floral and Faunal Species Specific Assessment	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
M-L Woodland Camp; 17th c. Domestic	1	–	0	1	1	0	1	1	0	0	0	5	4	High
Civil War earthwork	1	–	0	1	1	0	1	1	0	0	0	5	4	High
Prehistoric Camp; E 17th c. Domestic	–	1	0	1	1	0	1	1	0	0	0	5	2	Low
Civil War Fort	1	–	0	1	1	0	1	1	0	0	0	5	4	High
L Woodland Camp; 18th c Domestic; Civil War Fort	–	1	0	1	1	0	1	1	0	0	0	5	2	Low
L Woodland Camp (?); 17th-18th c. Domestic	–	0	0	0	1	0	1	1	0	0	0	3	2	Low
L Woodland Camp/Farmstead; 17th c. Domestic	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
Kingsmill "Island House"	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
L Archaic Camp; 17th c Domestic; 18th-19th c Wharf	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
Travis House	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
JC-903	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate

Table B-1 (continued). Cultural Exposure 2020 at Colonial National Historical Park, Virginia.

Resource/Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2020	SURGE_ CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
JC-937	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
Jamestown Island Seawall	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Black Point Bridge	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Boundary	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Natural Systems and Features	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Spatial Organization	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Land Use	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Topography	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Vegetation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Circulation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Buildings and Structures	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Views and Vistas	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Small-Scale Features	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Archeological Sites	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Collections Material	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Collections Extended power outage	–	1	1	1	1	1	1	1	1	1	1	10	4	High

Table B-1 (continued). Cultural Exposure 2020 at Colonial National Historical Park, Virginia.

Resource/Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2020	SURGE_ CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
Collections Location	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Collections Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Natural Landscapes Retaining Non-developed Character	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Floral and Faunal Species Specific Assessment	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
L Archaic; M&L Woodland; 17th c. Domestic site	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Glasshouse Ruins	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Glasshouse Monument	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Greate Road Trace	–	0	0	0	0	1	1	1	1	1	1	6	3	Moderate
Colonial Parkway Isthmus Bridge	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Powhatan Bridge	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes: See Newtown or Jamestown	–	N/A	N/A	N/A	N/A	N/A	1	1	1	1	1	5	2	Low
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Natural Landscapes Retaining Non-developed Character	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate

Table B-1 (continued). Cultural Exposure 2020 at Colonial National Historical Park, Virginia.

Resource/Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2020	SURGE_ CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
Floral and Faunal Species Specific Assessment	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Late-17th / Early-18th c. Domestic site	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Cultural Landscapes See Newtown or Jamestown	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Natural Landscapes Retaining Non-developed Character	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Floral and Faunal Species Specific Assessment	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
18th century domestic site, Colonial Pkwy Km 29	–	0	0	1	1	0	1	1	0	0	0	4	2	Low
19th century Civil War Earthwork, Colonial Pkwy Km 32	–	1	0	1	1	0	1	1	0	0	0	5	2	Low
17th through 20th century domestic occupation, Colonial Pkwy Km 28	1	0	0	1	1	0	1	1	0	0	0	5	4	High
Woodland domestic occupation, Colonial Pkwy Km 25	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Middle Woodland Domestic Occupation, Colonial Pkwy Km 25	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Park's Paper Mill	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Middle Woodland occupation and midden site	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
18th century embanked enclosure	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate

Table B-1 (continued). Cultural Exposure 2020 at Colonial National Historical Park, Virginia.

Resource/Factor	FEMA_VE	FEMA_A	EROSION	SLR 2020	SURGE_CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_Raw	Exp_Binned	Exp_Rank
Colonial Parkway Cultural Landscape boundary	–	1	1	1	1	1	1	1	0	0	0	7	3	Moderate
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Natural Landscapes Retaining Non-developed Character	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Floral and Faunal Species Specific Assessment	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Middle to Late Woodland scatter	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
17th- & 18th-c. Plantation complex (Bellfield Plantation)	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Ringfield Plantation	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Kiskiak Village Site	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
redoubt 11 Civil War earthwork, Colonial Pkwy Km 16	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
redoubt 14 Civil War earthwork	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Multi-component site Archaic, Woodland, and Historic Components, Colonial Pkwy Km 9-10 al Assemblage	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate

Table B-1 (continued). Cultural Exposure 2020 at Colonial National Historical Park, Virginia.

Resource/Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2020	SURGE_ CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
Natural Landscapes Retaining Non-developed Character	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Floral and Faunal Species Specific Assessment	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Yorktown Waterfront Lot 108 -- how developed are these?	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
Yorktown Waterfront Lot 106	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 105	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 95	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 94	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 93	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 92	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 91	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 90	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 89	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 88	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 87	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 86	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Late 17th-Early-18th-century domestic plantation sites	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Uniontown	–	1	1	1	1	1	1	1	0	0	0	7	3	Moderate
Cornwallis Cave	0	0	0	0	0	1	1	1	0	0	0	3	2	Low
Nelson House-BLUFF	0	0	0	0	0	1	1	1	0	0	0	3	2	Low
Cole Diggs House-BLUFF	0	0	0	0	0	1	1	1	0	0	0	3	2	Low

Table B-1 (continued). Cultural Exposure 2020 at Colonial National Historical Park, Virginia.

Resource/Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2020	SURGE_ CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
Swann Tavern-BLUFF	0	0	0	0	0	1	1	1	0	0	0	3	2	Low
Archer Cottage	0	1	1	0	0	1	1	1	0	0	0	5	2	Low
Yorktown Cultural Landscape Boundary	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Yorktown Cultural Landscape Natural Systems and Features	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Yorktown Cultural Landscape Topography	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Yorktown Cultural Landscape Spatial Organization	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes Buildings and Structures	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Yorktown Cultural Landscape Circulation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Yorktown Cultural Landscape Vegetation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Yorktown Cultural Landscape Views and Vistas	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Yorktown Cultural Landscape Small-Scale Features	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Nelson House Cultural Landscape Boundary	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Nelson House Cultural Landscape Spatial Organization	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Nelson House Cultural Landscape Vegetation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Nelson House Cultural Landscape Circulation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Nelson House Cultural Landscape Buildings and Structures	–	1	1	1	1	1	1	1	1	1	1	10	4	High

Table B-1 (continued). Cultural Exposure 2020 at Colonial National Historical Park, Virginia.

Resource/Factor	FEMA_VE	FEMA_A	EROSION	SLR 2020	SURGE_CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_Raw	Exp_Binned	Exp_Rank
Nelson House Cultural Landscape Views and Vistas	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Nelson House Cultural Landscape Small Scale Features	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Collections Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Natural Landscapes Retaining Non-developed Character	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Floral and Faunal Species Specific Assessment	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Middle Woodland Procurement Camp	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
18th and 19th century military fortifications and earthworks	–	0	0	0	1	0	1	1	0	0	0	3	2	Low
redoubt 2 (Revolutionary War earthwork)	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Revolutionary War Encampments	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Mid-Second Siege Line, Revolutionary War Earthwork	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Connecting Trench Between 1st and 2nd Siege Parallels, Revolutionary War Earthwork	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
American Hospital / Smith Plantation	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
British redoubt	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal

Table B-1 (continued). Cultural Exposure 2020 at Colonial National Historical Park, Virginia.

Resource/Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2020	SURGE_ CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
Rochambeau's Headquarters / Nelson Family Plantation	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Adjunct General's Headquarters	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Washington's Headquarters / Meadowfield Plantation	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Von Stueben's Headquarters	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Archaic / Woodland Site	–	1	0	0	0	0	1	1	0	0	0	3	2	Low
Surrender Field	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Multi-component site Early Woodland, 18th-century domestic	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Middle Woodland campsite	–	1	0	0	1	0	1	1	0	0	0	4	2	Low
Grand French Battery	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
redoubt 10--Revolutionary War Earthwork	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal
Yorktown Battlefield Cultural Landscape Boundary	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal
Moore House Cultural Landscape Boundary	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal
Moore House Cultural Landscape Spatial Organization	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal
Moore House Cultural Landscape Vegetation	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal
Moore House Cultural Landscape Circulation	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal
Moore House Cultural Landscape Buildings and Structures	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal
Moore House Cultural Landscape Views and Vistas	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal

Table B-1 (continued). Cultural Exposure 2020 at Colonial National Historical Park, Virginia.

Resource/Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2020	SURGE_ CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
Moore House Cultural Landscape Small-Scale Features	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Natural Landscapes Retaining Non-developed Character	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Floral and Faunal Species Specific Assessment	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
17th c. domestic site, possibly w / structure	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Mid- to Late-17th c. Domestic site (Berkeley Manor House and Ludwell-Lee House)	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
17th- and / or 18th-c. plantation outbuilding (?)	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
18th c. slave quarters (?)	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
19th c. domestic site, w / structure	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Green Spring manor house periphery	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
17th and / or 18th c. brick kiln and borrow pit	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
17th c. rice paddies (?)	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Historic-period roadbed	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Late-18th / early-19th-c.(?) earthen mound	–	0	0	0	0	0	0	0	1	0	0	1	1	Minimal

Table B-1 (continued). Cultural Exposure 2020 at Colonial National Historical Park, Virginia.

Resource/Factor	FEMA_VE	FEMA_A	EROSION	SLR 2020	SURGE_CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_Raw	Exp_Binned	Exp_Rank
Green Spring Cultural Landscape Boundary	–	0	0	0	0	0	0	0	1	0	0	1	1	Minimal
Green Spring Cultural Landscape Spatial Organization	–	0	0	0	0	0	0	0	1	0	0	1	1	Minimal
Green Spring Cultural Landscape Topography	–	0	0	0	0	0	0	0	1	0	0	1	1	Minimal
Green Spring Cultural Landscape Natural Systems and Features	–	0	0	0	0	0	0	0	1	0	0	1	1	Minimal
Green Spring Cultural Landscape Archeological Sites	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Natural Landscapes Retaining Non-developed Character	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Floral and Faunal Species Specific Assessment	–	0	0	0	0	1	1	0	1	1	1	5	2	Low
Collections Material	–	0	0	0	0	1	1	0	1	1	1	5	2	Low
Collections Extended power outage	–	0	0	0	0	1	1	0	1	1	1	5	2	Low
Collections Location	–	0	0	0	0	1	1	0	1	1	1	5	2	Low

Table B-2. Cultural Exposure 2050 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2050	SURGE _CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
19th & 20th c. components; Civil War earthwork	1	0	0	0	1	0	1	1	0	0	0	4	4	High
Jamestown - Structure 8 / 9 [18th century gentry house / townstead North of warehouse area; part of Travis Farmstead]	–	0	0	0	1	0	1	1	0	0	0	3	2	Low
Jamestown - Rowhouse Structure 17	–	1	1	0	1	0	1	1	0	0	0	5	2	Low
Jamestown - Jackson House Structure 24	–	1	1	0	1	0	1	1	0	0	0	5	2	Low
Jamestown - May Hartwell House	–	1	0	0	1	0	1	1	0	0	0	4	2	Low
Jamestown - KSP (William Sherwood House / Richard Kemp House)	–	0	0	0	1	0	1	1	0	0	0	3	2	Low
Jamestown - Ambler (LCS #76J640A1)	1	0	0	0	0	0	1	1	0	0	0	3	4	High
Jamestown - Gov. Harvey Structure 112	–	0	0	0	1	0	1	1	0	0	0	3	2	Low
Jamestown - Warehouse	1	0	1	0	1	0	1	1	0	0	0	5	4	High
Jamestown - Rowhouse Structure 115	–	0	0	0	1	0	1	1	0	0	0	3	2	Low
Jamestown - Swann Tavern	–	0	0	0	1	0	1	1	0	0	0	3	2	Low
Structure 110-First Brewery in English North America	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
State House Structure 141	–	0	1	0	1	0	1	1	0	0	0	4	2	Low
Jamestown Church	–	0	0	0	1	1	1	1	1	1	1	7	3	Moderate
Church Tower	–	0	0	0	1	1	1	1	1	1	1	7	3	Moderate
Jamestown Fort	–	0	0	0	0	1	1	1	1	1	1	6	3	Moderate
Jamestown Monument	–	0	0	0	0	1	1	1	1	1	1	6	3	Moderate

Table B-2 (continued). Cultural Exposure 2050 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2050	SURGE _CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
Travis Graveyard	–	1	0	0	1	1	1	1	1	1	1	8	4	High
Boundary Berms	–	1	1	1	1	1	1	1	1	1	1	10	4	High
The Back Street	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Highway Close to the Great River	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Great Road Trace	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Natural Systems and Features same for all 4 areas Newtown, Jamestown, Neck of Land, Glass Point	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Topography	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Circulation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Spatial organization	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Vegetation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Views and Vistas	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Small Scale Features	–	1	1	1	1	1	1	1	1	1	1	10	4	High

Table B-2 (continued). Cultural Exposure 2050 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2050	SURGE _CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
Archaeological Sites of Social, Political, or Economic Significance to Tribes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Natural Landscapes Retaining Non-developed Character	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Floral and Faunal Species Specific Assessment	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
M-L Woodland Camp; 17th c. Domestic	1	–	0	1	1	0	1	1	0	0	0	5	4	High
Civil War earthwork	1	–	0	1	1	0	1	1	0	0	0	5	4	High
Prehistoric Camp; E 17th c. Domestic	–	1	0	1	1	0	1	1	0	0	0	5	2	Low
Civil War Fort	1	–	0	1	1	0	1	1	0	0	0	5	4	High
L Woodland Camp; 18th c Domestic; Civil War Fort	–	1	0	1	1	0	1	1	0	0	0	5	2	Low
L Woodland Camp(?); 17th-18th c. Domestic	–	0	0	0	1	0	1	1	0	0	0	3	2	Low
L Woodland Camp / Farmstead; 17th c. Domestic	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
Kingsmill "Island House"	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
L Archaic Camp; 17th c Domestic; 18th-19th c Wharf	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
Travis House	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
JC-903	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
JC-937	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
Jamestown Island Seawall	–	1	1	1	1	1	1	1	1	1	1	10	4	High

Table B-2 (continued). Cultural Exposure 2050 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2050	SURGE _CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
Black Point Bridge	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Boundary	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Natural Systems and Features	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Spatial Organization	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Land Use	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Topography	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Vegetation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Circulation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Buildings and Structures	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Views and Vistas	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Small-Scale Features	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Archeological Sites	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Collections Material	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Collections Extended power outage	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Collections Location	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate

Table B-2 (continued). Cultural Exposure 2050 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2050	SURGE _CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
Collections Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Natural Landscapes Retaining Non-developed Character	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Floral and Faunal Species Specific Assessment	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
L Archaic; M&L Woodland; 17th c. Domestic site	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Glasshouse Ruins	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Glasshouse Monument	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Greate Road Trace	–	0	0	0	0	1	1	1	1	1	1	6	3	Moderate
Colonial Parkway Isthmus Bridge	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Powhatan Bridge	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes: See Newtown or Jamestown	–	N/A	N/A	N/A	N/A	N/A	1	1	1	1	1	5	2	Low
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Natural Landscapes Retaining Non-developed Character	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Floral and Faunal Species Specific Assessment	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Late-17th / Early-18th c. Domestic site	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal

Table B-2 (continued). Cultural Exposure 2050 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_VE	FEMA_A	EROSION	SLR 2050	SURGE_CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_Raw	Exp_Binned	Exp_Rank
Cultural Landscapes See Newtown or Jamestown	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Natural Landscapes Retaining Non-developed Character	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Floral and Faunal Species Specific Assessment	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
18th century domestic site, Colonial Pkwy Km 29	–	0	0	1	1	0	1	1	0	0	0	4	2	Low
19th century Civil War Earthwork, Colonial Pkwy Km 32	–	1	0	1	1	0	1	1	0	0	0	5	2	Low
17th through 20th century domestic occupation, Colonial Pkwy Km 28	1	0	0	1	1	0	1	1	0	0	0	5	4	High
Woodland domestic occupation, Colonial Pkwy Km 25	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Middle Woodland Domestic Occupation, Colonial Pkwy Km 25	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Park's Paper Mill	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Middle Woodland occupation and midden site	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
18th century embanked enclosure	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
Colonial Parkway Cultural Landscape boundary	–	1	1	1	1	1	1	1	0	0	0	7	3	Moderate
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate

Table B-2 (continued). Cultural Exposure 2050 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2050	SURGE _CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Natural Landscapes Retaining Non-developed Character	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Floral and Faunal Species Specific Assessment	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Middle to Late Woodland scatter	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
17th- & 18th-c. Plantation complex (Bellfield Plantation)	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Ringfield Plantation	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Kiskiak Village Site	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
redoubt 11 Civil War earthwork, Colonial Pkwy Km 16	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
redoubt 14 Civil War earthwork	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Multi-component site Archaic, Woodland, and Historic Components, Colonial Pkwy Km 9-10 al Assemblage	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Natural Landscapes Retaining Non-developed Character	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Floral and Faunal Species Specific Assessment	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Yorktown Waterfront Lot 108 --how developed are these?	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate

Table B-2 (continued). Cultural Exposure 2050 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_VE	FEMA_A	EROSION	SLR 2050	SURGE_CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_Raw	Exp_Binned	Exp_Rank
Yorktown Waterfront Lot 106	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 105	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 95	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 94	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 93	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 92	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 91	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 90	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 89	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 88	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 87	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 86	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Late 17th-Early-18th-century domestic plantation sites	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Uniontown	–	1	1	1	1	1	1	1	0	0	0	7	3	Moderate
Cornwallis Cave	0	0	0	0	0	1	1	1	0	0	0	3	2	Low
Nelson House-BLUFF	0	0	0	0	0	1	1	1	0	0	0	3	2	Low
Cole Diggs House-BLUFF	0	0	0	0	0	1	1	1	0	0	0	3	2	Low
Swann Tavern-BLUFF	0	0	0	0	0	1	1	1	0	0	0	3	2	Low
Archer Cottage	0	1	1	0	0	1	1	1	0	0	0	5	2	Low
Yorktown Cultural Landscape Boundary	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Yorktown Cultural Landscape Natural Systems and Features	–	1	1	1	1	1	1	1	1	1	1	10	4	High

Table B-2 (continued). Cultural Exposure 2050 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2050	SURGE _CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
Yorktown Cultural Landscape Topography	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Yorktown Cultural Landscape Spatial Organization	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes Buildings and Structures	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Yorktown Cultural Landscape Circulation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Yorktown Cultural Landscape Vegetation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Yorktown Cultural Landscape Views and Vistas	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Yorktown Cultural Landscape Small-Scale Features	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Nelson House Cultural Landscape Boundary	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Nelson House Cultural Landscape Spatial Organization	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Nelson House Cultural Landscape Vegetation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Nelson House Cultural Landscape Circulation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Nelson House Cultural Landscape Buildings and Structures	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Nelson House Cultural Landscape Views and Vistas	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Nelson House Cultural Landscape Small Scale Features	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate

Table B-2 (continued). Cultural Exposure 2050 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_VE	FEMA_A	EROSION	SLR 2050	SURGE_CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_Raw	Exp_Binned	Exp_Rank
Collections Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Natural Landscapes Retaining Non-developed Character	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Floral and Faunal Species Specific Assessment	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Middle Woodland Procurement Camp	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
18th and 19th century military fortifications and earthworks	–	0	0	0	1	0	1	1	0	0	0	3	2	Low
redoubt 2 (Revolutionary War earthwork)	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Revolutionary War Encampments	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Mid-Second Siege Line, Revolutionary War Earthwork	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Connecting Trench Between 1st and 2nd Siege Parallels, Revolutionary War Earthwork	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
American Hospital / Smith Plantation	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
British redoubt	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Rochambeau's Headquarters / Nelson Family Plantation	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Adjunct General's Headquarters	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Washington's Headquarters / Meadowfield Plantation	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Von Stueben's Headquarters	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Archaic / Woodland Site	–	1	0	0	0	0	1	1	0	0	0	3	2	Low

Table B-2 (continued). Cultural Exposure 2050 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_VE	FEMA_A	EROSION	SLR 2050	SURGE_CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_Raw	Exp_Binned	Exp_Rank
Surrender Field	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Multi-component site Early Woodland, 18th-century domestic	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Middle Woodland campsite	–	1	0	0	1	0	1	1	0	0	0	4	2	Low
Grand French Battery	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
redoubt 10--Revolutionary War Earthwork	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal
Yorktown Battlefield Cultural Landscape Boundary	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal
Moore House Cultural Landscape Boundary	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal
Moore House Cultural Landscape Spatial Organization	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal
Moore House Cultural Landscape Vegetation	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal
Moore House Cultural Landscape Circulation	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal
Moore House Cultural Landscape Buildings and Structures	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal
Moore House Cultural Landscape Views and Vistas	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal
Moore House Cultural Landscape Small-Scale Features	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Natural Landscapes Retaining Non-developed Character	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal

Table B-2 (continued). Cultural Exposure 2050 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_VE	FEMA_A	EROSION	SLR 2050	SURGE_CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_Raw	Exp_Binned	Exp_Rank
Floral and Faunal Species Specific Assessment	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
17th c. domestic site, possibly w / structure	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Mid- to Late-17th c. Domestic site (Berkeley Manor House and Ludwell-Lee House)	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
17th- and / or 18th-c. plantation outbuilding (?)	0	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
18th c. slave quarters (?)	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
19th c. domestic site, w / structure	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Green Spring manor house periphery	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
17th and / or 18th c. brick kiln and borrow pit	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
17th c. rice paddies (?)	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Historic-period roadbed	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Late-18th / early-19th-c.(?) earthen mound	–	0	0	0	0	0	0	0	1	0	0	1	1	Minimal
Green Spring Cultural Landscape Boundary	–	0	0	0	0	0	0	0	1	0	0	1	1	Minimal
Green Spring Cultural Landscape Spatial Organization	–	0	0	0	0	0	0	0	1	0	0	1	1	Minimal
Green Spring Cultural Landscape Topography	–	0	0	0	0	0	0	0	1	0	0	1	1	Minimal
Green Spring Cultural Landscape Natural Systems and Features	–	0	0	0	0	0	0	0	1	0	0	1	1	Minimal
Green Spring Cultural Landscape Archeological Sites	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal

Table B-2 (continued). Cultural Exposure 2050 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_VE	FEMA_A	EROSION	SLR 2050	SURGE_CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_Raw	Exp_Binned	Exp_Rank
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Natural Landscapes Retaining Non-developed Character	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Floral and Faunal Species Specific Assessment	–	0	0	0	0	1	1	0	1	1	1	5	2	Low
Collections Material	–	0	0	0	0	1	1	0	1	1	1	5	2	Low
Collections Extended power outage	–	0	0	0	0	1	1	0	1	1	1	5	2	Low
Collections Location	–	0	0	0	0	1	1	0	1	1	1	5	2	Low

Table B-3. Cultural Exposure 2100 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2100	SURG_ CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
19th & 20th c. components; Civil War earthwork	–	0	0	0	1	0	1	1	0	0	0	3	2	Low
Jamestown - Structure 8 / 9 [18th century gentry house / townstead North of warehouse area; part of Travis Farmstead]	–	0	0	0	1	0	1	1	0	0	0	3	2	Low
Jamestown - Rowhouse Structure 17	–	1	1	0	1	0	1	1	0	0	0	5	2	Low
Jamestown - Jackson House Structure 24	–	1	1	0	1	0	1	1	0	0	0	5	2	Low
Jamestown - May Hartwell House	–	1	0	0	1	0	1	1	0	0	0	4	2	Low
Jamestown - KSP (William Sherwood House / Richard Kemp House)	–	0	0	0	1	0	1	1	0	0	0	3	2	Low
Jamestown - Ambler (LCS #76J640A1)	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
Jamestown - Gov. Harvey Structure 112	–	0	0	0	1	0	1	1	0	0	0	3	2	Low
Jamestown - Warehouse	1	–	1	0	1	0	1	1	0	0	0	5	4	High
Jamestown - Rowhouse Structure 115	–	0	0	0	1	0	1	1	0	0	0	3	2	Low
Jamestown - Swann Tavern	–	0	0	0	1	0	1	1	0	0	0	3	2	Low
Structure 110-First Brewery in English North America	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
State House Structure 141	–	0	1	0	1	0	1	1	0	0	0	4	2	Low
Jamestown Church	–	0	0	0	1	1	1	1	1	1	1	7	3	Moderate
Church Tower	–	0	0	0	1	1	1	1	1	1	1	7	3	Moderate
Jamestown Fort	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Monument	–	0	0	0	0	1	1	1	1	1	1	6	3	Moderate
Travis Graveyard	–	1	0	0	1	1	1	1	1	1	1	8	4	High
Boundary Berms	–	1	1	1	1	1	1	1	1	1	1	10	4	High

Table B-3 (continued). Cultural Exposure 2100 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_VE	FEMA_A	EROSION	SLR 2100	SURG_CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_Raw	Exp_Binned	Exp_Rank
The Back Street	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Highway Close to the Great River	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Great Road Trace	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Natural Systems and Features same for all 4 areas Newtown, Jamestown, Neck of Land, Glass Point	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Topography	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Circulation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Spatial organization	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Vegetation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Views and Vistas	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Small Scale Features	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Archaeological Sites of Social, Political, or Economic Significance to Tribes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Natural Landscapes Retaining Non-developed Character	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate

Table B-3 (continued). Cultural Exposure 2100 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2100	SURG_ CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
Floral and Faunal Species Specific Assessment	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
M-L Woodland Camp; 17th c. Domestic	1	–	0	1	1	0	1	1	0	0	0	5	4	High
Civil War earthwork	1	–	0	1	1	0	1	1	0	0	0	5	4	High
Prehistoric Camp; E 17th c. Domestic	–	1	0	1	1	0	1	1	0	0	0	5	2	Low
Civil War Fort	1	–	0	1	1	0	1	1	0	0	0	5	4	High
L Woodland Camp; 18th c Domestic; Civil War Fort	–	1	0	1	1	0	1	1	0	0	0	5	2	Low
L Woodland Camp(?); 17th-18th c. Domestic	–	0	0	0	1	0	1	1	0	0	0	3	2	Low
L Woodland Camp / Farmstead; 17th c. Domestic	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
Kingsmill "Island House"	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
L Archaic Camp; 17th c Domestic; 18th-19th c Wharf	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
Travis House	–	1	0	0	1	0	1	1	0	0	0	4	2	Low
JC-903	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
JC-937	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
Jamestown Island Seawall	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Black Point Bridge	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Boundary	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Natural Systems and Features	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Spatial Organization	–	1	1	1	1	1	1	1	1	1	1	10	4	High

Table B-3 (continued). Cultural Exposure 2100 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2100	SURG_ CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
Jamestown Island Area Cultural Landscape Land Use	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Topography	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Vegetation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Circulation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Buildings and Structures	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Views and Vistas	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Small-Scale Features	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Jamestown Island Area Cultural Landscape Archeological Sites	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Collections Material	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Collections Extended power outage	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Collections Location	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Collections Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Natural Landscapes Retaining Non-developed Character	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Floral and Faunal Species Specific Assessment	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
L Archaic; M&L Woodland; 17th c. Domestic site	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal

Table B-3 (continued). Cultural Exposure 2100 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2100	SURG_ CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
Glasshouse Ruins	–	1	0	0	1	0	1	1	0	0	0	4	2	Low
Glasshouse Monument	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Greate Road Trace	–	0	0	0	0	1	1	1	1	1	1	6	3	Moderate
Colonial Parkway Isthmus Bridge	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Powhatan Bridge	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes: See Newtown or Jamestown	–	N/A	N/A	N/A	N/A	N/A	1	1	1	1	1	5	2	Low
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Natural Landscapes Retaining Non-developed Character	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Floral and Faunal Species Specific Assessment	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Late-17th / Early-18th c. Domestic site	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Cultural Landscapes See Newtown or Jamestown	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Natural Landscapes Retaining Non-developed Character	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Floral and Faunal Species Specific Assessment	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
18th century domestic site, Colonial Pkwy Km 29	–	0	0	1	1	0	1	1	0	0	0	4	2	Low

Table B-3 (continued). Cultural Exposure 2100 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2100	SURG_ CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
19th century Civil War Earthwork, Colonial Pkwy Km 32	–	1	0	1	1	0	1	1	0	0	0	5	2	Low
17th through 20th century domestic occupation, Colonial Pkwy Km 28	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
Woodland domestic occupation, Colonial Pkwy Km 25	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Middle Woodland Domestic Occupation, Colonial Pkwy Km 25	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Park's Paper Mill	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Middle Woodland occupation and midden site	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
18th century embanked enclosure	–	1	1	1	1	0	1	1	0	0	0	6	3	Moderate
Colonial Parkway Cultural Landscape boundary	–	1	1	1	1	1	1	1	0	0	0	7	3	Moderate
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Natural Landscapes Retaining Non-developed Character	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Floral and Faunal Species Specific Assessment	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Middle to Late Woodland scatter	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
17th- & 18th-c. Plantation complex (Bellfield Plantation)	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Ringfield Plantation	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Kiskiak Village Site	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
redoubt 11 Civil War earthwork, Colonial Pkwy Km 16	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal

Table B-3 (continued). Cultural Exposure 2100 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2100	SURG_ CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
redoubt 14 Civil War earthwork	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Multi-component site Archaic, Woodland, and Historic Components, Colonial Pkwy Km 9-10 al Assemblage	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Natural Landscapes Retaining Non-developed Character	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Floral and Faunal Species Specific Assessment	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Yorktown Waterfront Lot 105	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 106	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 108	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 95	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 94	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 93	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 92	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 91	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 90	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 89	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 88	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 87	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Yorktown Waterfront Lot 86	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal

Table B-3 (continued). Cultural Exposure 2100 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2100	SURG_ CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
Late 17th-Early-18th-century domestic plantation sites	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Uniontown	–	1	1	1	1	1	1	1	0	0	0	7	3	Moderate
Cornwallis Cave	–	1	1	1	1	1	1	1	0	0	0	7	3	Moderate
Nelson House-BLUFF	–	1	1	1	1	1	1	1	0	0	0	7	3	Moderate
Cole Diggs House-BLUFF	–	1	1	1	1	1	1	1	0	0	0	7	3	Moderate
Swann Tavern-BLUFF	–	1	1	1	1	1	1	1	0	0	0	7	3	Moderate
Archer Cottage	–	1	1	1	1	1	1	1	0	0	0	7	3	Moderate
Yorktown Cultural Landscape Boundary	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Yorktown Cultural Landscape Natural Systems and Features	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Yorktown Cultural Landscape Topography	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Yorktown Cultural Landscape Spatial Organization	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Cultural Landscapes Buildings and Structures	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Yorktown Cultural Landscape Circulation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Yorktown Cultural Landscape Vegetation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Yorktown Cultural Landscape Views and Vistas	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Yorktown Cultural Landscape Small-Scale Features	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Nelson House Cultural Landscape Boundary	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Nelson House Cultural Landscape Spatial Organization	–	1	1	1	1	1	1	1	1	1	1	10	4	High

Table B-3 (continued). Cultural Exposure 2100 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2100	SURG_ CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
Nelson House Cultural Landscape Vegetation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Nelson House Cultural Landscape Circulation	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Nelson House Cultural Landscape Buildings and Structures	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Nelson House Cultural Landscape Views and Vistas	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Nelson House Cultural Landscape Small Scale Features	–	1	1	1	1	1	1	1	1	1	1	10	4	High
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Collections Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Natural Landscapes Retaining Non-developed Character	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Floral and Faunal Species Specific Assessment	–	1	1	1	1	0	1	1	0	1	0	7	3	Moderate
Middle Woodland Procurement Camp	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
18th and 19th century military fortifications and earthworks	–	0	0	0	1	0	1	1	0	0	0	3	2	Low
redoubt 2 (Revolutionary War earthwork)	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Revolutionary War Encampments	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Mid-Second Siege Line, Revolutionary War Earthwork	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Connecting Trench Between 1st and 2nd Siege Parallels, Revolutionary War Earthwork	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal

Table B-3 (continued). Cultural Exposure 2100 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2100	SURG_ CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
American Hospital / Smith Plantation	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
British redoubt	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Rochambeau's Headquarters / Nelson Family Plantation	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Archaic / Woodland Site	–	1	0	0	0	0	1	1	0	0	0	3	2	Low
Surrender Field	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Multi-component site Early Woodland, 18th-century domestic	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Middle Woodland campsite	–	1	0	0	1	0	1	1	0	0	0	4	2	Low
Grand French Battery	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
redoubt 10--Revolutionary War Earthwork	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal
Yorktown Battlefield Cultural Landscape Boundary	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal
Moore House Cultural Landscape Boundary	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal
Moore House Cultural Landscape Spatial Organization	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal
Moore House Cultural Landscape Vegetation	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal
Moore House Cultural Landscape Circulation	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal
Moore House Cultural Landscape Buildings and Structures	–	0	0	0	0	0	0	1	0	1	0	2	1	Minimal
Moore House Cultural Landscape Views and Vistas	–	0	0	tic	0	0	0	1	0	1	0	2	1	Minimal
Moore House Cultural Landscape Small-Scale Features	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal

Table B-3 (continued). Cultural Exposure 2100 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2100	SURG_ CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Natural Landscapes Retaining Non-developed Character	–	0	0	0	0	0	1	1	0	0	0	2	1	Minimal
Floral and Faunal Species Specific Assessment	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
17th c. domestic site, possibly w / structure	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Mid- to Late-17th c. Domestic site (Berkeley Manor House and Ludwell-Lee House)	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
17th- and / or 18th-c. plantation outbuilding (?)	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
18th c. slave quarters (?)	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
19th c. domestic site, w / structure	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Green Spring manor house periphery	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
17th and / or 18th c. brick kiln and borrow pit	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
17th c. rice paddies (?)	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Historic-period roadbed	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Late-18th / early-19th-c.(?) earthen mound	–	0	0	0	0	0	0	0	1	0	0	1	1	Minimal
Green Spring Cultural Landscape Boundary	–	0	0	0	0	0	0	0	1	0	0	1	1	Minimal
Green Spring Cultural Landscape Spatial Organization	–	0	0	0	0	0	0	0	1	0	0	1	1	Minimal
Green Spring Cultural Landscape Topography	–	0	0	0	0	0	0	0	1	0	0	1	1	Minimal

Table B-3 (continued). Cultural Exposure 2100 at Colonial National Historical Park, Virginia.

Resource / Factor	FEMA_ VE	FEMA_ A	EROSION	SLR 2100	SURG_ CAT3	Precip	Wind	Soil Chem	Runoff	Temp	Humidity	Exp_ Raw	Exp_ Binned	Exp_ Rank
Green Spring Cultural Landscape Natural Systems and Features	–	0	0	0	0	0	0	0	1	0	0	1	1	Minimal
Green Spring Cultural Landscape Archeological Sites	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Archaeological Sites of Social, Political, or Economic Significance Composite Score	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Natural Landscapes Retaining Non-developed Character	–	0	0	0	0	0	1	0	0	0	0	1	1	Minimal
Floral and Faunal Species Specific Assessment	–	0	0	0	0	1	1	0	1	1	1	5	2	Low
Collections Material	–	0	0	0	0	1	1	0	1	1	1	5	2	Low
Collections Extended power outage	–	0	0	0	0	1	1	0	1	1	1	5	2	Low
Collections Location	–	0	0	0	0	1	1	0	1	1	1	5	2	Low

Table B-4. Cultural Sensitivity at Colonial National Historical Park, Virginia.

Resource / Factor	S_ Cflood	S_ Erosion	S_ SLR	S_ Surge	S_ Precip	S_ Wind	S_Soil Chem	S_ Runoff	S_ Temp	S_ Humidity	Sens_ Raw	Sens_ Bin	Sens_ Rank
19th & 20th c. components; Civil War earthwork	3	1	1	3	1	3	3	1	1	1	18	3	Moderate
Jamestown - Structure 8 / 9 [18th century gentry house / townstead North of warehouse area; part of Travis Farmstead]	3	3	2	3	1	1	3	1	1	1	19	3	Moderate
Jamestown - Rowhouse Structure 17	3	3	2	3	1	1	3	1	1	1	19	3	Moderate
Jamestown - Jackson House Structure 24	3	3	2	3	1	1	3	1	1	1	19	3	Moderate
Jamestown - May Hartwell House	3	3	2	3	1	2	3	1	1	1	20	3	Moderate
Jamestown - KSP (William Sherwood House / Richard Kemp House)	3	2	3	3	1	2	3	1	1	1	20	3	Moderate
Jamestown - Ambler (LCS #76J640A1)	3	2	3	3	1	2	3	1	1	1	20	3	Moderate
Jamestown - Gov. Harvey Structure 112	3	1	2	3	1	2	3	1	1	1	18	3	Moderate
Jamestown - Warehouse	3	3	3	3	1	1	3	1	1	1	20	3	Moderate
Jamestown - Rowhouse Structure 115	3	1	2	3	1	2	3	1	1	1	18	3	Moderate
Jamestown - Swann Tavern	3	1	2	3	1	2	3	1	1	1	18	3	Moderate
Structure 110-First Brewery in English North America	3	2	3	3	1	2	3	1	1	1	20	3	Moderate
State House Structure 141	3	2	2	3	1	1	3	1	1	1	18	3	Moderate
Jamestown Church	3	3	1	3	1	3	3	3	1	2	23	4	High
Church Tower	3	3	1	3	1	3	3	3	1	2	23	4	High
Jamestown Fort	3	3	3	3	3	3	3	3	3	3	30	4	High
Jamestown Monument	2	2	1	2	2	2	2	2	1	2	18	3	Moderate
Travis Graveyard	2	1	2	3	1	2	3	1	1	1	17	3	Moderate
Boundary Berms	2	1	1	3	1	3	3	1	1	1	17	3	Moderate
The Back Street	2	1	1	3	1	3	3	1	1	1	17	3	Moderate
Highway Close to the Great River	3	3	3	3	3	1	3	1	1	1	22	4	High

Table B-4 (continued). Cultural Sensitivity at Colonial National Historical Park, Virginia.

Resource / Factor	S_ Cflood	S_ Erosion	S_ SLR	S_ Surge	S_ Precip	S_ Wind	S_Soil Chem	S_ Runoff	S_ Temp	S_ Humidity	Sens_ Raw	Sens_ Bin	Sens_ Rank
Jamestown Island Great Road Trace	3	3	3	3	2	3	3	2	1	1	24	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Natural Systems and Features same for all 4 areas Newtown, Jamestown, Neck of Land, Glass Point	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	1	Minimal
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Topography	2	1	1	2	1	1	1	2	1	1	13	2	Low
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Circulation	2	2	1	2	1	1	1	1	1	1	13	2	Low
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Spatial organization	2	1	1	2	1	1	1	1	1	1	12	2	Low
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Vegetation	3	2	2	3	2	3	3	1	1	1	21	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Views and Vistas	2	1	1	2	1	1	1	1	1	1	12	2	Low
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Small Scale Features	2	2	1	2	1	1	1	1	1	1	13	2	Low
Archaeological Sites of Social, Political, or Economic Significance to Tribes Composite Score	3	3	3	3	1	3	3	3	1	2	25	4	High
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	1	Minimal
Natural Landscapes Retaining Non-developed Character	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	1	Minimal
Floral and Faunal Species Specific Assessment	2	2	3	2	1	2	2	N/A	2	N/A	16	3	Moderate
M-L Woodland Camp; 17th c. Domestic	3	3	3	3	3	3	3	1	1	1	24	4	High
Civil War earthwork	3	3	2	3	3	3	3	1	1	1	23	4	High
Prehistoric Camp; E 17th c. Domestic	3	3	3	3	3	3	3	1	1	1	24	4	High
Civil War Fort	3	3	3	3	3	3	3	1	1	1	24	4	High

Table B-4 (continued). Cultural Sensitivity at Colonial National Historical Park, Virginia.

Resource / Factor	S_ Cflood	S_ Erosion	S_ SLR	S_ Surge	S_ Precip	S_ Wind	S_Soil Chem	S_ Runoff	S_ Temp	S_ Humidity	Sens_ Raw	Sens_ Bin	Sens_ Rank
L Woodland Camp; 18th c Domestic; Civil War Fort	3	3	3	3	3	3	3	1	1	1	24	4	High
L Woodland Camp(?); 17th-18th c. Domestic	3	3	3	3	3	3	3	1	1	1	24	4	High
L Woodland Camp / Farmstead; 17th c. Domestic	3	3	3	3	3	3	3	1	1	1	24	4	High
Kingsmill "Island House"	3	3	3	3	3	3	3	1	1	1	24	4	High
L Archaic Camp; 17th c Domestic; 18th-19th c Wharf	3	3	3	3	3	3	3	1	1	1	24	4	High
Travis House	3	3	3	3	3	3	3	1	1	1	24	4	High
JC-903	3	3	3	3	3	3	3	3	3	3	30	4	High
JC-937	3	3	3	3	3	3	3	3	3	3	30	4	High
Jamestown Island Seawall	3	3	3	3	2	1	3	2	1	1	22	4	High
Black Point Bridge	3	3	3	3	3	1	3	3	1	2	25	4	High
Jamestown Island Area Cultural Landscape Boundary	3	3	3	3	1	1	1	1	1	1	18	3	Moderate
Jamestown Island Area Cultural Landscape Natural Systems and Features	3	3	3	3	3	2	3	3	3	3	29	4	High
Jamestown Island Area Cultural Landscape Spatial Organization	3	3	3	3	1	1	3	3	1	1	22	4	High
Jamestown Island Area Cultural Landscape Land Use	1	1	1	1	1	1	1	1	1	1	10	1	Minimal
Jamestown Island Area Cultural Landscape Topography	3	3	3	3	1	2	1	2	1	1	20	3	Moderate
Jamestown Island Area Cultural Landscape Vegetation	2	2	2	2	1	2	2	1	1	1	16	3	Moderate
Jamestown Island Area Cultural Landscape Circulation	2	2	2	2	1	1	1	1	1	1	14	2	Low
Jamestown Island Area Cultural Landscape Buildings and Structures	2	2	2	2	1	1	1	1	1	1	14	2	Low

Table B-4 (continued). Cultural Sensitivity at Colonial National Historical Park, Virginia.

Resource / Factor	S_ Cflood	S_ Erosion	S_ SLR	S_ Surge	S_ Precip	S_ Wind	S_Soil Chem	S_ Runoff	S_ Temp	S_ Humidity	Sens_ Raw	Sens_ Bin	Sens_ Rank
Jamestown Island Area Cultural Landscape Views and Vistas	1	1	1	1	1	1	1	1	1	1	10	1	Minimal
Jamestown Island Area Cultural Landscape Small-Scale Features	2	2	2	2	1	1	1	1	1	1	14	2	Low
Jamestown Island Area Cultural Landscape Archeological Sites	3	3	3	3	3	3	3	3	1	1	26	4	High
Collections Material	2	3	3	3	3	3	3	3	3	3	29	4	High
Collections Extended power outage	2	2	2	2	3	2	2	2	3	3	23	4	High
Collections Location	3	3	3	3	3	3	3	3	3	3	30	4	High
Archaeological Sites of Social, Political, or Economic Significance Composite Score	3	3	3	3	3	3	3	1	1	1	24	4	High
Collections Composite Score	2	3	3	3	3	3	3	3	3	3	29	4	High
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	1	3	3	1	1	1	2	N/A	2	N/A	14	2	Low
Natural Landscapes Retaining Non-developed Character	–	–	–	–	–	–	–	–	–	–	0	1	Minimal
Floral and Faunal Species Specific Assessment	2	2	3	2	1	2	2	N/A	2	N/A	16	3	Moderate
L Archaic; M&L Woodland; 17th c. Domestic site	3	3	3	3	3	3	3	3	3	3	30	4	High
Glasshouse Ruins	3	3	3	3	3	3	3	3	3	3	30	4	High
Glasshouse Monument	3	3	3	3	3	1	3	3	1	3	26	4	High
Greate Road Trace	3	3	3	3	3	1	3	3	1	2	25	4	High
Colonial Parkway Isthmus Bridge	3	3	3	3	3	1	3	3	1	2	25	4	High
Powhatan Bridge	3	3	3	3	3	1	3	3	1	2	25	4	High
Cultural Landscapes: See Newtown or Jamestown	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	1	Minimal
Archaeological Sites of Social, Political, or Economic Significance Composite Score	3	3	3	3	3	3	3	3	3	3	30	4	High

Table B-4 (continued). Cultural Sensitivity at Colonial National Historical Park, Virginia.

Resource / Factor	S_ Cflood	S_ Erosion	S_ SLR	S_ Surge	S_ Precip	S_ Wind	S_Soil Chem	S_ Runoff	S_ Temp	S_ Humidity	Sens_ Raw	Sens_ Bin	Sens_ Rank
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	1	3	3	1	1	1	2	N/A	2	N/A	14	2	Low
Natural Landscapes Retaining Non-developed Character	–	–	–	–	–	–	–	–	–	–	0	1	Minimal
Floral and Faunal Species Specific Assessment	2	2	3	2	1	2	2	N/A	2	N/A	16	3	Moderate
Late-17th / Early-18th c. Domestic site	3	3	2	3	3	3	3	2	1	1	24	4	High
Cultural Landscapes See Newtown or Jamestown	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	1	Minimal
Archaeological Sites of Social, Political, or Economic Significance Composite Score	3	3	2	3	3	3	3	2	1	1	24	4	High
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	1	3	3	1	1	1	2	N/A	2	N/A	14	2	Low
Natural Landscapes Retaining Non-developed Character	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	1	Minimal
Floral and Faunal Species Specific Assessment	2	2	3	2	1	2	2	N/A	2	N/A	16	3	Moderate
18th century domestic site, Colonial Pkwy Km 29	3	3	3	3	1	2	3	1	1	1	21	4	High
19th century Civil War Earthwork, Colonial Pkwy Km 32	3	3	3	3	2	3	3	3	1	1	25	4	High
17th through 20th century domestic occupation, Colonial Pkwy Km 28	3	3	3	3	1	1	3	1	1	1	20	3	Moderate
Woodland domestic occupation, Colonial Pkwy Km 25	1	1	1	1	1	3	2	1	1	1	13	2	Low
Middle Woodland Domestic Occupation, Colonial Pkwy Km 25	3	3	3	3	1	3	2	1	1	1	21	4	High
Park's Paper Mill	2	2	2	3	2	3	2	2	1	1	20	3	Moderate
Middle Woodland occupation and midden site	1	1	1	2	1	3	1	1	1	1	13	2	Low
18th century embanked enclosure	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	0	1	Minimal
Colonial Parkway Cultural Landscape boundary	3	3	3	3	2	1	1	3	1	1	21	4	High

Table B-4 (continued). Cultural Sensitivity at Colonial National Historical Park, Virginia.

Resource / Factor	S_ Cflood	S_ Erosion	S_ SLR	S_ Surge	S_ Precip	S_ Wind	S_Soil Chem	S_ Runoff	S_ Temp	S_ Humidity	Sens_ Raw	Sens_ Bin	Sens_ Rank
Archaeological Sites of Social, Political, or Economic Significance Composite Score	2	2	2	3	1	3	2	1	1	1	18	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	1	3	3	1	1	1	2	N/A	2	N/A	14	2	Low
Natural Landscapes Retaining Non-developed Character	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	1	Minimal
Floral and Faunal Species Specific Assessment	2	2	3	2	1	2	2	N/A	2	N/A	16	3	Moderate
Middle to Late Woodland scatter	3	3	2	2	1	2	3	1	1	1	19	3	Moderate
17th- & 18th-c. Plantation complex (Bellfield Plantation)	2	3	2	3	1	3	2	2	1	1	20	3	Moderate
Ringfield Plantation	1	1	1	1	1	3	2	1	1	1	13	2	Low
Kiskiak Village Site	3	3	2	3	1	3	3	1	1	1	21	4	High
redoubt 11 Civil War earthwork, Colonial Pkwy Km 16	1	1	1	1	2	3	1	2	1	1	14	2	Low
redoubt 14 Civil War earthwork	1	1	1	1	2	3	1	2	1	1	14	2	Low
Multi-component site Archaic, Woodland, and Historic Components, Colonial Pkwy Km 9-10 al Assemblage	2	3	3	3	1	3	3	1	1	1	21	4	High
Archaeological Sites of Social, Political, or Economic Significance Composite Score	3	3	3	3	1	3	3	2	1	1	23	4	High
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	1	3	3	1	1	1	2	N/A	2	N/A	14	2	Low
Natural Landscapes Retaining Non-developed Character	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	1	Minimal
Floral and Faunal Species Specific Assessment	2	2	3	2	1	2	2	N/A	2	N/A	16	3	Moderate
Yorktown Waterfront Lot 108 --how developed are these?	3	3	3	3	3	2	3	3	1	1	25	4	High
Yorktown Waterfront Lot 106	3	3	3	3	3	2	3	3	1	1	25	4	High
Yorktown Waterfront Lot 105	3	3	3	3	3	2	3	3	1	1	25	4	High

Table B-4 (continued). Cultural Sensitivity at Colonial National Historical Park, Virginia.

Resource / Factor	S_ Cflood	S_ Erosion	S_ SLR	S_ Surge	S_ Precip	S_ Wind	S_Soil Chem	S_ Runoff	S_ Temp	S_ Humidity	Sens_ Raw	Sens_ Bin	Sens_ Rank
Yorktown Waterfront Lot 95	3	3	3	3	3	2	3	3	1	1	25	4	High
Yorktown Waterfront Lot 94	3	3	3	3	3	2	3	3	1	1	25	4	High
Yorktown Waterfront Lot 93	3	3	3	3	3	2	3	3	1	1	25	4	High
Yorktown Waterfront Lot 92	3	3	3	3	3	2	3	3	1	1	25	4	High
Yorktown Waterfront Lot 91	3	3	3	3	3	2	3	3	1	1	25	4	High
Yorktown Waterfront Lot 90	3	3	3	3	3	2	3	3	1	1	25	4	High
Yorktown Waterfront Lot 89	3	3	3	3	3	2	3	3	1	1	25	4	High
Yorktown Waterfront Lot 88	3	3	3	3	3	2	3	3	1	1	25	4	High
Yorktown Waterfront Lot 87	3	3	3	3	3	2	3	3	1	1	25	4	High
Yorktown Waterfront Lot 86	3	3	3	3	3	2	3	3	1	1	25	4	High
Late 17th-Early-18th-century domestic plantation sites	3	3	3	3	3	2	3	3	1	1	25	4	High
Uniontown	1	1	1	1	2	3	1	1	1	1	13	2	Low
Cornwallis Cave	3	3	3	3	2	2	3	1	2	2	24	4	High
Nelson House-BLUFF	1	1	1	1	1	1	1	1	1	1	10	1	Minimal
Cole Diggs House-BLUFF	1	1	1	1	1	1	1	1	1	1	10	1	Minimal
Swann Tavern-BLUFF	1	1	1	1	1	1	1	1	1	1	10	1	Minimal
Archer Cottage	3	3	3	3	3	3	3	3	3	3	30	4	High
Yorktown Cultural Landscape Boundary	1	2	2	1	1	1	1	1	1	1	12	2	Low
Yorktown Cultural Landscape Natural Systems and Features	2	2	2	2	2	1	1	2	1	1	16	3	Moderate
Yorktown Cultural Landscape Topography	2	2	2	2	2	1	1	2	1	1	16	3	Moderate
Yorktown Cultural Landscape Spatial Organization	1	1	1	1	1	1	1	1	1	1	10	1	Minimal

Table B-4 (continued). Cultural Sensitivity at Colonial National Historical Park, Virginia.

Resource / Factor	S_ Cflood	S_ Erosion	S_ SLR	S_ Surge	S_ Precip	S_ Wind	S_Soil Chem	S_ Runoff	S_ Temp	S_ Humidity	Sens_ Raw	Sens_ Bin	Sens_ Rank
Cultural Landscapes Buildings and Structures	1	1	1	1	1	1	1	1	1	1	10	1	Minimal
Yorktown Cultural Landscape Circulation	2	2	2	2	1	1	1	2	1	1	15	2	Low
Yorktown Cultural Landscape Vegetation	1	1	1	1	2	2	1	1	2	1	13	2	Low
Yorktown Cultural Landscape Views and Vistas	1	1	1	1	2	1	1	1	2	1	12	2	Low
Yorktown Cultural Landscape Small-Scale Features	1	1	1	1	1	1	1	1	1	1	10	1	Minimal
Nelson House Cultural Landscape Boundary	1	1	1	1	1	1	1	1	1	1	10	1	Minimal
Nelson House Cultural Landscape Spatial Organization	1	1	1	1	1	1	1	1	1	1	10	1	Minimal
Nelson House Cultural Landscape Vegetation	1	1	1	1	2	2	1	1	2	1	13	2	Low
Nelson House Cultural Landscape Circulation	1	1	1	1	2	1	2	2	2	1	14	2	Low
Nelson House Cultural Landscape Buildings and Structures	1	1	1	1	1	2	1	1	1	1	11	2	Low
Nelson House Cultural Landscape Views and Vistas	1	1	1	1	2	1	1	1	2	1	12	2	Low
Nelson House Cultural Landscape Small Scale Features	1	1	1	1	1	1	1	1	1	1	10	1	Minimal
Archaeological Sites of Social, Political, or Economic Significance Composite Score	3	3	3	3	3	2	3	3	1	1	25	4	High
Collections Composite Score	1	1	1	1	2	2	2	2	2	2	16	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	1	3	3	1	1	1	2	N/A	2	N/A	14	2	Low
Natural Landscapes Retaining Non-developed Character	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	1	Minimal
Floral and Faunal Species Specific Assessment	2	2	3	2	1	2	2	N/A	2	N/A	16	3	Moderate
Middle Woodland Procurement Camp	3	3	3	3	2	3	3	2	1	1	24	4	High
18th and 19th century military fortifications and earthworks	2	3	2	3	3	3	3	2	1	1	23	4	High

Table B-4 (continued). Cultural Sensitivity at Colonial National Historical Park, Virginia.

Resource / Factor	S_ Cflood	S_ Erosion	S_ SLR	S_ Surge	S_ Precip	S_ Wind	S_Soil Chem	S_ Runoff	S_ Temp	S_ Humidity	Sens_ Raw	Sens_ Bin	Sens_ Rank
redoubt 2 (Revolutionary War earthwork)	1	1	1	1	2	1	1	1	1	1	11	2	Low
Revolutionary War Encampments	1	1	1	1	1	2	1	1	1	1	11	2	Low
Mid-Second Siege Line, Revolutionary War Earthwork	1	1	1	1	2	2	1	2	1	1	13	2	Low
Connecting Trench Between 1st and 2nd Siege Parallels, Revolutionary War Earthwork	1	1	1	1	2	2	1	2	1	1	13	2	Low
American Hospital / Smith Plantation	1	1	1	1	2	1	1	1	1	1	11	2	Low
British redoubt	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	0	1	Minimal
Rochambeau's Headquarters / Nelson Family Plantation	1	1	1	1	1	3	1	1	1	1	12	2	Low
Adjunct General's Headquarters	1	1	1	1	1	3	1	1	1	1	12	2	Low
Washington's Headquarters / Meadowfield Plantation	1	1	1	1	1	3	1	1	1	1	12	2	Low
Von Stueben's Headquarters	1	1	1	1	1	3	1	1	1	1	12	2	Low
Archaic / Woodland Site	3	1	1	1	1	3	1	1	1	1	14	2	Low
Surrender Field	1	1	1	1	1	1	1	1	1	1	10	1	Minimal
Multi-component site Early Woodland, 18th-century domestic	3	2	1	3	1	1	2	1	1	1	16	3	Moderate
Middle Woodland campsite	3	2	2	3	2	3	3	2	1	1	22	4	High
Grand French Battery	1	1	1	1	1	1	1	1	1	1	10	1	Minimal
redoubt 10--Revolutionary War Earthwork	3	3	3	3	3	3	2	2	1	1	24	4	High
Yorktown Battlefield Cultural Landscape Boundary	1	1	1	1	1	1	1	1	1	1	10	1	Minimal
Moore House Cultural Landscape Boundary	1	1	1	1	1	1	1	1	1	1	10	1	Minimal
Moore House Cultural Landscape Spatial Organization	1	1	1	1	1	1	1	1	1	1	10	1	Minimal
Moore House Cultural Landscape Vegetation	1	1	1	1	2	2	2	1	2	1	14	2	Low

Table B-4 (continued). Cultural Sensitivity at Colonial National Historical Park, Virginia.

Resource / Factor	S_ Cflood	S_ Erosion	S_ SLR	S_ Surge	S_ Precip	S_ Wind	S_Soil Chem	S_ Runoff	S_ Temp	S_ Humidity	Sens_ Raw	Sens_ Bin	Sens_ Rank
Moore House Cultural Landscape Circulation	1	1	1	1	1	1	1	1	1	1	10	1	Minimal
Moore House Cultural Landscape Buildings and Structures	1	1	1	1	1	1	1	1	1	1	10	1	Minimal
Moore House Cultural Landscape Views and Vistas	1	1	1	1	2	1	1	1	2	1	12	2	Low
Moore House Cultural Landscape Small-Scale Features	1	1	1	1	1	1	1	1	1	1	10	1	Minimal
Archaeological Sites of Social, Political, or Economic Significance Composite Score	3	3	2	3	2	3	3	2	1	1	23	4	High
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	1	3	3	1	1	1	2	N/A	2	N/A	14	2	Low
Natural Landscapes Retaining Non-developed Character	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	1	Minimal
Floral and Faunal Species Specific Assessment	2	2	3	2	1	2	2	N/A	2	N/A	16	3	Moderate
17th c. domestic site, possibly w / structure	1	1	1	1	2	3	1	2	1	1	14	2	Low
Mid- to Late-17th c. Domestic site (Berkeley Manor House and Ludwell-Lee House)	1	1	1	1	2	3	1	2	1	1	14	2	Low
17th- and / or 18th-c. plantation outbuilding (?)	1	1	1	1	2	3	1	2	1	1	14	2	Low
18th c. slave quarters (?)	1	1	1	1	2	3	1	2	1	1	14	2	Low
19th c. domestic site, w / structure	1	1	1	1	2	3	1	2	1	1	14	2	Low
Green Spring manor house periphery	1	1	1	1	2	3	1	2	1	1	14	2	Low
17th and / or 18th c. brick kiln and borrow pit	1	1	1	1	2	3	1	2	1	1	14	2	Low
17th c. rice paddies (?)	1	1	1	1	2	3	1	2	1	1	14	2	Low
Historic-period roadbed	1	1	1	1	2	3	1	2	1	1	14	2	Low
Late-18th / early-19th-c.(?) earthen mound	1	1	1	1	2	3	1	2	1	1	14	2	Low
Green Spring Cultural Landscape Boundary	1	1	1	1	1	1	1	1	1	1	10	1	Minimal

Table B-4 (continued). Cultural Sensitivity at Colonial National Historical Park, Virginia.

Resource / Factor	S_ Cflood	S_ Erosion	S_ SLR	S_ Surge	S_ Precip	S_ Wind	S_Soil Chem	S_ Runoff	S_ Temp	S_ Humidity	Sens_ Raw	Sens_ Bin	Sens_ Rank
Green Spring Cultural Landscape Spatial Organization	1	1	1	1	1	1	2	2	1	1	12	2	Low
Green Spring Cultural Landscape Topography	1	1	1	1	1	1	1	2	1	1	11	2	Low
Green Spring Cultural Landscape Natural Systems and Features	1	1	1	1	2	2	1	2	2	1	14	2	Low
Green Spring Cultural Landscape Archeological Sites	1	1	1	1	2	2	2	2	1	1	14	2	Low
Archaeological Sites of Social, Political, or Economic Significance Composite Score	1	1	1	1	2	3	1	2	1	1	14	2	Low
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	1	3	3	1	1	1	2	N/A	2	N/A	14	2	Low
Natural Landscapes Retaining Non-developed Character	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	1	Minimal
Floral and Faunal Species Specific Assessment	2	2	3	2	1	2	2	N/A	2	N/A	16	3	Moderate
Collections Material	1	1	1	1	2	2	2	2	2	2	16	3	Moderate
Collections Extended power outage	1	1	1	1	2	2	2	2	2	2	16	3	Moderate
Collections Location	1	1	1	1	2	2	2	2	2	2	16	3	Moderate

Table B-5. Cultural Vulnerability 2020, 2050, 2100 at Colonial National Historical Park, Virginia.

Geo. Area	ID	ASMIS or LCS #	Resource / Factor	2020			2050			2100		
				Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank
Newtown	1	44JC932	19th & 20th c. components; Civil War earthwork	7	4	High	7	4	High	5	3	Moderate
	2	44JC0001008	Jamestown - Structure 8 / 9 [18th century gentry house / townstead North of warehouse area; part of Travis Farmstead]	5	3	Moderate	5	3	Moderate	5	3	Moderate
	3	44JC0001017	Jamestown - Rowhouse Structure 17	5	3	Moderate	5	3	Moderate	5	3	Moderate
	4	44JC0001024	Jamestown - Jackson House Structure 24	5	3	Moderate	5	3	Moderate	5	3	Moderate
	5	44JC0001086	Jamestown - May Hartwell House	5	3	Moderate	5	3	Moderate	5	3	Moderate
	6	44JC0001031	Jamestown - KSP (William Sherwood House/Richard Kemp House)	5	3	Moderate	5	3	Moderate	5	3	Moderate
	7	44JC0001101	Jamestown - Ambler (LCS #76J640A1)	7	4	High	7	4	High	6	4	High
	8	44JC0001112	Jamestown - Gov. Harvey Structure 112	5	3	Moderate	5	3	Moderate	5	3	Moderate
	9	44JC0001026	Jamestown - Warehouse	7	4	High	7	4	High	7	4	High
	10	44JC0001115	Jamestown - Rowhouse Structure 115	5	3	Moderate	5	3	Moderate	5	3	Moderate
	11	44JC0001019	Jamestown - Swann Tavern	5	3	Moderate	5	3	Moderate	5	3	Moderate
	12	N/A	Structure 110-First Brewery in English North America	4	3	Moderate	4	3	Moderate	6	4	High
	13	44JC0001144	State House Structure 141	5	3	Moderate	5	3	Moderate	5	3	Moderate
	14	N/A	Jamestown Church	7	4	High	7	4	High	7	4	High
	15	N/A	Church Tower	7	4	High	7	4	High	7	4	High

Table B-5 (continued). Cultural Vulnerability 2020, 2050, 2100 at Colonial National Historical Park, Virginia.

Geo. Area	ID	ASMIS or LCS #	Resource / Factor	2020			2050			2100		
				Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank
Newtown (continued)	16	N/A	Jamestown Fort	7	4	High	7	4	High	8	4	High
	17	LCS006903	Jamestown Monument	6	4	High	6	4	High	6	4	High
	18	LCS006904	Travis Graveyard	7	4	High	7	4	High	7	4	High
	19	LCS081774	Boundary Berms	7	4	High	7	4	High	7	4	High
	20	LCS081773	The Back Street	7	4	High	7	4	High	7	4	High
	21	LCS081772	Highway Close to the Great River	8	4	High	8	4	High	8	4	High
	22	LCS000205	Jamestown Island Great Road Trace	8	4	High	8	4	High	8	4	High
	23	N/A	Cultural Landscapes - Newtown Sub-area of Jamestown Island CL Natural Systems and Features same for all 4 areas Newtown, Jamestown, Neck of Land, Glass Point	5	3	Moderate	5	3	Moderate	5	3	Moderate
	24	N/A	Cultural Landscapes - Newtown Sub-area of Jamestown Island CL Topography	6	4	High	6	4	High	6	4	High
	25	N/A	Cultural Landscapes - Newtown Sub-area of Jamestown Island CL Circulation	6	4	High	6	4	High	6	4	High
	26	N/A	Cultural Landscapes - Newtown Sub-area of Jamestown Island CL Spatial organization	6	4	High	6	4	High	6	4	High
	27	N/A	Cultural Landscapes - Newtown Sub-area of Jamestown Island CL Vegetation	8	4	High	8	4	High	8	4	High

Table B-5 (continued). Cultural Vulnerability 2020, 2050, 2100 at Colonial National Historical Park, Virginia.

Geo. Area	ID	ASMIS or LCS #	Resource / Factor	2020			2050			2100		
				Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank
Newtown (continued)	28	N/A	Cultural Landscapes - Newtown Sub-area of Jamestown Island CL Views and Vistas	6	4	High	6	4	High	6	4	High
	29	N/A	Cultural Landscapes - Newtown Sub-area of Jamestown Island CL Small Scale Features	6	4	High	6	4	High	6	4	High
	30	N/A	Archaeological Sites of Social, Political, or Economic Significance to Tribes Composite Score	7	4	High	7	4	High	7	4	High
	31	N/A	Tidal and Non-Tidal Wetlands Including Marshes Composite Score	4	3	Moderate	4	3	Moderate	4	3	Moderate
	32	N/A	Natural Landscapes Retaining Non-developed Character	4	3	Moderate	4	3	Moderate	4	3	Moderate
	33	N/A	Floral and Faunal Species Specific Assessment	6	4	High	6	4	High	6	4	High
Jamestown Island	N/A	44JC0920	M-L Woodland Camp; 17th c. Domestic	8	4	High	8	4	High	8	4	High
	N/A	44JC0942	Civil War earthwork	8	4	High	8	4	High	8	4	High
	N/A	44JC0897	Prehistoric Camp; E 17th c. Domestic	6	4	High	6	4	High	6	4	High
	N/A	44JC0893	Civil War Fort	8	4	High	8	4	High	8	4	High
	N/A	44JC0907	L Woodland Camp; 18th c Domestic; Civil War Fort	6	4	High	6	4	High	6	4	High
	N/A	44JC0908	L Woodland Camp(?); 17th-18th c. Domestic	6	4	High	6	4	High	6	4	High
	N/A	44JC0886	L Woodland Camp / Farmstead; 17th c. Domestic	7	4	High	7	4	High	7	4	High

Table B-5 (continued). Cultural Vulnerability 2020, 2050, 2100 at Colonial National Historical Park, Virginia.

Geo. Area	ID	ASMIS or LCS #	Resource / Factor	2020			2050			2100		
				Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank
Jamestown Island (continued)	N/A	44JC0915	Kingsmill "Island House"	7	4	High	7	4	High	7	4	High
	N/A	44JC0916	L Archaic Camp; 17th c Domestic; 18th-19th c Wharf	7	4	High	7	4	High	7	4	High
	N/A	44JC0887	Travis House	7	4	High	7	4	High	6	4	High
	N/A	44JC0903	JC-903	7	4	High	7	4	High	7	4	High
	N/A	44JC0937	JC-937	7	4	High	7	4	High	7	4	High
	N/A	LCS081775	Jamestown Island Seawall	8	4	High	8	4	High	8	4	High
	N/A	N/A	Black Point Bridge	8	4	High	8	4	High	8	4	High
	N/A	N/A	Jamestown Island Area Cultural Landscape Boundary	7	4	High	7	4	High	7	4	High
	N/A	N/A	Jamestown Island Area Cultural Landscape Natural Systems and Features	8	4	High	8	4	High	8	4	High
	N/A	N/A	Jamestown Island Area Cultural Landscape Spatial Organization	8	4	High	8	4	High	8	4	High
	N/A	N/A	Jamestown Island Area Cultural Landscape Land Use	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	N/A	Jamestown Island Area Cultural Landscape Topography	7	4	High	7	4	High	7	4	High
	N/A	N/A	Jamestown Island Area Cultural Landscape Vegetation	7	4	High	7	4	High	7	4	High
	N/A	N/A	Jamestown Island Area Cultural Landscape Circulation	6	4	High	6	4	High	6	4	High
	N/A	N/A	Jamestown Island Area Cultural Landscape Buildings and Structures	6	4	High	6	4	High	6	4	High

Table B-5 (continued). Cultural Vulnerability 2020, 2050, 2100 at Colonial National Historical Park, Virginia.

Geo. Area	ID	ASMIS or LCS #	Resource / Factor	2020			2050			2100		
				Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank
Jamestown Island (continued)	N/A	N/A	Jamestown Island Area Cultural Landscape Views and Vistas	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	N/A	Jamestown Island Area Cultural Landscape Small-Scale Features	6	4	High	6	4	High	6	4	High
	N/A	N/A	Jamestown Island Area Cultural Landscape Archeological Sites	8	4	High	8	4	High	8	4	High
	N/A	N/A	Collections Material	8	4	High	8	4	High	8	4	High
	N/A	N/A	Collections Extended power outage	8	4	High	8	4	High	8	4	High
	N/A	N/A	Collections Location	8	4	High	8	4	High	8	4	High
	N/A	N/A	Archaeological Sites of Social, Political, or Economic Significance Composite Score	7	4	High	7	4	High	7	4	High
	N/A	N/A	Collections Composite Score	7	4	High	7	4	High	7	4	High
	N/A	N/A	Tidal and Non-Tidal Wetlands Including Marshes Composite Score	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	N/A	Natural Landscapes Retaining Non-developed Character	4	3	Moderate	4	3	Moderate	4	3	Moderate
	N/A	N/A	Floral and Faunal Species Specific Assessment	6	4	High	6	4	High	6	4	High
Glasshouse Point	N/A	44JC0106	L Archaic; M&L Woodland; 17th c. Domestic site	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	44JC0986	Glasshouse Ruins	5	3	Moderate	5	3	Moderate	6	4	High
	N/A	LCS081776	Glasshouse Monument	8	4	High	8	4	High	8	4	High
	N/A	LCS000205	Greate Road Trace	7	4	High	7	4	High	7	4	High

Table B-5 (continued). Cultural Vulnerability 2020, 2050, 2100 at Colonial National Historical Park, Virginia.

Geo. Area	ID	ASMIS or LCS #	Resource / Factor	2020			2050			2100		
				Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank
Glasshouse Point (continued)	N/A	N/A	Colonial Parkway Isthmus Bridge	8	4	High	8	4	High	8	4	High
	N/A	LCS081740	Powhatan Bridge	8	4	High	8	4	High	8	4	High
	N/A	N/A	Cultural Landscapes: See Newtown or Jamestown	3	2	Low	3	2	Low	3	2	Low
	N/A	N/A	Archaeological Sites of Social, Political, or Economic Significance Composite Score	7	4	High	7	4	High	7	4	High
	N/A	N/A	Tidal and Non-Tidal Wetlands Including Marshes Composite Score	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	N/A	Natural Landscapes Retaining Non-developed Character	4	3	Moderate	4	3	Moderate	4	3	Moderate
	N/A	N/A	Floral and Faunal Species Specific Assessment	6	4	High	6	4	High	6	4	High
Neck of Land	N/A	44JC1047	Late-17th / Early-18th c. Domestic site	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	N/A	Cultural Landscapes See Newtown or Jamestown	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	N/A	Archaeological Sites of Social, Political, or Economic Significance Composite Score	7	4	High	7	4	High	7	4	High
	N/A	N/A	Tidal and Non-Tidal Wetlands Including Marshes Composite Score	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	N/A	Natural Landscapes Retaining Non-developed Character	4	3	Moderate	4	3	Moderate	4	3	Moderate
	N/A	N/A	Floral and Faunal Species Specific Assessment	6	4	High	6	4	High	6	4	High

Table B-5 (continued). Cultural Vulnerability 2020, 2050, 2100 at Colonial National Historical Park, Virginia.

Geo. Area	ID	ASMIS or LCS #	Resource / Factor	2020			2050			2100		
				Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank
James River Parkway	N/A	44JC1183	18th century domestic site, Colonial Pkwy Km 29	6	4	High	6	4	High	6	4	High
	N/A	44JC1179	19th century Civil War Earthwork, Colonial Pkwy Km 32	6	4	High	6	4	High	6	4	High
	N/A	44JC1884	17th through 20th century domestic occupation, Colonial Pkwy Km 28	7	4	High	7	4	High	6	4	High
	N/A	44JC1187	Woodland domestic occupation, Colonial Pkwy Km 25	3	2	Low	3	2	Low	3	2	Low
	N/A	44JC1199	Middle Woodland Domestic Occupation, Colonial Pkwy Km 25	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	44JC1205	Park's Paper Mill	4	3	Moderate	4	3	Moderate	4	3	Moderate
	N/A	44JC1280	Middle Woodland occupation and midden site	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	44JC1282	18th century embanked enclosure	4	3	Moderate	4	3	Moderate	4	3	Moderate
	N/A	N/A	Colonial Parkway Cultural Landscape boundary	7	4	High	7	4	High	7	4	High
	N/A	N/A	Archaeological Sites of Social, Political, or Economic Significance Composite Score	6	4	High	6	4	High	6	4	High
	N/A	N/A	Tidal and Non-Tidal Wetlands Including Marshes Composite Score	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	N/A	Natural Landscapes Retaining Non-developed Character	4	3	Moderate	4	3	Moderate	4	3	Moderate
	N/A	N/A	Floral and Faunal Species Specific Assessment	6	4	High	6	4	High	6	4	High

Table B-5 (continued). Cultural Vulnerability 2020, 2050, 2100 at Colonial National Historical Park, Virginia.

Geo. Area	ID	ASMIS or LCS #	Resource / Factor	2020			2050			2100		
				Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank
York River Parkway	N/A	44YO0166	Middle to Late Woodland scatter	4	3	Moderate	4	3	Moderate	4	3	Moderate
	N/A	44YO0316	17th- & 18th-c. Plantation complex (Bellfield Plantation)	4	3	Moderate	4	3	Moderate	4	3	Moderate
	N/A	44YO0320	Ringfield Plantation	3	2	Low	3	2	Low	3	2	Low
	N/A	44YO0002	Kiskiak Village Site	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	44YO0053	redoubt 11 Civil War earthwork, Colonial Pkwy Km 16	3	2	Low	3	2	Low	3	2	Low
	N/A	44YO0054	redoubt 14 Civil War earthwork	3	2	Low	3	2	Low	3	2	Low
	N/A	44YO0150	Multi-component site Archaic, Woodland, and Historic Components, Colonial Pkwy Km 9-10 al Assemblage	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	N/A	Archaeological Sites of Social, Political, or Economic Significance Composite Score	7	4	High	7	4	High	7	4	High
	N/A	N/A	Tidal and Non-Tidal Wetlands Including Marshes Composite Score	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	N/A	Natural Landscapes Retaining Non-developed Character	4	3	Moderate	4	3	Moderate	4	3	Moderate
	N/A	N/A	Floral and Faunal Species Specific Assessment	6	4	High	6	4	High	6	4	High
Yorktown Waterfront and Bluffs	N/A	44YO0100-108	Yorktown Waterfront Lot 108 - -how developed are these?	7	4	High	7	4	High	5	3	Moderate
	N/A	44YO0100-106	Yorktown Waterfront Lot 106	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	44YO0100-105	Yorktown Waterfront Lot 105	5	3	Moderate	5	3	Moderate	5	3	Moderate

Table B-5 (continued). Cultural Vulnerability 2020, 2050, 2100 at Colonial National Historical Park, Virginia.

Geo. Area	ID	ASMIS or LCS #	Resource / Factor	2020			2050			2100		
				Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank
Yorktown Waterfront and Bluffs (continued)	N/A	44YO0100-95	Yorktown Waterfront Lot 95	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	44YO0100-94	Yorktown Waterfront Lot 94	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	44YO0100-93	Yorktown Waterfront Lot 93	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	44YO0100-92	Yorktown Waterfront Lot 92	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	44YO0100-91	Yorktown Waterfront Lot 91	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	44YO0100-90	Yorktown Waterfront Lot 90	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	44YO0100-89	Yorktown Waterfront Lot 89	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	44YO0100-88	Yorktown Waterfront Lot 88	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	44YO0100-87	Yorktown Waterfront Lot 87	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	44YO0100-86	Yorktown Waterfront Lot 86	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	44YO0373	Late 17th-Early-18th-century domestic plantation sites	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	N/A	Uniontown	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	LCS081752	Cornwallis Cave	6	4	High	6	4	High	7	4	High
	N/A	LCS000223	Nelson House-BLUFF	3	2	Low	3	2	Low	4	3	Moderate
	N/A	LCS000217	Cole Diggs House-BLUFF	3	2	Low	3	2	Low	4	3	Moderate
	N/A	LCS000212	Swann Tavern-BLUFF	3	2	Low	3	2	Low	4	3	Moderate
	N/A	LCS000206	Archer Cottage	6	4	High	6	4	High	7	4	High
	N/A	N/A	Yorktown Cultural Landscape Boundary	6	4	High	6	4	High	6	4	High
	N/A	N/A	Yorktown Cultural Landscape Natural Systems and Features	7	4	High	7	4	High	7	4	High
	N/A	N/A	Yorktown Cultural Landscape Topography	7	4	High	7	4	High	7	4	High
	N/A	N/A	Yorktown Cultural Landscape Spatial Organization	5	3	Moderate	5	3	Moderate	5	3	Moderate

Table B-5 (continued). Cultural Vulnerability 2020, 2050, 2100 at Colonial National Historical Park, Virginia.

Geo. Area	ID	ASMIS or LCS #	Resource / Factor	2020			2050			2100		
				Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank
Yorktown Waterfront and Bluffs (continued)	N/A	N/A	Cultural Landscapes Buildings and Structures	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	N/A	Yorktown Cultural Landscape Circulation	6	4	High	6	4	High	6	4	High
	N/A	N/A	Yorktown Cultural Landscape Vegetation	6	4	High	6	4	High	6	4	High
	N/A	N/A	Yorktown Cultural Landscape Views and Vistas	6	4	High	6	4	High	6	4	High
	N/A	N/A	Yorktown Cultural Landscape Small-Scale Features	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	N/A	Nelson House Cultural Landscape Boundary	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	N/A	Nelson House Cultural Landscape Spatial Organization	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	N/A	Nelson House Cultural Landscape Vegetation	6	4	High	6	4	High	6	4	High
	N/A	N/A	Nelson House Cultural Landscape Circulation	6	4	High	6	4	High	6	4	High
	N/A	N/A	Nelson House Cultural Landscape Buildings and Structures	6	4	High	6	4	High	6	4	High
	N/A	N/A	Nelson House Cultural Landscape Views and Vistas	6	4	High	6	4	High	6	4	High
	N/A	N/A	Nelson House Cultural Landscape Small Scale Features	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	N/A	Archaeological Sites of Social, Political, or Economic Significance Composite Score	7	4	High	7	4	High	7	4	High
	N/A	N/A	Collections Composite Score	6	4	High	6	4	High	6	4	High

Table B-5 (continued). Cultural Vulnerability 2020, 2050, 2100 at Colonial National Historical Park, Virginia.

Geo. Area	ID	ASMIS or LCS #	Resource / Factor	2020			2050			2100		
				Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank
Yorktown Waterfront and Bluffs (continued)	N/A	N/A	Tidal and Non-Tidal Wetlands Including Marshes Composite Score	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	N/A	Natural Landscapes Retaining Non-developed Character	4	3	Moderate	4	3	Moderate	4	3	Moderate
	N/A	N/A	Floral and Faunal Species Specific Assessment	6	4	High	6	4	High	6	4	High
Yorktown Battlefield	N/A	44YO0996	Middle Woodland Procurement Camp	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	44YO0013/C	18th and 19th century military fortifications and earthworks	6	4	High	6	4	High	6	4	High
	N/A	44YO0107	redoubt 2 (Revolutionary War earthwork)	3	2	Low	3	2	Low	3	2	Low
	N/A	44YO0218	Revolutionary War Encampments	3	2	Low	3	2	Low	3	2	Low
	N/A	44YO0220	Mid-Second Siege Line, Revolutionary War Earthwork	3	2	Low	3	2	Low	3	2	Low
	N/A	44YO0221	Connecting Trench Between 1st and 2nd Siege Parallels, Revolutionary War Earthwork	3	2	Low	3	2	Low	3	2	Low
	N/A	44YO0354	American Hospital/Smith Plantation	3	2	Low	3	2	Low	3	2	Low
	N/A	44YO0355	British redoubt	2	1	Minimal	2	1	Minimal	2	1	Minimal
	N/A	44YO0359	Rochambeau's Headquarters/Nelson Family Plantation	3	2	Low	3	2	Low	3	2	Low
	N/A	44YO0360	Adjunct General's Headquarters	3	2	Low	3	2	Low	3	2	Low
	N/A	44YO0362	Washington's Headquarters / Meadowfield Plantation	3	2	Low	3	2	Low	3	2	Low

Table B-5 (continued). Cultural Vulnerability 2020, 2050, 2100 at Colonial National Historical Park, Virginia.

Geo. Area	ID	ASMIS or LCS #	Resource / Factor	2020			2050			2100		
				Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank
Yorktown Battlefield (continued)	N/A	44YO0382	Von Stueben's Headquarters	3	2	Low	3	2	Low	3	2	Low
	N/A	44YO0383	Archaic / Woodland Site	4	3	Moderate	4	3	Moderate	4	3	Moderate
	N/A	44YO0393	Surrender Field	2	1	Minimal	2	1	Minimal	2	1	Minimal
	N/A	44YO0452	Multi-component site Early Woodland, 18th-century domestic	4	3	Moderate	4	3	Moderate	4	3	Moderate
	N/A	44YO0453	Middle Woodland campsite	6	4	High	6	4	High	6	4	High
	N/A	44YO0219	Grand French Battery	2	1	Minimal	2	1	Minimal	2	1	Minimal
	N/A	N/A	redoubt 10--Revolutionary War Earthwork	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	N/A	Yorktown Battlefield Cultural Landscape Boundary	2	1	Minimal	2	1	Minimal	2	1	Minimal
	N/A	N/A	Moore House Cultural Landscape Boundary	2	1	Minimal	2	1	Minimal	2	1	Minimal
	N/A	N/A	Moore House Cultural Landscape Spatial Organization	2	1	Minimal	2	1	Minimal	2	1	Minimal
	N/A	N/A	Moore House Cultural Landscape Vegetation	3	2	Low	3	2	Low	3	2	Low
	N/A	N/A	Moore House Cultural Landscape Circulation	2	1	Minimal	2	1	Minimal	2	1	Minimal
	N/A	N/A	Moore House Cultural Landscape Buildings and Structures	2	1	Minimal	2	1	Minimal	2	1	Minimal
	N/A	N/A	Moore House Cultural Landscape Views and Vistas	3	2	Low	3	2	Low	3	2	Low
	N/A	N/A	Moore House Cultural Landscape Small-Scale Features	2	1	Minimal	2	1	Minimal	2	1	Minimal

Table B-5 (continued). Cultural Vulnerability 2020, 2050, 2100 at Colonial National Historical Park, Virginia.

Geo. Area	ID	ASMIS or LCS #	Resource / Factor	2020			2050			2100		
				Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank
Yorktown Battlefield (continued)	N/A	N/A	Archaeological Sites of Social, Political, or Economic Significance Composite Score	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	N/A	Tidal and Non-Tidal Wetlands Including Marshes Composite Score	3	2	Low	3	2	Low	3	2	Low
	N/A	N/A	Natural Landscapes Retaining Non-developed Character	2	1	Minimal	2	1	Minimal	2	1	Minimal
	N/A	N/A	Floral and Faunal Species Specific Assessment	4	3	Moderate	4	3	Moderate	4	3	Moderate
Green Springs	N/A	44JC0685	17th c. domestic site, possibly w/structure	3	2	Low	3	2	Low	3	2	Low
	N/A	44JC0009/C	Mid- to Late-17th c. Domestic site (Berkeley Manor House and Ludwell-Lee House)	3	2	Low	3	2	Low	3	2	Low
	N/A	N/A	17th- and/or 18th-c. plantation outbuilding (?)	3	2	Low	3	2	Low	3	2	Low
	N/A	44JC0009/B	18th c. slave quarters (?)	3	2	Low	3	2	Low	3	2	Low
	N/A	44JC0688	19th c. domestic site, w/ structure	3	2	Low	3	2	Low	3	2	Low
	N/A	44JC0009/E	Green Spring manor house periphery	3	2	Low	3	2	Low	3	2	Low
	N/A	44JC0009/A	17th and/or 18th c. brick kiln and borrow pit	3	2	Low	3	2	Low	3	2	Low
	N/A	44JC0009/D	17th c. rice paddies (?)	3	2	Low	3	2	Low	3	2	Low
	N/A	44JC0389	Historic-period roadbed	3	2	Low	3	2	Low	3	2	Low
	N/A	44JC0691	Late-18th/early-19th-c.(?) earthen mound	3	2	Low	3	2	Low	3	2	Low
	N/A	N/A	Green Spring Cultural Landscape Boundary	2	1	Minimal	2	1	Minimal	2	1	Minimal

Table B-5 (continued). Cultural Vulnerability 2020, 2050, 2100 at Colonial National Historical Park, Virginia.

Geo. Area	ID	ASMIS or LCS #	Resource / Factor	2020			2050			2100		
				Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank	Sum_ BinE+BinS	Vuln_ Final	Vuln_ Rank
Green Springs (continued)	N/A	N/A	Green Spring Cultural Landscape Spatial Organization	3	2	Low	3	2	Low	3	2	Low
	N/A	N/A	Green Spring Cultural Landscape Topography	3	2	Low	3	2	Low	3	2	Low
	N/A	N/A	Green Spring Cultural Landscape Natural Systems and Features	3	2	Low	3	2	Low	3	2	Low
	N/A	N/A	Green Spring Cultural Landscape Archeological Sites	3	2	Low	3	2	Low	3	2	Low
	N/A	N/A	Archaeological Sites of Social, Political, or Economic Significance Composite Score	3	2	Low	3	2	Low	3	2	Low
	N/A	N/A	Tidal and Non-Tidal Wetlands Including Marshes Composite Score	3	2	Low	3	2	Low	3	2	Low
	N/A	N/A	Natural Landscapes Retaining Non-developed Character	2	1	Minimal	2	1	Minimal	2	1	Minimal
	N/A	N/A	Floral and Faunal Species Specific Assessment	5	3	Moderate	5	3	Moderate	5	3	Moderate
Yorktown Collections	N/A	N/A	Collections Material	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	N/A	Collections Extended power outage	5	3	Moderate	5	3	Moderate	5	3	Moderate
	N/A	N/A	Collections Location	5	3	Moderate	5	3	Moderate	5	3	Moderate

Table B-6. Cultural Vulnerability at Colonial National Historical Park, Virginia.

Resource/Factor	Sum_ BinE+BinS	Vuln_Final	Vuln_Rank
19th & 20th c. components; Civil War earthwork	7	4	High
Jamestown - Structure 8/9 [18th century gentry house / townstead North of warehouse area; part of Travis Farmstead]	5	3	Moderate
Jamestown - Rowhouse Structure 17	5	3	Moderate
Jamestown - Jackson House Structure 24	5	3	Moderate
Jamestown - May Hartwell House	5	3	Moderate
Jamestown - KSP (William Sherwood House / Richard Kemp House)	5	3	Moderate
Jamestown - Ambler (LCS #76J640A1)	7	4	High
Jamestown - Gov. Harvey Structure 112	5	3	Moderate
Jamestown - Warehouse	7	4	High
Jamestown - Rowhouse Structure 115	5	3	Moderate
Jamestown - Swann Tavern	5	3	Moderate
Structure 110-First Brewery in English North America	4	3	Moderate
State House Structure 141	5	3	Moderate
Jamestown Church	7	4	High
Church Tower	7	4	High
Jamestown Fort	7	4	High
Jamestown Monument	6	4	High
Travis Graveyard	7	4	High
Boundary Berms	7	4	High
The Back Street	7	4	High
Highway Close to the Great River	8	4	High
Jamestown Island Great Road Trace	8	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Natural Systems and Features same for all 4 areas Newtown, Jamestown, Neck of Land, Glass Point	5	3	Moderate
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Topography	6	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Circulation	6	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Spatial organization	6	4	High

Table B-6 (continued). Cultural Vulnerability at Colonial National Historical Park, Virginia.

Resource/Factor	Sum_ BinE+BinS	Vuln_Final	Vuln_Rank
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Vegetation	8	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Views and Vistas	6	4	High
Cultural Landscapes -Newtown Sub-area of Jamestown Island CL Small Scale Features	6	4	High
Archaeological Sites of Social, Political, or Economic Significance to Tribes Composite Score	7	4	High
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	4	3	Moderate
Natural Landscapes Retaining Non-developed Character	4	3	Moderate
Floral and Faunal Species Specific Assessment	6	4	High
M-L Woodland Camp; 17th c. Domestic	8	4	High
Civil War earthwork	8	4	High
Prehistoric Camp; E 17th c. Domestic	6	4	High
Civil War Fort	8	4	High
L Woodland Camp; 18th c Domestic; Civil War Fort	6	4	High
L Woodland Camp(?); 17th-18th c. Domestic	6	4	High
L Woodland Camp / Farmstead; 17th c. Domestic	7	4	High
Kingsmill "Island House"	7	4	High
L Archaic Camp; 17th c Domestic; 18th-19th c Wharf	7	4	High
Travis House	7	4	High
JC-903	7	4	High
JC-937	7	4	High
Jamestown Island Seawall	8	4	High
Black Point Bridge	8	4	High
Jamestown Island Area Cultural Landscape Boundary	7	4	High
Jamestown Island Area Cultural Landscape Natural Systems and Features	8	4	High
Jamestown Island Area Cultural Landscape Spatial Organization	8	4	High
Jamestown Island Area Cultural Landscape Land Use	5	3	Moderate
Jamestown Island Area Cultural Landscape Topography	7	4	High
Jamestown Island Area Cultural Landscape Vegetation	7	4	High

Table B-6 (continued). Cultural Vulnerability at Colonial National Historical Park, Virginia.

Resource/Factor	Sum_ BinE+BinS	Vuln_Final	Vuln_Rank
Jamestown Island Area Cultural Landscape Circulation	6	4	High
Jamestown Island Area Cultural Landscape Buildings and Structures	6	4	High
Jamestown Island Area Cultural Landscape Views and Vistas	5	3	Moderate
Jamestown Island Area Cultural Landscape Small-Scale Features	6	4	High
Jamestown Island Area Cultural Landscape Archeological Sites	8	4	High
Collections Material	8	4	High
Collections Extended power outage	8	4	High
Collections Location	8	4	High
Archaeological Sites of Social, Political, or Economic Significance Composite Score	7	4	High
Collections Composite Score	7	4	High
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	5	3	Moderate
Natural Landscapes Retaining Non-developed Character	4	3	Moderate
Floral and Faunal Species Specific Assessment	6	4	High
L Archaic; M&L Woodland; 17th c. Domestic site	5	3	Moderate
Glasshouse Ruins	5	3	Moderate
Glasshouse Monument	8	4	High
Greate Road Trace	7	4	High
Colonial Parkway Isthmus Bridge	8	4	High
Powhatan Bridge	8	4	High
Cultural Landscapes: See Newtown or Jamestown	3	2	Low
Archaeological Sites of Social, Political, or Economic Significance Composite Score	7	4	High
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	5	3	Moderate
Natural Landscapes Retaining Non-developed Character	4	3	Moderate
Floral and Faunal Species Specific Assessment	6	4	High
Late-17th / Early-18th c. Domestic site	5	3	Moderate
Cultural Landscapes See Newtown or Jamestown	5	3	Moderate
Archaeological Sites of Social, Political, or Economic Significance Composite Score	7	4	High

Table B-6 (continued). Cultural Vulnerability at Colonial National Historical Park, Virginia.

Resource/Factor	Sum_ BinE+BinS	Vuln_Final	Vuln_Rank
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	5	3	Moderate
Natural Landscapes Retaining Non-developed Character	4	3	Moderate
Floral and Faunal Species Specific Assessment	6	4	High
18th century domestic site, Colonial Pkwy Km 29	6	4	High
19th century Civil War Earthwork, Colonial Pkwy Km 32	6	4	High
17th through 20th century domestic occupation, Colonial Pkwy Km 28	7	4	High
Woodland domestic occupation, Colonial Pkwy Km 25	3	2	Low
Middle Woodland Domestic Occupation, Colonial Pkwy Km 25	5	3	Moderate
Park's Paper Mill	4	3	Moderate
Middle Woodland occupation and midden site	5	3	Moderate
18th century embanked enclosure	4	3	Moderate
Colonial Parkway Cultural Landscape boundary	7	4	High
Archaeological Sites of Social, Political, or Economic Significance Composite Score	6	4	High
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	5	3	Moderate
Natural Landscapes Retaining Non-developed Character	4	3	Moderate
Floral and Faunal Species Specific Assessment	6	4	High
Middle to Late Woodland scatter	4	3	Moderate
17th- & 18th-c. Plantation complex (Bellfield Plantation)	4	3	Moderate
Ringfield Plantation	3	2	Low
Kiskiak Village Site	5	3	Moderate
redoubt 11 Civil War earthwork, Colonial Pkwy Km 16	3	2	Low
redoubt 14 Civil War earthwork	3	2	Low
Multi-component site Archaic, Woodland, and Historic Components, Colonial Pkwy Km 9-10 al Assemblage	5	3	Moderate
Archaeological Sites of Social, Political, or Economic Significance Composite Score	7	4	High
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	5	3	Moderate
Natural Landscapes Retaining Non-developed Character	4	3	Moderate
Floral and Faunal Species Specific Assessment	6	4	High

Table B-6 (continued). Cultural Vulnerability at Colonial National Historical Park, Virginia.

Resource/Factor	Sum_ BinE+BinS	Vuln_Final	Vuln_Rank
Yorktown Waterfront Lot 108 --how developed are these?	7	4	High
Yorktown Waterfront Lot 106	5	3	Moderate
Yorktown Waterfront Lot 105	5	3	Moderate
Yorktown Waterfront Lot 95	5	3	Moderate
Yorktown Waterfront Lot 94	5	3	Moderate
Yorktown Waterfront Lot 93	5	3	Moderate
Yorktown Waterfront Lot 92	5	3	Moderate
Yorktown Waterfront Lot 91	5	3	Moderate
Yorktown Waterfront Lot 90	5	3	Moderate
Yorktown Waterfront Lot 89	5	3	Moderate
Yorktown Waterfront Lot 88	5	3	Moderate
Yorktown Waterfront Lot 87	5	3	Moderate
Yorktown Waterfront Lot 86	5	3	Moderate
Late 17th-Early-18th-century domestic plantation sites	5	3	Moderate
Uniontown	5	3	Moderate
Cornwallis Cave	6	4	High
Nelson House-BLUFF	3	2	Low
Cole Diggs House-BLUFF	3	2	Low
Swann Tavern-BLUFF	3	2	Low
Archer Cottage	6	4	High
Yorktown Cultural Landscape Boundary	6	4	High
Yorktown Cultural Landscape Natural Systems and Features	7	4	High
Yorktown Cultural Landscape Topography	7	4	High
Yorktown Cultural Landscape Spatial Organization	5	3	Moderate
Cultural Landscapes Buildings and Structures	5	3	Moderate
Yorktown Cultural Landscape Circulation	6	4	High
Yorktown Cultural Landscape Vegetation	6	4	High

Table B-6 (continued). Cultural Vulnerability at Colonial National Historical Park, Virginia.

Resource/Factor	Sum_ BinE+BinS	Vuln_Final	Vuln_Rank
Yorktown Cultural Landscape Views and Vistas	6	4	High
Yorktown Cultural Landscape Small-Scale Features	5	3	Moderate
Nelson House Cultural Landscape Boundary	5	3	Moderate
Nelson House Cultural Landscape Spatial Organization	5	3	Moderate
Nelson House Cultural Landscape Vegetation	6	4	High
Nelson House Cultural Landscape Circulation	6	4	High
Nelson House Cultural Landscape Buildings and Structures	6	4	High
Nelson House Cultural Landscape Views and Vistas	6	4	High
Nelson House Cultural Landscape Small Scale Features	5	3	Moderate
Archaeological Sites of Social, Political, or Economic Significance Composite Score	7	4	High
Collections Composite Score	6	4	High
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	5	3	Moderate
Natural Landscapes Retaining Non-developed Character	4	3	Moderate
Floral and Faunal Species Specific Assessment	6	4	High
Middle Woodland Procurement Camp	5	3	Moderate
18th and 19th century military fortifications and earthworks	6	4	High
redoubt 2 (Revolutionary War earthwork)	3	2	Low
Revolutionary War Encampments	3	2	Low
Mid-Second Siege Line, Revolutionary War Earthwork	3	2	Low
Connecting Trench Between 1st and 2nd Siege Parallels, Revolutionary War Earthwork	3	2	Low
American Hospital / Smith Plantation	3	2	Low
British redoubt	2	1	Minimal
Rochambeau's Headquarters / Nelson Family Plantation	3	2	Low
Adjunct General's Headquarters	3	2	Low
Washington's Headquarters / Meadowfield Plantation	3	2	Low
Von Stueben's Headquarters	3	2	Low
Archaic / Woodland Site	4	3	Moderate

Table B-6 (continued). Cultural Vulnerability at Colonial National Historical Park, Virginia.

Resource/Factor	Sum_ BinE+BinS	Vuln_Final	Vuln_Rank
Surrender Field	2	1	Minimal
Multi-component site Early Woodland, 18th-century domestic	4	3	Moderate
Middle Woodland campsite	6	4	High
Grand French Battery	2	1	Minimal
redoubt 10--Revolutionary War Earthwork	5	3	Moderate
Yorktown Battlefield Cultural Landscape Boundary	2	1	Minimal
Moore House Cultural Landscape Boundary	2	1	Minimal
Moore House Cultural Landscape Spatial Organization	2	1	Minimal
Moore House Cultural Landscape Vegetation	3	2	Low
Moore House Cultural Landscape Circulation	2	1	Minimal
Moore House Cultural Landscape Buildings and Structures	2	1	Minimal
Moore House Cultural Landscape Views and Vistas	3	2	Low
Moore House Cultural Landscape Small-Scale Features	2	1	Minimal
Archaeological Sites of Social, Political, or Economic Significance Composite Score	5	3	Moderate
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	3	2	Low
Natural Landscapes Retaining Non-developed Character	2	1	Minimal
Floral and Faunal Species Specific Assessment	4	3	Moderate
17th c. domestic site, possibly w/ structure	3	2	Low
Mid- to Late-17th c. Domestic site (Berkeley Manor House and Ludwell-Lee House)	3	2	Low
17th- and/or 18th-c. plantation outbuilding (?)	3	2	Low
18th c. slave quarters (?)	3	2	Low
19th c. domestic site, w/ structure	3	2	Low
Green Spring manor house periphery	3	2	Low
17th and/or 18th c. brick kiln and borrow pit	3	2	Low
17th c. rice paddies (?)	3	2	Low
Historic-period roadbed	3	2	Low
Late-18th / early-19th-c.(?) earthen mound	3	2	Low

Table B-6 (continued). Cultural Vulnerability at Colonial National Historical Park, Virginia.

Resource/Factor	Sum_ BinE+BinS	Vuln_Final	Vuln_Rank
Green Spring Cultural Landscape Boundary	2	1	Minimal
Green Spring Cultural Landscape Spatial Organization	3	2	Low
Green Spring Cultural Landscape Topography	3	2	Low
Green Spring Cultural Landscape Natural Systems and Features	3	2	Low
Green Spring Cultural Landscape Archeological Sites	3	2	Low
Archaeological Sites of Social, Political, or Economic Significance Composite Score	3	2	Low
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	3	2	Low
Natural Landscapes Retaining Non-developed Character	2	1	Minimal
Floral and Faunal Species Specific Assessment	5	3	Moderate
Collections Material	5	3	Moderate
Collections Extended power outage	5	3	Moderate
Collections Location	5	3	Moderate

Appendix C. Cultural Resources Adaptive Capacity Assessment Data Set at Colonial National Historical Park.

Table C-1. Cultural adaptive capacity at Colonial National Historical Park, Virginia.

Resource/Factor	Physical-Natural	Physical-Technology	Organizational	Social	Economic	AC_ Sum	AC_ Bin	AC_ Rank	Comments
19th & 20th c. components; Civil War earthwork	1	2	1	3	1	8	2	Moderate	Changed Physical / Technological adaptive capacity from H to M in light of NPS mission. Even though there are technological options for adapting these sites, these adaptations do not preserve these sites in situ. Even with an archaeologist at COLO, there are a lot of sites; high priority for Civil War groups; partial site; Civil War partner organization may help contribute to documentation
Jamestown - Structure 8/9 [18th century gentry house / townstead North of warehouse area; part of Travis Farmstead]	1	2	1	2	1	7	1	Low	many of these sites have been previously excavated, so there may not be a lot of remaining artifacts, context remains
Jamestown - Rowhouse Structure 17	1	2	1	2	1	7	1	Low	–
Jamestown - Jackson House Structure 24	1	2	1	2	1	7	1	Low	–
Jamestown - May Hartwell House	1	2	1	2	1	7	1	Low	–
Jamestown - KSP (William Sherwood House/Richard Kemp House)	1	2	1	2	1	7	1	Low	–

Table C-1 (continued). Cultural adaptive capacity at Colonial National Historical Park, Virginia.

Resource/Factor	Physical-Natural	Physical-Technology	Organizational	Social	Economic	AC_ Sum	AC_ Bin	AC_ Rank	Comments
Jamestown - Ambler (LCS #006902)	1	2	3	3	3	12	2	Moderate	–
Jamestown - Gov. Harvey Structure 112	1	2	1	3	1	8	2	Moderate	–
Jamestown - Warehouse	1	2	1	2	1	7	1	Low	–
Jamestown - Rowhouse Structure 115	1	2	1	2	1	7	1	Low	–
Jamestown - Swann Tavern	1	2	1	3	1	8	2	Moderate	–
Structure 110-First Brewery in English North America	1	2	1	3	3	10	2	Moderate	–
State House Structure 141	1	2	1	3	1	8	2	Moderate	–
Jamestown Memorial Church	1	3	3	3	3	13	3	High	owned by PV
Church Tower	1	3	3	3	3	13	3	High	owned by PV
Jamestown Fort	1	3	3	3	3	13	3	High	owned by PV; as we fall back from the island with rising sea levels, we will still want to maintain access to those resources, and these 3 are on the highest ground
Jamestown Monument	2	3	3	3	1	12	2	Moderate	could be used to interpret the change
Travis Graveyard	1	3	3	3	2	12	2	Moderate	families still responsible for headstones; Travis family is still interested in the site;
Boundary Berms	1	2	2	2	2	9	2	Moderate	–
The Back Street	1	3	3	3	3	13	3	High	GPR could be useful identifying sections
The Highway Close to the River	1	3	3	3	3	13	3	High	–

Table C-1 (continued). Cultural adaptive capacity at Colonial National Historical Park, Virginia.

Resource/Factor	Physical-Natural	Physical-Technology	Organizational	Social	Economic	AC_ Sum	AC_ Bin	AC_ Rank	Comments
Jamestown Island Great Road Trace	1	3	3	3	3	13	3	High	–
Cultural Landscapes - Newtown Sub-area of Jamestown Island CL Natural Systems and Features same for all 4 areas Newtown, Jamestown, Neck of Land, Glass Point	2	2	2	2	2	10	2	Moderate	–
Cultural Landscapes - Newtown Sub-area of Jamestown Island CL Topography	1	1	1	1	1	5	1	Low	–
Cultural Landscapes - Newtown Sub-area of Jamestown Island CL Circulation	2	2	2	2	2	10	2	Moderate	–
Cultural Landscapes - Newtown Sub-area of Jamestown Island CL Spatial organization	1	1	1	1	1	5	1	Low	–
Cultural Landscapes - Newtown Sub-area of Jamestown Island CL Vegetation	2	2	3	2	3	12	2	Moderate	have the ability to replant, but will lose original material;
Cultural Landscapes - Newtown Sub-area of Jamestown Island CL Views and Vistas	3	3	3	3	3	15	3	High	–

Table C-1 (continued). Cultural adaptive capacity at Colonial National Historical Park, Virginia.

Resource/Factor	Physical-Natural	Physical-Technology	Organizational	Social	Economic	AC_ Sum	AC_ Bin	AC_ Rank	Comments
Cultural Landscapes - Newtown Sub-area of Jamestown Island CL Small Scale Features	3	3	3	3	3	15	3	High	–
Archaeological Sites of Social, Political, or Economic Significance to Tribes Composite Score	1	3	3	3	2	12	2	Moderate	reminiscent of Angelo Site
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	3	3	3	3	1	13	3	High	–
Natural Landscapes Retaining Non-developed Character	3	3	3	3	2	14	3	High	–
Floral and Faunal Species Specific Assessment	1	1	1	1	1	5	1	Low	–
M-L Woodland Camp; 17th c. Domestic	1	2	1	3	2	9	2	Moderate	partnerships with other organizations allows us to understand more sites, specific sites may have M–H adaptive capacity
Civil War earthwork	1	2	1	3	1	8	2	Moderate	−
Prehistoric Camp; E 17th c. Domestic	1	2	1	3	1	8	2	Moderate	–
Civil War Fort	1	2	1	3	1	8	2	Moderate	–
L Woodland Camp; 18th c Domestic; Civil War Fort	1	2	1	2	1	7	1	Low	–
L Woodland Camp (?); 17th-18th c. Domestic	1	2	1	2	1	7	1	Low	−

Table C-1 (continued). Cultural adaptive capacity at Colonial National Historical Park, Virginia.

Resource/Factor	Physical-Natural	Physical-Technology	Organizational	Social	Economic	AC_ Sum	AC_ Bin	AC_ Rank	Comments
L Woodland Camp/Farmstead; 17th c. Domestic	1	2	1	2	1	7	1	Low	–
Kingsmill "Island House"	1	2	1	3	1	8	2	Moderate	–
L Archaic Camp; 17th c Domestic; 18th-19th c Wharf	1	2	1	2	1	7	1	Low	–
Travis House	1	1	2	1	2	7	1	Low	–
JC-903	1	2	1	3	2	9	2	Moderate	903– small site, would be easy to mitigate, 65% of the site has already been lost; high priority site given erosion
JC-937	1	2	1	3	1	8	2	Moderate	–
Jamestown Island Seawall	1	3	3	3	3	13	3	High	If we lose the seawall, all of the other resources in the Newtown area will be threatened
Black Point Bridge	1	3	1	1	1	7	1	Low	Only significance is for tour road
Jamestown Island Area Cultural Landscape Boundary	1	1	1	1	1	5	1	Low	if you lose land, you lose that boundary, part of the landscape
Jamestown Island Area Cultural Landscape Natural Systems and Features	2	2	2	2	2	10	2	Moderate	–
Jamestown Island Area Cultural Landscape Spatial Organization	1	1	1	1	1	5	1	Low	based on sites and ruins, if these have to be moved, affects sense of place
Jamestown Island Area Cultural Landscape Land Use	2	2	2	2	2	10	2	Moderate	not a main contributing characteristic at this site, landuse and educational, can go on in the face of impacts

Table C-1 (continued). Cultural adaptive capacity at Colonial National Historical Park, Virginia.

Resource/Factor	Physical-Natural	Physical-Technology	Organizational	Social	Economic	AC_ Sum	AC_ Bin	AC_ Rank	Comments
Jamestown Island Area Cultural Landscape Topography	1	1	1	1	1	5	1	Low	cannot affect the topography
Jamestown Island Area Cultural Landscape Vegetation	2	2	2	2	2	10	2	Moderate	–
Jamestown Island Area Cultural Landscape Circulation	2	2	2	2	2	10	2	Moderate	–
Jamestown Island Area Cultural Landscape Buildings and Structures	2	2	2	2	2	10	2	Moderate	–
Jamestown Island Area Cultural Landscape Views and Vistas	3	3	3	3	3	15	3	High	Views are relatively easy to maintain
Jamestown Island Area Cultural Landscape Small-Scale Features	3	3	3	3	3	15	3	High	Small scale features can be moved
Jamestown Island Area Cultural Landscape Archeological Sites	1	1	1	1	1	5	1	Low	Overall: CL=Moderate
Collections Material	1	3	3	2	2	11	2	Moderate	Funding available in emergency situations, harder to get funding for other solutions—not a given
Collections Extended power outage	1	3	3	2	2	11	2	Moderate	−
Collections Location	1	3	3	2	2	11	2	Moderate	–

Table C-1 (continued). Cultural adaptive capacity at Colonial National Historical Park, Virginia.

Resource/Factor	Physical-Natural	Physical-Technology	Organizational	Social	Economic	AC_ Sum	AC_ Bin	AC_ Rank	Comments
Archaeological Sites of Social, Political, or Economic Significance Composite Score	1	2	2	3	1	9	2	Moderate	–
Collections Composite Score	1	3	3	2	2	11	2	Moderate	–
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	3	3	3	3	1	13	3	High	–
Natural Landscapes Retaining Non-developed Character	3	3	3	3	2	14	3	High	–
Floral and Faunal Species Specific Assessment	1	1	1	1	1	5	1	Low	–
L Archaic; M&L Woodland; 17th c. Domestic site	1	2	2	2	1	8	2	Moderate	The organizational capacity is higher in this area because of the prominence of these sites, higher visitation, more focus.
Glasshouse Ruins	1	2	2	2	1	8	2	Moderate	–
Glasshouse Monument	2	3	3	3	3	14	3	High	–
Glasshouse Ruins	1	3	3	3	3	13	3	High	–
Colonial Parkway - Isthmus Bridge	1	3	3	3	3	13	3	High	–
Powhatan Bridge	1	3	3	3	3	13	3	High	–
Cultural Landscapes: See Newtown or Jamestown	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A	–
Archaeological Sites of Social, Political, or Economic Significance Composite Score	1	2	2	3	1	9	2	Moderate	–

Table C-1 (continued). Cultural adaptive capacity at Colonial National Historical Park, Virginia.

Resource/Factor	Physical-Natural	Physical-Technology	Organizational	Social	Economic	AC_ Sum	AC_ Bin	AC_ Rank	Comments
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	3	3	3	3	1	13	3	High	–
Natural Landscapes Retaining Non-developed Character	3	3	3	3	2	14	3	High	–
Floral and Faunal Species Specific Assessment	1	1	1	1	1	5	1	Low	–
Late-17th/Early-18th c. Domestic site	1	2	2	2	1	8	2	Moderate	–
Cultural Landscapes See Newtown or Jamestown	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A	–
Archaeological Sites of Social, Political, or Economic Significance Composite Score	1	2	2	3	1	9	2	Moderate	–
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	3	3	3	3	1	13	3	High	–
Natural Landscapes Retaining Non-developed Character	3	3	3	3	2	14	3	High	–
Floral and Faunal Species Specific Assessment	1	1	1	1	1	5	1	Low	–
18th century domestic site, Colonial Pkwy Km 29	1	2	1	2	1	7	1	Low	–
19th century Civil War Earthwork, Colonial Pkwy Km 32	1	2	1	3	1	8	2	Moderate	Potential support from Civil War groups

Table C-1 (continued). Cultural adaptive capacity at Colonial National Historical Park, Virginia.

Resource/Factor	Physical-Natural	Physical-Technology	Organizational	Social	Economic	AC_ Sum	AC_ Bin	AC_ Rank	Comments
17th through 20th century domestic occupation, Colonial Pkwy Km 28	1	2	1	2	1	7	1	Low	–
Woodland domestic occupation, Colonial Pkwy Km 25	1	2	1	2	1	7	1	Low	–
Middle Woodland Domestic Occupation, Colonial Pkwy Km 25	1	2	1	2	1	7	1	Low	–
Park's Paper Mill	1	2	1	2	1	7	1	Low	–
Middle Woodland occupation and midden site	1	2	1	2	1	7	1	Low	–
18th century embanked enclosure	1	2	1	2	1	7	1	Low	–
Colonial Parkway Cultural Landscape boundary	1	1	1	1	1	5	1	Low	–
Archaeological Sites of Social, Political, or Economic Significance Composite Score	1	2	2	3	1	9	2	Moderate	–
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	3	3	3	3	1	13	3	High	–
Natural Landscapes Retaining Non-developed Character	3	3	3	3	2	14	3	High	–
Floral and Faunal Species Specific Assessment	1	1	1	1	1	5	1	Low	–

Table C-1 (continued). Cultural adaptive capacity at Colonial National Historical Park, Virginia.

Resource/Factor	Physical-Natural	Physical-Technology	Organizational	Social	Economic	AC_ Sum	AC_ Bin	AC_ Rank	Comments
Middle to Late Woodland scatter	1	2	1	2	1	7	1	Low	–
17th- & 18th-c. Plantation complex (Bellfield Plantation)	1	2	1	2	1	7	1	Low	–
Ringfield Plantation	1	2	1	3	1	8	2	Moderate	–
Kiskiak Village Site	1	2	3	3	1	10	2	Moderate	Any activity in Kiskiak Village would involve the regional office
redoubt 11 Civil War earthwork, Colonial Pkwy Km 16	1	2	1	3	1	8	2	Moderate	–
redoubt 14 Civil War earthwork	1	2	1	3	1	8	2	Moderate	–
Multi-component site Archaic, Woodland, and Historic Components, Colonial Pkwy Km 9-10 al Assemblage	1	2	1	2	1	7	1	Low	–
Archaeological Sites of Social, Political, or Economic Significance Composite Score	1	2	2	3	1	9	2	Moderate	–
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	3	3	3	3	1	13	3	High	–
Natural Landscapes Retaining Non-developed Character	3	3	3	3	2	14	3	High	–
Floral and Faunal Species Specific Assessment	1	1	1	1	1	5	1	Low	–

Table C-1 (continued). Cultural adaptive capacity at Colonial National Historical Park, Virginia.

Resource/Factor	Physical-Natural	Physical-Technology	Organizational	Social	Economic	AC_ Sum	AC_ Bin	AC_ Rank	Comments
Yorktown Waterfront Lot 108	1	2	1	2	1	7	1	Low	–
Yorktown Waterfront Lot 106	1	2	1	2	1	7	1	Low	–
Yorktown Waterfront Lot 105	1	2	1	2	1	7	1	Low	–
Yorktown Waterfront Lot 95	1	2	1	2	1	7	1	Low	–
Yorktown Waterfront Lot 94	1	2	1	2	1	7	1	Low	–
Yorktown Waterfront Lot 93	1	2	1	2	1	7	1	Low	–
Yorktown Waterfront Lot 92	1	2	1	2	1	7	1	Low	–
Yorktown Waterfront Lot 91	1	2	1	2	1	7	1	Low	–
Yorktown Waterfront Lot 90	1	2	1	2	1	7	1	Low	–
Yorktown Waterfront Lot 89	1	2	1	2	1	7	1	Low	–
Yorktown Waterfront Lot 88	1	2	1	2	1	7	1	Low	–
Yorktown Waterfront Lot 87	1	2	1	2	1	7	1	Low	–
Yorktown Waterfront Lot 86	1	2	1	2	1	7	1	Low	–
Late 17th-Early-18th-century domestic plantation sites	1	2	1	2	1	7	1	Low	–
Uniontown	1	2	1	2	1	7	1	Low	–
Cornwallis Cave	1	2	1	3	1	8	2	Moderate	–
Nelson House	1	2	1	3	1	8	2	Moderate	–
Cole Diggs House	1	2	1	2	2	8	2	Moderate	–
Swann Tavern	1	2	1	3	2	9	2	Moderate	–

Table C-1 (continued). Cultural adaptive capacity at Colonial National Historical Park, Virginia.

Resource/Factor	Physical-Natural	Physical-Technology	Organizational	Social	Economic	AC_ Sum	AC_ Bin	AC_ Rank	Comments
Archer Cottage	1	2	1	2	1	7	1	Low	Archer Cottage needs substantial documentation: HSR & HABS = HIGH PRIORITY!
Yorktown Cultural Landscape Boundary	1	1	1	1	1	5	1	Low	All CL scores that are not for Jamestown are borrowed from those overall scores that were given at WS#2
Yorktown Cultural Landscape Natural Systems and Features	2	2	2	2	2	10	2	Moderate	–
Yorktown Cultural Landscape Topography	1	1	1	1	1	5	1	Low	–
Yorktown Cultural Landscape Spatial Organization	1	1	1	1	1	5	1	Low	–
Cultural Landscapes Buildings and Structures	2	2	2	2	2	10	2	Moderate	–
Yorktown Cultural Landscape Circulation	2	2	2	2	2	10	2	Moderate	–
Yorktown Cultural Landscape Vegetation	2	2	2	2	2	10	2	Moderate	–
Yorktown Cultural Landscape Views and Vistas	3	3	3	3	3	15	3	High	–
Yorktown Cultural Landscape Small-Scale Features	3	3	3	3	3	15	3	High	–
Nelson House Cultural Landscape Boundary	1	1	1	1	1	5	1	Low	–

Table C-1 (continued). Cultural adaptive capacity at Colonial National Historical Park, Virginia.

Resource/Factor	Physical-Natural	Physical-Technology	Organizational	Social	Economic	AC_ Sum	AC_ Bin	AC_ Rank	Comments
Nelson House Cultural Landscape Spatial Organization	1	1	1	1	1	5	1	Low	–
Nelson House Cultural Landscape Vegetation	2	2	2	2	2	10	2	Moderate	–
Nelson House Cultural Landscape Circulation	2	2	2	2	2	10	2	Moderate	–
Nelson House Cultural Landscape Buildings and Structures	2	2	2	2	2	10	2	Moderate	–
Nelson House Cultural Landscape Views and Vistas	3	3	3	3	3	15	3	High	–
Nelson House Cultural Landscape Small Scale Features	3	3	3	3	3	15	3	High	–
Archaeological Sites of Social, Political, or Economic Significance Composite Score	1	2	2	3	1	9	2	Moderate	–
Collections Composite Score	1	3	3	2	2	11	2	Moderate	–
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	3	3	3	3	1	13	3	High	–
Natural Landscapes Retaining Non-developed Character	3	3	3	3	2	14	3	High	–
Floral and Faunal Species Specific Assessment	1	1	1	1	1	5	1	Low	–

Table C-1 (continued). Cultural adaptive capacity at Colonial National Historical Park, Virginia.

Resource/Factor	Physical-Natural	Physical-Technology	Organizational	Social	Economic	AC_ Sum	AC_ Bin	AC_ Rank	Comments
Middle Woodland Procurement Camp	1	2	1	2	1	7	2	Moderate	–
18th and 19th century military fortifications and earthworks	1	2	1	2	1	7	2	Moderate	–
redoubt 2 (Revolutionary War earthwork)	1	2	1	2	1	7	2	Moderate	–
Revolutionary War Encampments	1	2	1	2	1	7	2	Moderate	–
Mid-Second Siege Line, Revolutionary War Earthwork	1	2	1	2	1	7	2	Moderate	–
Connecting Trench Between 1st and 2nd Siege Parallels, Revolutionary War Earthwork	1	2	1	2	1	7	2	Moderate	–
American Hospital/Smith Plantation	1	2	1	2	1	7	2	Moderate	–
British redoubt	1	2	1	2	1	7	2	Moderate	–
Rochambeau's Headquarters/Nelson Family Plantation	1	2	2	3	1	9	2	Moderate	–
Adjunct General's Headquarters	1	2	1	2	1	7	2	Moderate	–
Washington's Headquarters / Meadowfield Plantation	1	2	2	3	1	9	2	Moderate	–
Von Stueben's Headquarters	1	2	2	3	1	9	2	Moderate	–

Table C-1 (continued). Cultural adaptive capacity at Colonial National Historical Park, Virginia.

Resource/Factor	Physical-Natural	Physical-Technology	Organizational	Social	Economic	AC_ Sum	AC_ Bin	AC_ Rank	Comments
Archaic / Woodland Site	1	2	1	2	1	7	2	Moderate	–
Surrender Field	1	2	1	2	1	7	2	Moderate	–
Multi-component site Early Woodland, 18th-century domestic	1	2	1	2	1	7	2	Moderate	–
Middle Woodland campsite	1	2	1	2	1	7	2	Moderate	–
Grand French Battery	1	2	1	2	1	7	2	Moderate	–
Yorktown Battlefield Cultural Landscape Boundary	1	1	1	1	1	5	1	Low	–
Moore House Cultural Landscape Boundary	1	1	1	1	1	5	1	Low	–
Moore House Cultural Landscape Spatial Organization	1	1	1	1	1	5	1	Low	–
Moore House Cultural Landscape Vegetation	2	2	2	2	2	10	2	Moderate	–
Moore House Cultural Landscape Circulation	2	2	2	2	2	10	2	Moderate	–
Moore House Cultural Landscape Buildings and Structures	2	2	2	2	2	10	2	Moderate	–
Washington's Headquarters / Meadowfield Plantation	1	2	2	3	1	9	2	Moderate	–
Von Stueben's Headquarters	1	2	2	3	1	9	2	Moderate	–
Archaic / Woodland Site	1	2	1	2	1	7	2	Moderate	–

Table C-1 (continued). Cultural adaptive capacity at Colonial National Historical Park, Virginia.

Resource/Factor	Physical-Natural	Physical-Technology	Organizational	Social	Economic	AC_ Sum	AC_ Bin	AC_ Rank	Comments
Surrender Field	1	2	1	2	1	7	2	Moderate	–
Multi-component site Early Woodland, 18th-century domestic	1	2	1	2	1	7	2	Moderate	–
Middle Woodland campsite	1	2	1	2	1	7	2	Moderate	–
Grand French Battery	1	2	1	2	1	7	2	Moderate	–
Yorktown Battlefield Cultural Landscape Boundary	1	1	1	1	1	5	1	Low	–
Moore House Cultural Landscape Boundary	1	1	1	1	1	5	1	Low	–
Moore House Cultural Landscape Spatial Organization	1	1	1	1	1	5	1	Low	–
Moore House Cultural Landscape Vegetation	2	2	2	2	2	10	2	Moderate	–
Moore House Cultural Landscape Circulation	2	2	2	2	2	10	2	Moderate	–
Moore House Cultural Landscape Buildings and Structures	2	2	2	2	2	10	2	Moderate	–
Moore House Cultural Landscape Views and Vistas	3	3	3	3	3	15	3	High	–
Moore House Cultural Landscape Small-Scale Features	3	3	3	3	3	15	3	High	–

Table C-1 (continued). Cultural adaptive capacity at Colonial National Historical Park, Virginia.

Resource/Factor	Physical-Natural	Physical-Technology	Organizational	Social	Economic	AC_ Sum	AC_ Bin	AC_ Rank	Comments
Archaeological Sites of Social, Political, or Economic Significance Composite Score	1	2	2	3	1	9	2	Moderate	–
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	3	3	3	3	1	13	3	High	–
Natural Landscapes Retaining Non-developed Character	3	3	3	3	2	14	3	High	–
Floral and Faunal Species Specific Assessment	1	1	1	1	1	5	1	Low	–
17th c. domestic site, possibly w/structure	1	2	1	2	1	7	1	Low	–
Mid- to Late-17th c. Domestic site (Berkeley Manor House and Ludwell-Lee House)	1	2	2	3	1	9	2	Moderate	–
17th- and/or 18th-c. plantation outbuilding (?)	1	2	1	2	1	7	1	Low	–
18th c. slave quarters (?)	1	2	2	3	1	9	2	Moderate	–
19th c. domestic site, w/ structure	1	2	1	2	1	7	1	Low	–
Green Spring manor house periphery	1	2	1	2	1	7	1	Low	–
17th and/or 18th c. brick kiln and borrow pit	1	2	1	2	1	7	1	Low	–
17th c. rice paddies (?)	1	2	1	2	1	7	1	Low	–

Table C-1 (continued). Cultural adaptive capacity at Colonial National Historical Park, Virginia.

Resource/Factor	Physical-Natural	Physical-Technology	Organizational	Social	Economic	AC_ Sum	AC_ Bin	AC_ Rank	Comments
Historic-period roadbed	1	2	1	2	1	7	1	Low	–
Late-18th/early-19th-c.(?) earthen mound	1	2	1	2	1	7	1	Low	–
Green Spring Cultural Landscape Boundary	1	1	1	1	1	5	1	Low	–
Green Spring Cultural Landscape Spatial Organization	1	1	1	1	1	5	1	Low	–
Green Spring Cultural Landscape Topography	1	1	1	1	1	5	1	Low	–
Green Spring Cultural Landscape Natural Systems and Features	2	2	2	2	2	10	2	Moderate	–
Green Spring Cultural Landscape Archeological Sites	1	1	1	1	1	5	1	Low	–
Archaeological Sites of Social, Political, or Economic Significance Composite Score	1	2	2	3	1	9	2	Moderate	–
Tidal and Non-Tidal Wetlands Including Marshes Composite Score	3	3	3	3	1	13	3	High	–
Natural Landscapes Retaining Non-developed Character	3	3	3	3	2	14	3	High	–
Floral and Faunal Species Specific Assessment	1	1	1	1	1	5	1	Low	–
Collections Material	1	3	3	2	2	11	3	High	–

Table C-1 (continued). Cultural adaptive capacity at Colonial National Historical Park, Virginia.

Resource/Factor	Physical-Natural	Physical-Technology	Organizational	Social	Economic	AC_ Sum	AC_ Bin	AC_ Rank	Comments
Collections Extended power outage	1	3	3	2	2	11	3	High	–
Collections Location	1	3	3	2	2	11	3	High	–

Appendix D. Natural Resources Vulnerability Assessment Data Set at Colonial National Historical Park.

Table D-1. Natural resources overall general vulnerability scoring at Colonial National Historical Park, Virginia.

Resource	Vulnerability Score*		
	2020	2050	2100
1. Forest Vegetation (UPLAND)	6	6	11
1. Jamestown Forest Vegetation (UPLAND)	12	16	18
1. Yorktown Forest Vegetation (UPLAND)	6	6	10
2a. Non-Tidal Riparian Forest	4	4	6
2a. Jamestown Non-Tidal Riparian Forest	2	4	6
2a. Yorktown Non-Tidal Riparian Forest	3	3	4
2b. Tidal Riparian Forest	16	16	19
2b. Yorktown Tidal Riparian Forest	7	7	13
3. Non-tidal Wetlands	6	6	7
3. Yorktown Non-tidal Wetlands	3	3	7
4. Tidal Wetlands (In General)	12	12	12
4a. Beaches	9	9	10
4b. Disturbed Tidal Hardwood Swamp	7	10	11
4b. Jamestown Disturbed Tidal Hardwood Swamp	10	10	11
4c. Salt Scrub	10	10	11
4d. Tidal Bald Cypress Forest / Woodland	6	8	9
4e. Tidal Freshwater Marsh	13	13	14
4f. Tidal Mesohaline and Polyhaline Marsh	8	8	9

*Exposure Sensitivity based on 0-28 (min<=5; Low 6-10; Moderate 11-14; High 15+)

Table D-1 (continued). Natural resources overall general vulnerability scoring at Colonial National Historical Park, Virginia.

Resource	Vulnerability Score*		
	2020	2050	2100
4g. Tidal Oligohaline Marsh	12	12	13
4g. Yorktown Tidal Oligohaline Marsh	2	2	5
4h. Tidal Shrub Swamp (Wax Myrtle Type)	9	9	14
4h. Yorktown Tidal Shrub Swamp (Wax Myrtle Type)	6	6	10
5. Herps (COASTAL) eg turtles water snakes	10	10	11
6. Herps (UPLAND)	5	5	6
7. Eagles	1	1	2
8. Marsh Birds	10	10	11
9. Bluffs (Yorktown)	8	8	11

*Exposure Sensitivity based on 0-28 (min<=5; Low 6-10; Moderate 11-14; High 15+)

Table D-2. Natural resources focal area scoring for Jamestown Island only, Colonial National Historical Park, Virginia.

Resource	Vulnerability Score*		
	2020	2050	2100
1. Jamestown Forest Vegetation (UPLAND)	12	16	18
2a. Jamestown Non-Tidal Riparian Forest	2	4	6
2.b Tidal Riparian Forest	16	16	19
3. Non-tidal Wetlands	6	6	7
4. Tidal Wetlands (In General)	12	12	12
4a. Beaches	9	9	10
4b. Jamestown Disturbed Tidal Hardwood Swamp	10	10	11
4c. Salt Scrub	10	10	11
4d. Tidal Bald Cypress Forest / Woodland (0-5 ppt)	6	8	9
4e. Tidal Freshwater Marsh (0 - 0.5 ppt)	13	13	14
4f. Tidal Mesohaline and Polyhaline Marsh (5-18 ppt)	8	8	9
4g. Tidal Oligohaline Marsh (0.5 - 5 ppt)	12	12	13
4h. Tidal Shrub Swamp (Wax Myrtle Type) (0 - oligohaline)	9	9	14
5. Herps (COASTAL) eg turtles water snakes	10	10	11
6. Herps (UPLAND)	5	5	6
7. Eagles	1	1	2
8. Marsh Birds	10	10	11
9. Bluffs (Yorktown)	8	8	11

*Exposure Sensitivity based on 0-28 (min<=5; Low 6-10; Moderate 11-14; High 15+)

Table D-3. Natural resources focal area scoring for Yorktown only, Colonial National Historical Park, Virginia.

Resource	Vulnerability Score*		
	2020	2050	2100
1. Yorktown Forest Vegetation (UPLAND)	6	6	10
2a. Yorktown Non-Tidal Riparian Forest	3	3	4
2b. Yorktown Tidal Riparian Forest	7	7	13
3. Yorktown Non-tidal Wetlands	3	3	7
4. Tidal Wetlands (In General)	12	12	12
4a. Beaches	9	9	10
4b. Disturbed Tidal Hardwood Swamp	7	10	11
4c. Salt Scrub	10	10	11
4d. Tidal Bald Cypress Forest / Woodland (0-5 ppt)	6	8	9
4e. Tidal Freshwater Marsh (0 - 0.5 ppt)	13	13	14
4f. Tidal Mesohaline and Polyhaline Marsh (5-18 ppt)	8	8	9
4g. Yorktown Tidal Oligohaline Marsh (0.5 - 5 ppt)	2	2	5
4h. Yorktown Tidal Shrub Swamp (Wax Myrtle Type) (0 - oligohaline)	6	6	10
5. Herps (COASTAL) eg turtles water snakes	10	10	11
6. Herps (UPLAND)	5	5	6
7. Eagles	1	1	2
8. Marsh Birds	10	10	11
9. Bluffs (Yorktown)	8	8	11

*Exposure Sensitivity based on 0-28 (min<=5; Low 6-10; Moderate 11-14; High 15+)

Table D-4. General natural resources vulnerability analysis: climate stressors 1-3, Colonial National Historical Park, Virginia.

Resource	Sea Level Rise (sea level rise projections above base)			Ground Water Change (geo- chemistry of ground water; ground water table levels)			Severe Storms And Flooding (surge zone from Category 3 storm; FEMA AE zone, historic flooding (same as facilities)		
	2020	2050	2100	2020	2050	2100	2020	2050	2100
1. Forest Vegetation (UPLAND)	0	0	0	0	0	3	3	3	3
2a. Non-Tidal Riparian Forest	0	0	0	0	0	1	1	1	1
2b. Tidal Riparian Forest	3	3	3	4	4	4	4	4	4
3. Non-tidal Wetlands	0	0	0	3	3	3	2	2	2
4. Tidal Wetlands (In General)	4	4	4	2	2	2	1	1	1
4a. Beaches	2	2	2	1	1	1	1	1	1
4b.Disturbed Tidal Hardwood Swamp	0	3	3	3	3	3	1	1	1
4c. Salt Scrub	2	2	2	2	2	2	1	1	1
4d. Tidal Bald Cypress Forest / Woodland	0	2	2	2	2	2	1	1	1
4e. Tidal Freshwater Marsh	4	4	4	3	3	3	1	1	1
4f. Tidal Mesohaline and Polyhaline Marsh	2	2	2	1	1	1	1	1	1
4g. Tidal Oligohaline Marsh	4	4	4	2	2	2	1	1	1
4h. Tidal Shrub Swamp (Wax Myrtle Type)	0	0	4	3	3	3	1	1	1
5. Herps (COASTAL)	2	2	2	1	1	1	1	1	1
6. Herps (UPLAND)	0	0	0	1	1	1	1	1	1
7. Eagles	0	0	0	0	0	0	0	0	0
8. Marsh Birds	4	4	4	1	1	1	1	1	1
9. Bluffs (Yorktown)	0	0	0	0	0	0	3	3	3

Table D-5. General natural resources vulnerability analysis: climate stressors 4-7, Colonial National Historical Park, Virginia.

Resource	Erosion (USGS Buffer from shoreline (same as facilities) FEMA V ZONE, COASTAL A ZONE)			Precipitation (peak daily rainfall, mean annual rainfall, days >2" of rainfall)			Drought (dry spell length)			Temperature (days below freezing, days greater than 95 degrees, mean daily high and low temperatures)		
	2020	2050	2100	2020	2050	2100	2020	2050	2100	2020	2050	2100
1. Forest Vegetation (UPLAND)	1	1	1	0	0	2	0	0	0	2	2	2
2a. Non-Tidal Riparian Forest	1	1	1	0	0	0	0	0	0	1	1	1
2b. Tidal Riparian Forest	4	4	4	0	0	3	0	0	0	1	1	1
3. Non-tidal Wetlands	0	0	0	0	0	1	0	0	0	1	1	1
4. Tidal Wetlands (In General)	4	4	4	0	0	0	0	0	0	1	1	1
4a. Beaches	4	4	4	0	0	1	0	0	0	1	1	1
4b.Disturbed Tidal Hardwood Swamp	2	2	2	0	0	1	0	0	0	1	1	1
4c. Salt Scrub	4	4	4	0	0	1	0	0	0	1	1	1
4d. Tidal Bald Cypress Forest / Woodland	2	2	2	0	0	1	0	0	0	1	1	1
4e. Tidal Freshwater Marsh	4	4	4	0	0	1	0	0	0	1	1	1
4f. Tidal Mesohaline and Polyhaline Marsh	3	3	3	0	0	1	0	0	0	1	1	1
4g. Tidal Oligohaline Marsh	4	4	4	0	0	1	0	0	0	1	1	1
4h. Tidal Shrub Swamp (Wax Myrtle Type)	4	4	4	0	0	1	0	0	0	1	1	1
5. Herps (COASTAL)	3	3	3	0	0	1	0	0	0	3	3	3
6. Herps (UPLAND)	0	0	0	0	0	1	0	0	0	3	3	3
7. Eagles	0	0	0	0	0	1	0	0	0	1	1	1
8. Marsh Birds	3	3	3	0	0	1	0	0	0	1	1	1
9. Bluffs (Yorktown)	4	4	4	0	0	3	0	0	0	1	1	1

Table D-6. General natural resources exposure to climate stressors 1-3, Colonial National Historical Park, Virginia.

	Sea Level Rise (sea level rise projections above base)			Ground Water Change (geo- chemistry of ground water; ground water table levels)			Severe Storms And Flooding (surge zone from Category 3 storm; FEMA AE zone, historic flooding (same as facilities))		
Resource	**2020**	**2050**	**2100**	**2020**	**2050**	**2100**	**2020**	**2050**	**2100**
1. Forest Vegetation (UPLAND)	N	N	N	N	N	Y	Y	Y	Y
2a. Non-Tidal Riparian Forest	N	N	N	N	N	Y	Y	Y	Y
2b. Tidal Riparian Forest	Y	Y	Y	Y	Y	Y	Y	Y	Y
3. Non-tidal Wetlands	N	N	N	Y	Y	Y	Y	Y	Y
4. Tidal Wetlands (In General)	Y	Y	Y	Y	Y	Y	Y	Y	Y
4a. Beaches	Y	Y	Y	Y	Y	Y	Y	Y	Y
4b.Disturbed Tidal Hardwood Swamp	N	Y	Y	Y	Y	Y	Y	Y	Y
4c. Salt Scrub	Y	Y	Y	Y	Y	Y	Y	Y	Y
4d. Tidal Bald Cypress Forest / Woodland	N	Y	Y	Y	Y	Y	Y	Y	Y
4e. Tidal Freshwater Marsh	Y	Y	Y	Y	Y	Y	Y	Y	Y
4f. Tidal Mesohaline and Polyhaline Marsh	Y	Y	Y	Y	Y	Y	Y	Y	Y
4g. Tidal Oligohaline Marsh	Y	Y	Y	Y	Y	Y	Y	Y	Y
4h. Tidal Shrub Swamp (Wax Myrtle Type)	N	N	Y	Y	Y	Y	Y	Y	Y
5. Herps (COASTAL)	Y	Y	Y	Y	Y	Y	Y	Y	Y
6. Herps (UPLAND)	N	N	N	Y	Y	Y	Y	Y	Y
7. Eagles	N	N	N	N	N	N	N	N	N
8. Marsh Birds	Y	Y	Y	Y	Y	Y	Y	Y	Y
9. Bluffs (Yorktown)	N	N	N	N	N	N	Y	Y	Y

Table D-7. General Natural Resources Exposure to Climate Stressors 4-7, Colonial National Historical Park, Virginia.

	Erosion (USGS Buffer from shoreline (same as facilities) FEMA V ZONE, COASTAL A ZONE)			Precipitation (peak daily rainfall, mean annual rainfall, days >2" of rainfall)			Drought (dry spell length)			Temperature (days below freezing, days greater than 95 degrees, mean daily high and low temperatures)		
Resource	**2020**	**2050**	**2100**	**2020**	**2050**	**2100**	**2020**	**2050**	**2100**	**2020**	**2050**	**2100**
1. Forest Vegetation (UPLAND)	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
2a. Non-Tidal Riparian Forest	Y	Y	Y	N	N	N	N	N	N	Y	Y	Y
2b. Tidal Riparian Forest	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
3. Non-tidal Wetlands	N	N	N	N	N	Y	N	N	N	Y	Y	Y
4. Tidal Wetlands (In General)	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4a. Beaches	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4b.Disturbed Tidal Hardwood Swamp	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4c. Salt Scrub	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4d. Tidal Bald Cypress Forest / Woodland	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4e. Tidal Freshwater Marsh	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4f. Tidal Mesohaline and Polyhaline Marsh	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4g. Tidal Oligohaline Marsh	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4h. Tidal Shrub Swamp (Wax Myrtle Type)	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
5. Herps (COASTAL)	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
6. Herps (UPLAND)	N	N	N	N	N	Y	N	N	N	Y	Y	Y
7. Eagles	N	N	N	N	N	Y	N	N	N	Y	Y	Y
8. Marsh Birds	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
9. Bluffs (Yorktown)	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y

Table D-8. General natural resources sensitivity to climate stressors 1-3, Colonial National Historical Park, Virginia.1-4 = minimal or benefit, low, moderate, high.

Resource	Sea Level Rise (sea level rise projections above base)			Ground Water Change (geo- chemistry of ground water; ground water table levels)			Severe Storms and Flooding (surge zone from Category 3 storm; FEMA AE zone, historic flooding (same as facilities))		
	Score	**Why**	**Result**	**Score**	**Why**	**Result**	**Score**	**Why**	**Result**
1. Forest Vegetation (UPLAND)	4	salt water intrusion and inundation	dieback	3	root system, depth to groundwater	dieback, disease	3	intense wind	blown over trees, dieback
2a. Non-Tidal Riparian Forest	1	inundation	change of species composition	2	ability to migrate	species composition change	1	–	change in species composition
2b. Tidal Riparian Forest	3	salt water intrusion, inundation	dieback	4	saltwater intrusion,root system, depth to groundwater	dieback, disease	4	wind and wave overwash	blown over trees, dieback
3. Non-tidal Wetlands	4	salt water intrusion, inundation	change of species composition	3	ability to migrate, salt water intrusion	species composition change	2	flooding with salt water	change in species composition
4. Tidal Wetlands (In General)	4	salt water intrusion, inundation, ability to migrate	change in species composition, conversion to mudflat	2	salinity	–	1	resilient to short duration events	N/A
4a. Beaches	2	sediment supply, migration space	loss of beach	1	N/A	N/A	1	dynamic	loss of beach

Table D-8 (continued). General natural resources sensitivity to climate stressors 1-3, Colonial National Historical Park, Virginia.1-4 = minimal or benefit, low, moderate, high.

Resource	Sea Level Rise (sea level rise projections above base)			Ground Water Change (geo- chemistry of ground water; ground water table levels)			Severe Storms and Flooding (surge zone from Category 3 storm; FEMA AE zone, historic flooding (same as facilities))		
	Score	**Why**	**Result**	**Score**	**Why**	**Result**	**Score**	**Why**	**Result**
4b.Disturbed Tidal Hardwood Swamp	3	salt water intrusion , inundation	dead trees, dieback	3	salt water intrusion, inundation, root adaptation	dead trees, dieback	1	resilient to short duration events	N/A
4c. Salt Scrub	2	inundation, ability to migrate	dieback,	2	salt tolerant but sensitive to inundation, some ability to migrate	change in species composition, dieback	1	resilient to short duration events	N/A
4d. Tidal Bald Cypress Forest / Woodland	2	salt water intrusion ,	dieback	2	salt water intrusion	dieback	1	resilient to short duration events	N/A
4e. Tidal Freshwater Marsh	4	salt water intrusion, inundation, ability to migrate	change in species composition, conversion to mudflat	3	salt water intrusion	change in species composition	1	resilient to short duration events	N/A
4f. Tidal Mesohaline and Polyhaline Marsh	2	inundation, ability to migrate	loss of wetlands, conversion to mudflat	1	N/A	N/A	1	resilient to short duration events	N/A
4g. Tidal Oligohaline Marsh	4	salt water intrusion, inundation, ability to migrate	change in species composition, conversion to mudflat	2	salt water intrusion	change species composition	1	resilient to short duration events	N/A

Table D-8 (continued). General natural resources sensitivity to climate stressors 1-3, Colonial National Historical Park, Virginia.1-4 = minimal or benefit, low, moderate, high.

Resource	Sea Level Rise (sea level rise projections above base)			Ground Water Change (geo- chemistry of ground water; ground water table levels)			Severe Storms and Flooding (surge zone from Category 3 storm; FEMA AE zone, historic flooding (same as facilities))		
	Score	**Why**	**Result**	**Score**	**Why**	**Result**	**Score**	**Why**	**Result**
4h. Tidal Shrub Swamp (Wax Myrtle Type)	4	salt water intrusion, inundation, ability to migrate	change in species composition, conversion to marsh	3	salt water intrusion	change in species composition	1	resilient to short duration events	N/A
5. Herps (COASTAL)	2	loss of habitat, ability to migrate	loss in species population	1	little groundwater interaction	–	1	resilient	nest loss
6. Herps (UPLAND)	2	loss of habitat, ability to migrate	loss in species population	1	increased ponding	–	1	resilient	increased habitat
7. Eagles	1	loss of habitat, ability to migrate	loss in species population	1	–	–	2	wind, downed trees	nest loss, fledgling mortality
8. Marsh Birds	4	loss of habitat, ability to migrate	loss in species population	1	–	–	1	resilient	nest loss
9. Bluffs (Yorktown)	1	destabilization	loss of feature	2	event scale change in ground water	instability	3	surface water impact on feature	loss or migration of feature

Table D-9. General natural resources sensitivity to climate stressors 4-7, Colonial National Historical Park, Virginia. 1-4 = minimal or benefit, low, moderate, high.

	Erosion (USGS Buffer from shoreline (same as facilities) FEMA V ZONE, COASTAL A ZONE)			Precipitation (peak daily rainfall, mean annual rainfall, days >2" of rainfall)			Drought (dry spell length)			Temperature (days below freezing, days greater than 95 degrees, mean daily high and low temperatures)		
Resource	**Score**	**Why**	**Result**	**Score**	**Why**	**Result**	**Score**	**Why**	**Result**	**Score**	**Why**	**Result**
1. Forest Vegetation (UPLAND)	1	protected location	bluff edge tree loss	2	heavy rain events, soil saturation	preconditioning of trees to overturn	3	species dependent	stress in trees	2	in the future, pest species specific to the Red Bay	dead shrub
2a. Non-Tidal Riparian Forest	2	–	–	2	–	–	2	–	–	1		–
2b. Tidal Riparian Forest	4	wind and wave action, overwash	undercut, dieback	3	heavy rain events	upturned trees, bank flooding	4	species dependent	stress in trees	1	middle of range, emerging pests	N/A
3. Non-tidal Wetlands	3	sediment supply, wave action	conversion to mudflat	1	expands fresh water zone	increase in extent	4	water loss, hydro–obligates	dieback, species shift	1	middle of range	N/A
4. Tidal Wetlands (In General)	4	location, susceptible root structure,	a scarp	0	0	0	1	–	–	1	middle of range	N/A
4a. Beaches	4	absence of dunes, sediment supply, migration	loss of beach	1	N/A	N/A	1	–	–	1	N/A	N/A
4b.Disturbed Tidal Hardwood Swamp	2	protected location	intrusion of other species	1	expands fresh water zone, reduced salt water intrusion	maintenance of extent	3	salinity tolerance	stress	1	middle of range	N/A
4c. Salt Scrub	4	location, susceptible root structure	a scarp	1	–	–	1	–	–	1	middle of range	N/A

Table D-9 (continued). General natural resources sensitivity to climate stressors 4-7, Colonial National Historical Park, Virginia. 1-4 = minimal or benefit, low, moderate, high.

	Erosion (USGS Buffer from shoreline (same as facilities) FEMA V ZONE, COASTAL A ZONE)			Precipitation (peak daily rainfall, mean annual rainfall, days >2" of rainfall)			Drought (dry spell length)			Temperature (days below freezing, days greater than 95 degrees, mean daily high and low temperatures)		
Resource	**Score**	**Why**	**Result**	**Score**	**Why**	**Result**	**Score**	**Why**	**Result**	**Score**	**Why**	**Result**
4d. Tidal Bald Cypress Forest / Woodland	2	strong root structure	dead trees	1	–	–	1	–	–	1	middle of range	N/A
4e. Tidal Freshwater Marsh	4	location, susceptible root structure,	a scarp	1	expands fresh water zone, reduced salt water intrusion	maintenance of extent	3	salinity tolerance	change in species	1	middle of range	N/A
4f. Tidal Mesohaline and Polyhaline Marsh	3	moderate root structure	a scarp	1	–	–	1	–	–	1	middle of range	N/A
4g. Tidal Oligohaline Marsh	4	location, susceptible root structure,	a scarp	1	–	–	1	–	–	1	middle of range	N/A
4h. Tidal Shrub Swamp (Wax Myrtle Type)	4	location, susceptible root structure,	a scarp	1	–	–	2	salinity tolerance, groundwater fed	stress	1	middle of range	N/A
5. Herps (COASTAL)	3	terrapins are habitat specific	habitat loss	1	–	–	1	–	–	3	egg sex determination	low birth rate, change in species composition
6. Herps (UPLAND)	2	can migrate	habitat loss	1	good for eggs, ground cover moist	population boost	3	vegetation, water needs	stress	3	edge of range	change in species composition

Table D-9 (continued). General natural resources sensitivity to climate stressors 4-7, Colonial National Historical Park, Virginia. 1-4 = minimal or benefit, low, moderate, high.

	Erosion (USGS Buffer from shoreline (same as facilities) FEMA V ZONE, COASTAL A ZONE)			Precipitation (peak daily rainfall, mean annual rainfall, days >2" of rainfall)			Drought (dry spell length)			Temperature (days below freezing, days greater than 95 degrees, mean daily high and low temperatures)		
Resource	**Score**	**Why**	**Result**	**Score**	**Why**	**Result**	**Score**	**Why**	**Result**	**Score**	**Why**	**Result**
7. Eagles	1	downed tree	nest loss, fledgling mortality	1	–	–	1	–	–	1	N/A	N/A
8. Marsh Birds	3	are habitat specific	habitat loss	1	–	–	1	–	–	1	middle of range	N/A
9. Bluffs (Yorktown)	4	undermine feature at toe due to wave action	slumping, undercut	3	event scale change in surface water run	instability	1	–	–	1	N/A	N/A

Table D-10. Jamestown Natural Resources Vulnerability Analysis: Climate Stressors 1-3, Colonial National Historical Park, Virginia.

	Sea Level Rise (sea level rise projections above base)			Ground Water Change (geo-chemistry of ground water; ground water table levels)			Severe Storms and Flooding (surge zone from Category 3 storm; FEMA AE zone, historic flooding (same as facilities))		
Resource	**2020**	**2050**	**2100**	**2020**	**2050**	**2100**	**2020**	**2050**	**2100**
1. Jamestown Forest Vegetation (UPLAND)	0	4	4	4	4	4	3	3	3
2a. Jamestown Non-Tidal Riparian Forest	0	0	0	0	2	2	1	1	1
2b. Tidal Riparian Forest	3	3	3	4	4	4	4	4	4
3. Non-tidal wetlands	0	0	0	3	3	3	2	2	2
4. Tidal Wetlands (In General)	4	4	4	2	2	2	1	1	1
4a. Beaches	2	2	2	1	1	1	1	1	1
4b. Jamestown Disturbed Tidal Hardwood Swamp	3	3	3	3	3	3	1	1	1
4c. Salt Scrub	2	2	2	2	2	2	1	1	1
4d. Tidal Bald Cypress Forest / Woodland	0	2	2	2	2	2	1	1	1
4e. Tidal Freshwater Marsh	4	4	4	3	3	3	1	1	1
4f. Tidal Mesohaline and Polyhaline Marsh	2	2	2	1	1	1	1	1	1
4g. Tidal Oligohaline Marsh	4	4	4	2	2	2	1	1	1
4h. Tidal Shrub Swamp (Wax Myrtle Type)	0	0	4	3	3	3	1	1	1
5. Herps (COASTAL)	2	2	2	1	1	1	1	1	1
6. Herps (UPLAND)	0	0	0	1	1	1	1	1	1
7. Eagles	0	0	0	0	0	0	0	0	0
8. Marsh Birds	4	4	4	1	1	1	1	1	1
9. Bluffs (Yorktown)	0	0	0	0	0	0	3	3	3

Table D-11. Jamestown Natural Resources Vulnerability Analysis: Climate Stressors 4-7, Colonial National Historical Park, Virginia.

Resource	Erosion (USGS Buffer from shoreline (same as facilities) FEMA V ZONE, COASTAL A ZONE)			Precipitation (peak daily rainfall, mean annual rainfall, days >2" of rainfall)			Drought (dry spell length)			Temperature (days below freezing, days greater than 95 degrees, mean daily high and low temperatures)		
	2020	2050	2100	2020	2050	2100	2020	2050	2100	2020	2050	2100
1. Jamestown Forest Vegetation (UPLAND)	3	3	3	0	0	2	0	0	0	2	2	2
2a. Jamestown Non-Tidal Riparian Forest	0	0	2	0	0	0	0	0	0	1	1	1
2b. Tidal Riparian Forest	4	4	4	0	0	3	0	0	0	1	1	1
3. Non-tidal Wetlands	0	0	0	0	0	1	0	0	0	1	1	1
4. Tidal Wetlands (In General)	4	4	4	0	0	0	0	0	0	1	1	1
4a. Beaches	4	4	4	0	0	1	0	0	0	1	1	1
4b. Jamestown Disturbed Tidal Hardwood Swamp	2	2	2	0	0	1	0	0	0	1	1	1
4c. Salt Scrub	4	4	4	0	0	1	0	0	0	1	1	1
4d. Tidal Bald Cypress Forest / Woodland	2	2	2	0	0	1	0	0	0	1	1	1
4e. Tidal Freshwater Marsh	4	4	4	0	0	1	0	0	0	1	1	1
4f. Tidal Mesohaline and Polyhaline Marsh	3	3	3	0	0	1	0	0	0	1	1	1
4g. Tidal Oligohaline Marsh	4	4	4	0	0	1	0	0	0	1	1	1
4h. Tidal Shrub Swamp (Wax Myrtle Type)	4	4	4	0	0	1	0	0	0	1	1	1
5. Herps (COASTAL)	3	3	3	0	0	1	0	0	0	3	3	3
6. Herps (UPLAND)	0	0	0	0	0	1	0	0	0	3	3	3
7. Eagles	0	0	0	0	0	1	0	0	0	1	1	1
8. Marsh Birds	3	3	3	0	0	1	0	0	0	1	1	1
9. Bluffs (Yorktown)	4	4	4	0	0	3	0	0	0	1	1	1

Table D-12. Jamestown Natural Resources Exposure to Climate Stressors 1-3, Colonial National Historical Park, Virginia.

	Sea Level Rise (sea level rise projections above base)			Ground Water Change (geo-chemistry of ground water; ground water table levels)			Severe Storms and Flooding (surge zone from Category 3 storm; FEMA AE zone, historic flooding (same as facilities))		
Resource	**2020**	**2050**	**2100**	**2020**	**2050**	**2100**	**2020**	**2050**	**2100**
1. Jamestown Forest Vegetation (UPLAND)	N	Y	Y	Y	Y	Y	Y	Y	Y
2a. Jamestown Non-Tidal Riparian Forest	N	N	N	N	Y	Y	Y	Y	Y
2b. Tidal Riparian Forest	Y	Y	Y	Y	Y	Y	Y	Y	Y
3. Non-tidal Wetlands	N	N	N	Y	Y	Y	Y	Y	Y
4. Tidal Wetlands (In General)	Y	Y	Y	Y	Y	Y	Y	Y	Y
4a. Beaches	Y	Y	Y	Y	Y	Y	Y	Y	Y
4b. Jamestown Disturbed Tidal Hardwood Swamp	y	Y	Y	Y	Y	Y	Y	Y	Y
4c. Salt Scrub	Y	Y	Y	Y	Y	Y	Y	Y	Y
4d. Tidal Bald Cypress Forest / Woodland	N	Y	Y	Y	Y	Y	Y	Y	Y
4e. Tidal Freshwater Marsh	Y	Y	Y	Y	Y	Y	Y	Y	Y
4f. Tidal Mesohaline and Polyhaline Marsh	Y	Y	Y	Y	Y	Y	Y	Y	Y
4g. Tidal Oligohaline Marsh	Y	Y	Y	Y	Y	Y	Y	Y	Y
4h. Tidal Shrub Swamp (Wax Myrtle Type)	N	N	Y	Y	Y	Y	Y	Y	Y
5. Herps (COASTAL)	Y	Y	Y	Y	Y	Y	Y	Y	Y
6. Herps (UPLAND)	N	N	N	Y	Y	Y	Y	Y	Y
7. Eagles	N	N	N	N	N	N	N	N	N
8. Marsh Birds	Y	Y	Y	Y	Y	Y	Y	Y	Y
9. Bluffs (Yorktown)	N	N	N	N	N	N	Y	Y	Y

Table D-13. Jamestown Natural Resources Exposure to Climate Stressors 4-7, Colonial National Historical Park, Virginia.

	Erosion (USGS Buffer from shoreline (same as facilities) FEMA V ZONE, COASTAL A ZONE)			Precipitation (peak daily rainfall, mean annual rainfall, days >2" of rainfall)			Drought (dry spell length)			Temperature (days below freezing, days greater than 95 degrees, mean daily high and low temperatures)		
Resource	**2020**	**2050**	**2100**	**2020**	**2050**	**2100**	**2020**	**2050**	**2100**	**2020**	**2050**	**2100**
1. Jamestown Forest Vegetation (UPLAND)	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
2a. Jamestown Non-Tidal Riparian Forest	N	N	Y	N	N	N	N	N	N	Y	Y	Y
2b. Tidal Riparian Forest	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
3. Non-tidal Wetlands	N	N	N	N	N	Y	N	N	N	Y	Y	Y
4. Tidal Wetlands (In General)	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4a. Beaches	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4b. Jamestown Disturbed Tidal Hardwood Swamp	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4c. Salt Scrub	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4d. Tidal Bald Cypress Forest / Woodland	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4e. Tidal Freshwater Marsh	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4f. Tidal Mesohaline and Polyhaline Marsh	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4g. Tidal Oligohaline Marsh	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4h. Tidal Shrub Swamp (Wax Myrtle Type)	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
5. Herps (COASTAL)	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
6. Herps (UPLAND)	N	N	N	N	N	Y	N	N	N	Y	Y	Y
7. Eagles	N	N	N	N	N	Y	N	N	N	Y	Y	Y
8. Marsh Birds	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
9. Bluffs (Yorktown)	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y

Table D-14. Jamestown natural resources sensitivity to climate stressors 1-3, Colonial National Historical Park, Virginia. 1-4 = minimal or benefit, low, moderate, high.

Resource	Sea Level Rise (sea level rise projections above base)			Ground Water Change (geo- chemistry of ground water; ground water table levels)			Severe Storms and Flooding (surge zone from Category 3 storm; FEMA AE zone, historic flooding (same as facilities))		
	Score	**Why**	**Result**	**Score**	**Why**	**Result**	**Score**	**Why**	**Result**
1. Forest Vegetation (UPLAND)	4	salt water intrusion and inundation	dieback	4	root system, depth to groundwater	dieback, disease	3	intense wind	blown over trees, dieback
2a. Non-Tidal Riparian Forest	1	inundation	change of species composition	2	ability to migrate	species composition change	1	–	change in species composition
2b. Tidal Riparian Forest	3	salt water intrusion, inundation	dieback	4	saltwater intrusion, root system, depth to groundwater	dieback, disease	4	wind and wave overwash	blown over trees, dieback
3. Non-tidal Wetlands	4	salt water intrusion, inundation	change of species composition	3	ability to migrate, salt water intrusion	species composition change	2	flooding with salt water	change in species composition
4. Tidal Wetlands (In General)	4	salt water intrusion, inundation, ability to migrate	change in species composition, conversion to mudflat	2	salinity	–	1	resilient to short duration events	N/A
4a. Beaches	2	sediment supply, migration space	loss of beach	1	N/A	N/A	1	dynamic	loss of beach

Table D-14 (continued). Jamestown natural resources sensitivity to climate stressors 1-3, Colonial National Historical Park, Virginia. 1-4 = minimal or benefit, low, moderate, high.

Resource	Sea Level Rise (sea level rise projections above base)			Ground Water Change (geo- chemistry of ground water; ground water table levels)			Severe Storms and Flooding (surge zone from Category 3 storm; FEMA AE zone, historic flooding (same as facilities))		
	Score	**Why**	**Result**	**Score**	**Why**	**Result**	**Score**	**Why**	**Result**
4b.Disturbed Tidal Hardwood Swamp	3	salt water intrusion, inundation	dead trees, dieback	3	salt water intrusion , inundation, root adaptation	dead trees, dieback	1	resilient to short duration events	N/A
4c. Salt Scrub	2	inundation, ability to migrate	dieback	2	salt tolerant but sensitive to inundation, some ability to migrate	change in species composition, dieback	1	resilient to short duration events	N/A
4d. Tidal Bald Cypress Forest / Woodland	2	salt water intrusion	dieback	2	salt water intrusion	dieback	1	resilient to short duration events	N/A
4e. Tidal Freshwater Marsh	4	salt water intrusion, inundation, ability to migrate	change in species composition, conversion to mudflat	3	salt water intrusion	change in species composition	1	resilient to short duration events	N/A
4f. Tidal Mesohaline and Polyhaline Marsh	2	inundation, ability to migrate	loss of wetlands, conversion to mudflat	1	N/A	N/A	1	resilient to short duration events	N/A
4g. Tidal Oligohaline Marsh	4	salt water intrusion, inundation, ability to migrate	change in species composition, conversion to mudflat	2	salt water intrusion	change species composition	1	resilient to short duration events	N/A

Table D-14 (continued). Jamestown natural resources sensitivity to climate stressors 1-3, Colonial National Historical Park, Virginia. 1-4 = minimal or benefit, low, moderate, high.

Resource	Sea Level Rise (sea level rise projections above base)			Ground Water Change (geo- chemistry of ground water; ground water table levels)			Severe Storms and Flooding (surge zone from Category 3 storm; FEMA AE zone, historic flooding (same as facilities))		
	Score	**Why**	**Result**	**Score**	**Why**	**Result**	**Score**	**Why**	**Result**
4h. Tidal Shrub Swamp (Wax Myrtle Type)	4	salt water intrusion, inundation, ability to migrate	change in species composition, conversion to marsh	3	salt water intrusion	change in species composition	1	resilient to short duration events	N/A
5. Herps (COASTAL)	2	loss of habitat, ability to migrate	loss in species population	1	little groundwater interaction	–	1	resilient	nest loss
6. Herps (UPLAND)	2	loss of habitat, ability to migrate	loss in species population	1	increased ponding	–	1	resilient	increased habitat
7. Eagles	1	loss of habitat, ability to migrate	loss in species population	1	–	–	2	wind, downed trees	nest loss, fledgling mortality
8. Marsh Birds	4	loss of habitat, ability to migrate	loss in species population	1	–	–	1	resilient	nest loss
9. Bluffs (Yorktown)	1	destabilization	loss of feature	2	event scale change in ground water	instability	3	surface water impact on feature	loss or migration of feature

Table D-15. Jamestown Natural Resources Sensitivity to Climate Stressors 4-7, Colonial National Historical Park, Virginia. 1-4 = minimal or benefit, low, moderate, high.

Resource	Erosion (USGS Buffer from shoreline (same as facilities) FEMA V ZONE, COASTAL A ZONE)			Precipitation (peak daily rainfall, mean annual rainfall, days >2" of rainfall)			Drought (dry spell length)			Temperature (days below freezing, days greater than 95 degrees, mean daily high and low temperatures)		
	Score	**Why**	**Result**	**Score**	**Why**	**Result**	**Score**	**Why**	**Result**	**Score**	**Why**	**Result**
1. Forest Vegetation (UPLAND)	3	protected location	bluff edge tree loss	2	heavy rain events, soil saturation	preconditioning of trees to overturn	3	species dependent	stress in trees	2	in the future, pest species specific to the Red Bay	dead shrub
2a. Non-Tidal Riparian Forest	2	–	–	2	–	–	2	–	–	1	–	–
2b. Tidal Riparian Forest	4	wind and wave action, overwash	undercut, dieback	3	heavy rain events	upturned trees, bank flooding	4	species dependent	stress in trees	1	middle of range, emerging pests	N/A
3. Non-tidal Wetlands	3	sediment supply, wave action	conversion to mudflat	1	expands fresh water zone	increase in extent	4	water loss, hydro–obligates	dieback, species shift	1	middle of range	N/A
4. Tidal Wetlands (In General)	4	location, susceptible root structure,	a scarp	0	0	0	1	–	–	1	middle of range	N/A
4a. Beaches	4	absence of dunes, sediment supply, migration	loss of beach	1	N/A	N/A	1	–		1	N/A	N/A
4b.Disturbed Tidal Hardwood Swamp	2	protected location	intrusion of other species	1	expands fresh water zone, reduced salt water intrusion	maintenance of extent	3	salinity tolerance	stress	1	middle of range	N/A
4c. Salt Scrub	4	location, susceptible root structure	a scarp	1	–	–	1	–	–	1	middle of range	N/A

Table D-15 (continued). Jamestown Natural Resources Sensitivity to Climate Stressors 4-7, Colonial National Historical Park, Virginia. 1-4 = minimal or benefit, low, moderate, high.

Resource	Erosion (USGS Buffer from shoreline (same as facilities) FEMA V ZONE, COASTAL A ZONE)			Precipitation (peak daily rainfall, mean annual rainfall, days >2" of rainfall)			Drought (dry spell length)			Temperature (days below freezing, days greater than 95 degrees, mean daily high and low temperatures)		
	Score	Why	Result	Score	Why	Result	Score	Why	Result	Score	Why	Result
4d. Tidal Bald Cypress Forest / Woodland	2	strong root structure	dead trees	1	–	–	1	–	–	1	middle of range	N/A
4e. Tidal Freshwater Marsh	4	location, susceptible root structure,	a scarp	1	expands fresh water zone, reduced salt water intrusion	maintenance of extent	3	salinity tolerance	change in species	1	middle of range	N/A
4f. Tidal Mesohaline and Polyhaline Marsh	3	moderate root structure	a scarp	1	–	–	1	–	–	1	middle of range	N/A
4g. Tidal Oligohaline Marsh	4	location, susceptible root structure,	a scarp	1	–	–	1	–	–	1	middle of range	N/A
4h. Tidal Shrub Swamp (Wax Myrtle Type)	4	location, susceptible root structure,	a scarp	1	–	–	2	salinity tolerance, groundwater fed	stress	1	middle of range	N/A
5. Herps (COASTAL)	3	terrapins are habitat specific	habitat loss	1	–	–	1	–	–	3	egg sex determination	low birth rate, change in species composition
6. Herps (UPLAND)	2	can migrate	habitat loss	1	good for eggs, ground cover moist	population boost	3	vegetation, water needs	stress,	3	edge of range	change in species composition

Table D-15 (continued). Jamestown Natural Resources Sensitivity to Climate Stressors 4-7, Colonial National Historical Park, Virginia. 1-4 = minimal or benefit, low, moderate, high.

Resource	Erosion (USGS Buffer from shoreline (same as facilities) FEMA V ZONE, COASTAL A ZONE)			Precipitation (peak daily rainfall, mean annual rainfall, days >2" of rainfall)			Drought (dry spell length)			Temperature (days below freezing, days greater than 95 degrees, mean daily high and low temperatures)		
	Score	**Why**	**Result**	**Score**	**Why**	**Result**	**Score**	**Why**	**Result**	**Score**	**Why**	**Result**
7. Eagles	1	downed tree	nest loss, fledgling mortality	1	–	–	1	–	–	1	N/A	N/A
8. Marsh Birds	3	are habitat specific	habitat loss	1	–	–	1	–	–	1	middle of range	N/A
9. Bluffs (Yorktown)	4	undermine feature at toe due to wave action	slumping, undercut	3	event scale change in surface water run	instability,	1	–	–	1	N/A	N/A

Table D-16. Yorktown Natural Resources Vulnerability Analysis: Climate Stressors 1-3, Colonial National Historical Park, Virginia.

	Sea Level Rise (sea level rise projections above base)			Ground Water Change (geo-chemistry of ground water; ground water table levels)			Severe Storms and Flooding (surge zone from Category 3 storm; FEMA AE zone, historic flooding (same as facilities))		
Resource	**2020**	**2050**	**2100**	**2020**	**2050**	**2100**	**2020**	**2050**	**2100**
1. Jamestown Forest Vegetation (UPLAND)	0	0	0	0	0	2	3	3	3
2a. Jamestown Non-Tidal Riparian Forest	0	0	0	0	0	1	1	1	1
2b. Tidal Riparian Forest	0	0	0	0	0	3	3	3	3
3. Non-tidal Wetlands	0	0	0	0	0	3	2	2	2
4. Tidal Wetlands (In General)	4	4	4	2	2	2	1	1	1
4a. Beaches	2	2	2	1	1	1	1	1	1
4b. Jamestown Disturbed Tidal Hardwood Swamp	0	3	3	3	3	3	1	1	1
4c. Salt Scrub	2	2	2	2	2	2	1	1	1
4d. Tidal Bald Cypress Forest / Woodland	0	2	2	2	2	2	1	1	1
4e. Tidal Freshwater Marsh	4	4	4	3	3	3	1	1	1
4f. Tidal Mesohaline and Polyhaline Marsh	2	2	2	1	1	1	1	1	1
4g. Tidal Oligohaline Marsh	0	0	0	0	0	2	1	1	1
4h. Tidal Shrub Swamp (Wax Myrtle Type)	0	0	0	0	0	3	1	1	1
5. Herps (COASTAL)	2	2	2	1	1	1	1	1	1
6. Herps (UPLAND)	0	0	0	1	1	1	1	1	1
7. Eagles	0	0	0	0	0	0	0	0	0
8. Marsh Birds	4	4	4	1	1	1	1	1	1
9. Bluffs (Yorktown)	0	0	0	0	0	0	3	3	3

Table D-17. Yorktown Natural Resources Vulnerability Analysis: Climate Stressors 4-7, Colonial National Historical Park, Virginia.

	Erosion (USGS Buffer from shoreline (same as facilities) FEMA V ZONE, COASTAL A ZONE)			Precipitation (peak daily rainfall, mean annual rainfall, days >2" of rainfall)			Drought (dry spell length)			Temperature (days below freezing, days greater than 95 degrees, mean daily high and low temperatures)		
Resource	**2020**	**2050**	**2100**	**2020**	**2050**	**2100**	**2020**	**2050**	**2100**	**2020**	**2050**	**2100**
1. Jamestown Forest Vegetation (UPLAND)	1	1	1	0	0	2	0	0	0	2	2	2
2a. Jamestown Non-Tidal Riparian Forest	1	1	1	0	0	0	0	0	0	1	1	1
2b. Tidal Riparian Forest	3	3	3	0	0	3	0	0	0	1	1	1
3. Non-tidal Wetlands	0	0	0	0	0	1	0	0	0	1	1	1
4. Tidal Wetlands (In General)	4	4	4	0	0	0	0	0	0	1	1	1
4a. Beaches	4	4	4	0	0	1	0	0	0	1	1	1
4b. Jamestown Disturbed Tidal Hardwood Swamp	2	2	2	0	0	1	0	0	0	1	1	1
4c. Salt Scrub	4	4	4	0	0	1	0	0	0	1	1	1
4d. Tidal Bald Cypress Forest / Woodland	2	2	2	0	0	1	0	0	0	1	1	1
4e. Tidal Freshwater Marsh	4	4	4	0	0	1	0	0	0	1	1	1
4f. Tidal Mesohaline and Polyhaline Marsh	3	3	3	0	0	1	0	0	0	1	1	1
4g. Tidal Oligohaline Marsh	0	0	0	0	0	1	0	0	0	1	1	1
4h. Tidal Shrub Swamp (Wax Myrtle Type)	4	4	4	0	0	1	0	0	0	1	1	1
5. Herps (COASTAL)	3	3	3	0	0	1	0	0	0	3	3	3
6. Herps (UPLAND)	0	0	0	0	0	1	0	0	0	3	3	3
7. Eagles	0	0	0	0	0	1	0	0	0	1	1	1
8. Marsh Birds	3	3	3	0	0	1	0	0	0	1	1	1
9. Bluffs (Yorktown)	4	4	4	0	0	3	0	0	0	1	1	1

Table D-18. Yorktown Natural Resources Exposure to Climate Stressors 1-3, Colonial National Historical Park, Virginia.

	Sea Level Rise (sea level rise projections above base)			Ground Water Change (geo-chemistry of ground water; ground water table levels)			Severe Storms and Flooding (surge zone from Category 3 storm; FEMA AE zone, historic flooding (same as facilities))		
Resource	**2020**	**2050**	**2100**	**2020**	**2050**	**2100**	**2020**	**2050**	**2100**
1. Jamestown Forest Vegetation (UPLAND)	N	N	N	N	N	Y	Y	Y	Y
2a. Jamestown Non-Tidal Riparian Forest	N	N	N	N	N	Y	Y	Y	Y
2b. Tidal Riparian Forest	N	N	N	N	N	Y	Y	Y	Y
3. Non-tidal Wetlands	N	N	N	N	N	Y	Y	Y	Y
4. Tidal Wetlands (In General)	Y	Y	Y	Y	Y	Y	Y	Y	Y
4a. Beaches	Y	Y	Y	Y	Y	Y	Y	Y	Y
4b. Jamestown Disturbed Tidal Hardwood Swamp	N	Y	Y	Y	Y	Y	Y	Y	Y
4c. Salt Scrub	Y	Y	Y	Y	Y	Y	Y	Y	Y
4d. Tidal Bald Cypress Forest / Woodland	N	Y	Y	Y	Y	Y	Y	Y	Y
4e. Tidal Freshwater Marsh	Y	Y	Y	Y	Y	Y	Y	Y	Y
4f. Tidal Mesohaline and Polyhaline Marsh	Y	Y	Y	Y	Y	Y	Y	Y	Y
4g. Tidal Oligohaline Marsh	N	N	N	N	N	Y	Y	Y	Y
4h. Tidal Shrub Swamp (Wax Myrtle Type)	N	N	N	N	N	Y	Y	Y	Y
5. Herps (COASTAL)	Y	Y	Y	Y	Y	Y	Y	Y	Y
6. Herps (UPLAND)	N	N	N	Y	Y	Y	Y	Y	Y
7. Eagles	N	N	N	N	N	N	N	N	N
8. Marsh Birds	Y	Y	Y	Y	Y	Y	Y	Y	Y
9. Bluffs (Yorktown)	N	N	N	N	N	N	Y	Y	Y

Table D-19. Yorktown Natural Resources Exposure to Climate Stressors 4-7, Colonial National Historical Park, Virginia.

Resource	Erosion (USGS Buffer from shoreline (same as facilities) FEMA V ZONE, COASTAL A ZONE)			Precipitation (peak daily rainfall, mean annual rainfall, days >2" of rainfall)			Drought (dry spell length)			Temperature (days below freezing, days greater than 95 degrees, mean daily high and low temperatures)		
	2020	2050	2100	2020	2050	2100	2020	2050	2100	2020	2050	2100
1. Jamestown Forest Vegetation (UPLAND)	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
2a. Jamestown Non-Tidal Riparian Forest	Y	Y	Y	N	N	N	N	N	N	Y	Y	Y
2b. Tidal Riparian Forest	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
3. Non-tidal Wetlands	N	N	N	N	N	Y	N	N	N	Y	Y	Y
4. Tidal Wetlands (In General)	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4a. Beaches	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4b. Jamestown Disturbed Tidal Hardwood Swamp	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4c. Salt Scrub	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4d. Tidal Bald Cypress Forest / Woodland	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4e. Tidal Freshwater Marsh	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4f. Tidal Mesohaline and Polyhaline Marsh	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
4g. Tidal Oligohaline Marsh	N	N	N	N	N	Y	N	N	N	Y	Y	Y
4h. Tidal Shrub Swamp (Wax Myrtle Type)	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
5. Herps (COASTAL)	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
6. Herps (UPLAND)	N	N	N	N	N	Y	N	N	N	Y	Y	Y
7. Eagles	N	N	N	N	N	Y	N	N	N	Y	Y	Y
8. Marsh Birds	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
9. Bluffs (Yorktown)	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y

Table D-20. Yorktown natural resources sensitivity to climate stressors 1-3, Colonial National Historical Park, Virginia. 1-4 = minimal or benefit, low, moderate, high.

Resource	Sea Level Rise (sea level rise projections above base)			Ground Water Change (geo- chemistry of ground water; ground water table levels)			Severe Storms and Flooding (surge zone from Category 3 storm; FEMA AE zone, historic flooding (same as facilities))		
	Score	**Why**	**Result**	**Score**	**Why**	**Result**	**Score**	**Why**	**Result**
1. Forest Vegetation (UPLAND)	4	salt water intrusion and inundation	dieback	2	root system, depth to groundwater	dieback, disease	3	intense wind	blown over trees, dieback
2a. Non-Tidal Riparian Forest	1	inundation	change of species composition	2	ability to migrate	species composition change	1	–	change in species composition
2b. Tidal Riparian Forest	3	salt water intrusion, inundation	dieback	4	saltwater intrusion, root system, depth to groundwater	dieback, disease	4	wind and wave overwash	blown over trees, dieback
3. Non-tidal Wetlands	4	salt water intrusion, inundation	change of species composition	3	ability to migrate, salt water intrusion	species composition change	2	flooding with salt water	change in species composition
4. Tidal Wetlands (In General)	4	salt water intrusion, inundation, ability to migrate	change in species composition, conversion to mudflat	2	salinity	–	1	resilient to short duration events	N/A
4a. Beaches	2	sediment supply, migration space	loss of beach	1	N/A	N/A	1	dynamic	loss of beach

Table D-20 (continued). Yorktown natural resources sensitivity to climate stressors 1-3, Colonial National Historical Park, Virginia. 1-4 = minimal or benefit, low, moderate, high.

Resource	Sea Level Rise (sea level rise projections above base)			Ground Water Change (geo- chemistry of ground water; ground water table levels)			Severe Storms and Flooding (surge zone from Category 3 storm; FEMA AE zone, historic flooding (same as facilities))		
	Score	**Why**	**Result**	**Score**	**Why**	**Result**	**Score**	**Why**	**Result**
4b.Disturbed Tidal Hardwood Swamp	3	salt water intrusion, inundation	dead trees, dieback	3	salt water intrusion, inundation, root adaptation	dead trees, dieback	1	resilient to short duration events	N/A
4c. Salt Scrub	2	inundation, ability to migrate	dieback	2	salt tolerant but sensitive to inundation, some ability to migrate	change in species composition, dieback	1	resilient to short duration events	N/A
4d. Tidal Bald Cypress Forest / Woodland	2	salt water intrusion	dieback	2	salt water intrusion	dieback	1	resilient to short duration events	N/A
4e. Tidal Freshwater Marsh	4	salt water intrusion, inundation, ability to migrate	change in species composition, conversion to mudflat	3	salt water intrusion	change in species composition	1	resilient to short duration events	N/A
4f. Tidal Mesohaline and Polyhaline Marsh	2	inundation, ability to migrate	loss of wetlands, conversion to mudflat	1	N/A	N/A	1	resilient to short duration events	N/A
4g. Tidal Oligohaline Marsh	4	salt water intrusion, inundation, ability to migrate	change in species composition, conversion to mudflat	2	salt water intrusion	change species composition	1	resilient to short duration events	N/A

Table D-20 (continued). Yorktown natural resources sensitivity to climate stressors 1-3, Colonial National Historical Park, Virginia. 1-4 = minimal or benefit, low, moderate, high.

Resource	Sea Level Rise (sea level rise projections above base)			Ground Water Change (geo- chemistry of ground water; ground water table levels)			Severe Storms and Flooding (surge zone from Category 3 storm; FEMA AE zone, historic flooding (same as facilities))		
	Score	**Why**	**Result**	**Score**	**Why**	**Result**	**Score**	**Why**	**Result**
4h. Tidal Shrub Swamp (Wax Myrtle Type)	4	salt water intrusion, inundation, ability to migrate	change in species composition, conversion to marsh	3	salt water intrusion	change in species composition	1	resilient to short duration events	N/A
5. Herps (COASTAL)	2	loss of habitat, ability to migrate	loss in species population	1	little groundwater interaction	–	1	resilient	nest loss
6. Herps (UPLAND)	2	loss of habitat, ability to migrate	loss in species population	1	increased ponding	–	1	resilient	increased habitat
7. Eagles	1	loss of habitat, ability to migrate	loss in species population	1	–	–	2	wind, downed trees	nest loss, fledgling mortality
8. Marsh Birds	4	loss of habitat, ability to migrate	loss in species population	1	–	–	1	resilient	nest loss
9. Bluffs (Yorktown)	1	destabilization	loss of feature	2	event scale change in ground water	instability	3	surface water impact on feature	loss or migration of feature

Table D-21. Yorktown Natural Resources Sensitivity to Climate Stressors 4-7, Colonial National Historical Park, Virginia. 1-4 = minimal or benefit, low, moderate, high.

Resource	Erosion (USGS Buffer from shoreline (same as facilities) FEMA V ZONE, COASTAL A ZONE)			Precipitation (peak daily rainfall, mean annual rainfall, days >2" of rainfall)			Drought (dry spell length)			Temperature (days below freezing, days greater than 95 degrees, mean daily high and low temperatures)		
	Score	Why	Result	Score	Why	Result	Score	Why	Result	Score	Why	Result
1. Jamestown Forest Vegetation (UPLAND)	1	protected location	bluff edge tree loss	2	heavy rain events, soil saturation	preconditioning of trees to overturn	3	species dependent	stress in trees	2	in the future, pest species specific to the Red Bay	dead shrub
2a. Jamestown Non-Tidal Riparian Forest	2	–	–	2	–	–	2	–	–	1	–	–
2b. Tidal Riparian Forest	4	wind and wave action, overwash	undercut, dieback	3	heavy rain events	upturned trees, bank flooding	4	species dependent	stress in trees	1	middle of range, emerging pests	N/A
3. Non-tidal Wetlands	3	sediment supply, wave action	conversion to mudflat	1	expands fresh water zone	increase in extent	4	water loss, hydro–obligates	dieback, species shift	1	middle of range	N/A
4. Tidal Wetlands (In General)	4	location, susceptible root structure,	a scarp	0	0	0	1	–	–	1	middle of range	N/A
4a. Beaches	4	absence of dunes, sediment supply, migration	loss of beach	1	N/A	N/A	1	–		1	N/A	N/A
4b. Jamestown Disturbed Tidal Hardwood Swamp	2	protected location	intrusion of other species	1	expands fresh water zone, reduced salt water intrusion	maintenance of extent	3	salinity tolerance	stress	2	protected location	intrusion of other species

Table D-21 (continued). Yorktown Natural Resources Sensitivity to Climate Stressors 4-7, Colonial National Historical Park, Virginia. 1-4 = minimal or benefit, low, moderate, high.

Resource	Erosion (USGS Buffer from shoreline (same as facilities) FEMA V ZONE, COASTAL A ZONE)			Precipitation (peak daily rainfall, mean annual rainfall, days >2" of rainfall)			Drought (dry spell length)			Temperature (days below freezing, days greater than 95 degrees, mean daily high and low temperatures)		
	Score	Why	Result	Score	Why	Result	Score	Why	Result	Score	Why	Result
4c. Salt Scrub	4	location, susceptible root structure,	a scarp	1	–	–	1	–	–	4	location, susceptible root structure,	a scarp
4d. Tidal Bald Cypress Forest / Woodland	2	strong root structure	dead trees	1	–	–	1	–	–	2	strong root structure	dead trees
4e. Tidal Freshwater Marsh	4	location, susceptible root structure,	a scarp	1	expands fresh water zone, reduced salt water intrusion	maintenance of extent	3	salinity tolerance	change in species	4	location, susceptible root structure,	a scarp
4f. Tidal Mesohaline and Polyhaline Marsh	3	moderate root structure	a scarp	1	–	–	1	–	–	3	moderate root structure	a scarp
4g. Tidal Oligohaline Marsh	4	location, susceptible root structure,	a scarp	1	–	–	1	–	–	4	location, susceptible root structure,	a scarp
4h. Tidal Shrub Swamp (Wax Myrtle Type)	4	location, susceptible root structure,	a scarp	1	–	–	2	salinity tolerance, groundwater fed	stress	4	location, susceptible root structure,	a scarp
5. Herps (COASTAL)	3	terrapins are habitat specific	habitat loss	1	–	–	1	–	–	3	egg sex determination	low birth rate, change in species composition

Table D-21 (continued). Yorktown Natural Resources Sensitivity to Climate Stressors 4-7, Colonial National Historical Park, Virginia. 1-4 = minimal or benefit, low, moderate, high.

Resource	Erosion (USGS Buffer from shoreline (same as facilities) FEMA V ZONE, COASTAL A ZONE)			Precipitation (peak daily rainfall, mean annual rainfall, days >2" of rainfall)			Drought (dry spell length)			Temperature (days below freezing, days greater than 95 degrees, mean daily high and low temperatures)		
	Score	Why	Result	Score	Why	Result	Score	Why	Result	Score	Why	Result
6. Herps (UPLAND)	2	can migrate	habitat loss	1	good for eggs, ground cover moist	population boost	3	vegetation, water needs	stress	3	edge of range	change in species composition
7. Eagles	1	downed tree	nest loss, fledgling mortality	1	–	–	1	–	–	1	N/A	N/A
8. Marsh Birds	3	are habitat specific	habitat loss	1	–	–	1	–	–	1	middle of range	N/A
9. Bluffs (Yorktown)	4	undermine feature at toe due to wave action	slumping, undercut	3	event scale change in surface water run	instability	1	–	–	1	N/A	N/A

Appendix E. Natural Resources Adaptive Capacity Assessment Data Set at Colonial National Historical Park.

Table E-1. Natural resources adaptive capacity summary at Colonial National Historical Park, Virginia. Low (5-9), Moderate (10-12), High (13-15).

Resource	Total Adaptive Capacity Score	Total Adaptive Capacity Levels	Physical-Intrinsic	Physical-Technology	Organization	Social	Economic
1. Forest Vegetation (UPLAND)	12	Moderate	High	High	Moderate	Moderate	Moderate
1. Jamestown Forest Vegetation (UPLAND)	12	Moderate	High	High	Moderate	Moderate	Moderate
1. Yorktown Forest Vegetation (UPLAND)	12	Moderate	High	High	Moderate	Moderate	Moderate
2a. Non-Tidal Riparian Forest	11	Moderate	Moderate	High	Moderate	Low	High
2a. Jamestown Non-Tidal Riparian Forest	11	Moderate	Moderate	High	Moderate	Low	High
2a. Yorktown Non-Tidal Riparian Forest	11	Moderate	Moderate	High	Moderate	Low	High
2b. Tidal Riparian Forest	11	Moderate	Moderate	High	Moderate	Low	High
2b. Yorktown Tidal Riparian Forest	11	Moderate	Moderate	High	Moderate	Low	High
3. Non-tidal Wetlands	8	Low	High	Low	Moderate	Low	Low
3. Yorktown Non-tidal Wetlands	8	Low	High	Low	Moderate	Low	Low
4. Tidal Wetlands (In General)	13	High	High	High	High	High	Low
4a. Beaches	14	High	High	High	High	High	Moderate

Table E- (continued). Natural resources adaptive capacity summary at Colonial National Historical Park, Virginia. Low (5-9), Moderate (10-12), High (13-15).

Resource	Total Adaptive Capacity Score	Total Adaptive Capacity Levels	Physical-Intrinsic	Physical-Technology	Organization	Social	Economic
4b. Disturbed Tidal Hardwood Swamp	10	Moderate	Moderate	High	High	Low	Low
4b. Jamestown Disturbed Tidal Hardwood Swamp	10	Moderate	Moderate	High	High	Low	Low
4c. Salt Scrub	11	Moderate	High	High	High	Low	Low
4d. Tidal Bald Cypress Forest / Woodland (0-5 ppt)	12	Moderate	Moderate	High	High	High	Low
4e. Tidal Freshwater Marsh (0 - 0.5 ppt)	12	Moderate	Moderate	High	High	High	Low
4f. Tidal Mesohaline and Polyhaline Marsh (5-18 ppt)	14	High	High	High	High	High	Moderate
4g. Tidal Oligohaline Marsh (0.5 - 5 ppt)	13	Moderate	High	High	High	High	Low
4g. Yorktown Tidal Oligohaline Marsh (0.5 - 5 ppt)	13	Moderate	High	High	High	High	Low
4h. Tidal Shrub Swamp (Wax Myrtle Type) (0 - oligohaline)	12	Moderate	High	High	High	Moderate	Low
4h. Yorktown Tidal Shrub Swamp (Wax Myrtle Type) (0 - oligohaline)	12	Moderate	High	High	High	Moderate	Low

Table E-1 (continued). Natural resources adaptive capacity summary at Colonial National Historical Park, Virginia. Low (5-9), Moderate (10-12), High (13-15).

Resource	Total Adaptive Capacity Score	Total Adaptive Capacity Levels	Physical-Intrinsic	Physical-Technology	Organization	Social	Economic
5. Herps (COASTAL) eg turtles water snakes	11	Moderate	Moderate	High	High	Moderate	Low
6. Herps (UPLAND)	8	Low	Low	Low	High	Moderate	Low
7. Eagles	14	High	High	Moderate	High	High	High
8. Marsh Birds	11	Moderate	Moderate	High	Moderate	High	Low
9. Bluffs (Yorktown)	8	Low	Low	Moderate	Low	High	Low

Table E-2. Natural resources adaptive capacity detailed at Colonial National Historical Park, Virginia. TACS = Total Adaptive Capacity Score; PI = Physical Intrinsic, PT = Physical Technology, H = High, M = Moderate, L = Low.

Resource	TACS	Rank	PI	PT	Physical Notes	Organization	Org Notes	Social	Social Notes	Economic	Economic Notes	Division Overlap	Flags
1. Forest Vegetation (UPLAND)	12	H	H	H	site specific, could be lost in Island, no migration route	M	archeological sites may inhibit management actions; see earthworks management plan	M	buffer of neighborhoods, visible element of parkway; limits to acquisition	M	depends on location, long process for land acquisition; natural succession low cost	Cultural, Facilities	forests are different, this is only an average score
1. Jamestown Forest Vegetation (UPLAND)	12	H	H	H	site specific, could be lost in Island, no migration route	M	archeological sites may inhibit management actions; see earthworks management plan	M	buffer of neighborhoods, visible element of parkway; limits to acquisition	M	depends on location, long process for land acquisition; natural succession low cost	Cultural, Facilities	forests are different, this is only an average score
1. Yorktown Forest Vegetation (UPLAND)	12	H	H	H	site specific, could be lost in Island, no migration route	M	archeological sites may inhibit management actions; see earthworks management plan	M	buffer of neighborhoods, visible element of parkway; limits to acquisition	M	depends on location, long process for land acquisition; natural succession low cost	Cultural, Facilities	forests are different, this is only an average score
2a. Non-Tidal Riparian Forest	11	M	M	H	along the parkway, the score would be low, in Yorktown, some would be high	M	archeological sites may inhibit management actions	L	cultural landscape implications of Parkway	H	low cost for natural succession	Cultural, Facilities	forests are different, this is only an average score

Table E-2 (continued). Natural resources adaptive capacity detailed at Colonial National Historical Park, Virginia. TACS = Total Adaptive Capacity Score; PI = Physical Intrinsic, PT = Physical Technology, H = High, M = Moderate, L = Low.

Resource	TACS	Rank	PI	PT	Physical Notes	Organization	Org Notes	Social	Social Notes	Economic	Economic Notes	Division Overlap	Flags
2a. Jamestown Non-Tidal Riparian Forest	11	M	M	H	along the parkway, the score would be low, in Yorktown, some would be high	M	archeological sites may inhibit management actions	L	cultural landscape implications of Parkway	H	low cost for natural succession	Cultural, Facilities	forests are different, this is only an average score
2a. Yorktown Non-Tidal Riparian Forest	11	M	M	H	along the parkway, the score would be low, in Yorktown, some would be high	M	archeological sites may inhibit management actions	L	cultural landscape implications of Parkway	H	low cost for natural succession	Cultural, Facilities	forests are different, this is only an average score
2b. Tidal Riparian Forest	11	H	M	H	depends on the slope and infrastructure location, physical barriers.	M	archeological sites may inhibit management actions	L	cultural landscape implications of Parkway	H	low cost for natural succession	Cultural, Facilities	forests are different, this is only an average score
2b. Yorktown Tidal Riparian Forest	11	H	M	H	depends on the slope and infrastructure location, physical barriers.	M	archeological sites may inhibit management actions	L	cultural landscape implications of Parkway	H	low cost for natural succession	Cultural, Facilities	forests are different, this is only an average score
3. Non-tidal Wetlands	8	M	H	L	most are spring fed	M	in situ protected, but not to relocate or bank?	L	people don't like wetlands, swamps	L	some potential for wetlands banking? For restoration purposes	Cultural, Facilities	–

Table E-2 (continued). Natural resources adaptive capacity detailed at Colonial National Historical Park, Virginia. TACS = Total Adaptive Capacity Score; PI = Physical Intrinsic, PT = Physical Technology, H = High, M = Moderate, L = Low.

Resource	TACS	Rank	PI	PT	Physical Notes	Organization	Org Notes	Social	Social Notes	Economic	Economic Notes	Division Overlap	Flags
3. Yorktown Non-tidal Wetlands	8	M	H	L	most are spring fed	M	in situ protected, but not to relocate or bank?	L	people don't like wetlands, swamps	L	potential for wetlands banking for restoration purposes	Cultural, Facilities	–
4. Tidal Wetlands (In General)	13	H	H	H	–	H	protected	H	–	L	–	Facilities; Cultural for Jamestown Island	–
4a. Beaches	14	H	H	H	–	H	could be mediation requirement	H	–	M	–	Facilities	–
4b. Disturbed Tidal Hardwood Swamp	10	M	M	H	–	H	–	L	–	L	–	–	–
4b. Jamestown Disturbed Tidal Hardwood Swamp	10	M	M	H	–	H	–	L	–	L	–	–	–
4c. Salt Scrub	11	H	H	H	–	H	–	L	–	L	–	–	–
4d. Tidal Bald Cypress Forest / Woodland	12	H	M	H	needs wet conditions	H	–	H	–	L	–	–	–
4e. Tidal Freshwater Marsh	12	H	M	H	–	H	–	H	–	L	–	–	–
4f. Tidal Mesohaline and Polyhaline Marsh	14	H	H	H	–	H	–	H	–	M	for site specific cases	Facilities	–

Table E-2 (continued). Natural resources adaptive capacity detailed at Colonial National Historical Park, Virginia. TACS = Total Adaptive Capacity Score; PI = Physical Intrinsic, PT = Physical Technology, H = High, M = Moderate, L = Low.

Resource	TACS	Rank	PI	PT	Physical Notes	Organization	Org Notes	Social	Social Notes	Economic	Economic Notes	Division Overlap	Flags
4g. Tidal Oligohaline Marsh	13	H	H	H	–	H	–	H	–	L	–	–	–
4g. Yorktown Tidal Oligohaline Marsh	13	H	H	H	–	H	–	H	–	L	–	–	–
4h. Tidal Shrub Swamp (Wax Myrtle Type)	12	H	H	H	–	H	–	M	–	L	–	–	–
4h. Yorktown Tidal Shrub Swamp (Wax Myrtle Type)	12	H	H	H	–	H	–	M	–	L	–	–	–
5. Herps (COASTAL) e.g. turtles, water snakes	11	H	M	H	can move with the marshes; mixed effect of temperature; salinity concern; uncertainty about other factors . Check with researchers: Nancy K. or Anna. Linked to fate of, adaptability of habitat	H	laws in place, strong interest and mandate, bellweather species	M	–	L	study funds but not actions	Facilities, Cultural for Jamestown Island	–

Table E-2 (continued). Natural resources adaptive capacity detailed at Colonial National Historical Park, Virginia. TACS = Total Adaptive Capacity Score; PI = Physical Intrinsic, PT = Physical Technology, H = High, M = Moderate, L = Low.

Resource	TACS	Rank	PI	PT	Physical Notes	Organization	Org Notes	Social	Social Notes	Economic	Economic Notes	Division Overlap	Flags
6. Herps (UPLAND)	8	M	L	L	Jamestown will lose upland habitat; more precipitation? Trees will be slower to adapt	H	–	M	–	L	study funds but not actions	Facilities, (different reasons) Cultural for Jamestown Island, interpretation in other areas	–
7. Eagles	14	H	H	M	keep the tall loblolly pine riparian areas along waterways, some forest management; different in Jamestown; linked to upland management	H	–	H	–	H	interventions could be reasonable in cost	Facilities, interpretive and Cultural	–
8. Marsh Birds	11	H	M	H	tied to situation with their habitat; depends on species; storm recuperation during nesting periods infrequent brackish versus fresh marshes	M	no federally listed birds to date	H	–	L	–	Facilities	–

Table E-2 (continued). Natural resources adaptive capacity detailed at Colonial National Historical Park, Virginia. TACS = Total Adaptive Capacity Score; PI = Physical Intrinsic, PT = Physical Technology, H = High, M = Moderate, L = Low.

Resource	TACS	Rank	PI	PT	Physical Notes	Organization	Org Notes	Social	Social Notes	Economic	Economic Notes	Division Overlap	Flags
9. Bluffs (Yorktown)	8	M	L	M	sediment source, but limited due to armoring, habitat, armoring hides paleontology, limited possibility for living shoreline	L	protection of historic propertie parkway, archeological resources; low for natural resources, but for cultural it is high	H	everyone loves the parkway, don't want it closed or lost;	L	–	Cultural, Facilities	–

Appendix F. Facility Assets Vulnerability Assessment Data Set at Colonial National Historical Park.

Table F-1. Facilities Structures Exposure 2020 and 2050 at Colonial National Historical Park, Virginia.

ID	Structures	FEMA_ VE	FEMA_ A	Erosion	SLR_ 2050	Surge_ Cat3	Historic Flood	Score _Step1	Binned_ Raw	VE_ AutoHigh	Exposure_ Unmod	Flagged	Exposure Rank
1	Moore House 41Y200A1	–	1	1	1	1	1	5	1	–	1	–	Minimal
2	Moore House Ice House 41Y200I3	–	1	1	1	1	1	5	1	–	1	–	Minimal
3	Moore House Outside Kitchen 41Y200J3	–	1	1	1	1	1	5	1	–	1	–	Minimal
4	Moore House Wellhead 41Y200S3	–	1	1	1	1	1	5	1	–	1	–	Minimal
5	Jamestown Maintenance Office / Eq Storage 42J510T3	–	1	1	1	1	4	8	2	–	2	–	Low
6	Jamestown Maintenance Fire Cache/Storage 42J512T4	–	1	1	1	4	4	11	3	–	3	–	Moderate
8	Jamestown Rangers Station 42J520T4	–	1	1	1	1	1	5	1	–	1	–	Minimal
9	Glasshouse Factory 42J630A4	–	4	1	1	4	4	14	3	–	3	–	Moderate
10	Glasshouse Comfort Station 42J630D4	–	1	1	1	1	1	5	1	–	1	–	Minimal
12	Glasshouse Factory Ruins Shelter 42J630M4	–	4	4	1	4	4	17	4	–	4	–	High
13	Jefferson St Employee Qtrs 42W164A4	–	1	1	1	1	1	5	1	–	1	–	Minimal
14	Yorktown Curatorial Storage Bldg 42Y124A4	–	1	1	1	1	1	5	1	–	1	–	Minimal
15	Hogge House (LEO) 42Y132A3	–	1	1	1	1	1	5	1	–	1	–	Minimal
16	Hogge House Storage Shed 42Y132P4	–	1	1	1	1	1	5	1	–	1	–	Minimal
17	Hamilton House 42Y136A4	–	1	1	1	1	1	5	1	–	1	–	Minimal
18	Church St Comfort Station 41Y138D3	–	1	1	1	1	1	5	1	–	1	–	Minimal

Table F-1 (continued). Facilities Structures Exposure 2020 and 2050 at Colonial National Historical Park, Virginia.

ID	Structures	FEMA_ VE	FEMA_ A	Erosion	SLR_ 2050	Surge_ Cat3	Historic Flood	Score _Step1	Binned_ Raw	VE_ AutoHigh	Exposure_ Unmod	Flagged	Exposure Rank
19	Moore House Comfort Station Men's 41Y201D3	–	1	1	1	1	1	5	1	–	1	–	Minimal
20	Moore House Comfort Station Women's 41Y202D3	–	1	1	1	1	1	5	1	–	1	–	Minimal
21	Poor Potters Kiln Shelter 42Y146M4	–	1	1	1	1	1	5	1	–	1	–	Minimal
22	Yorktown National Cemetery Lodge 41Y212A2	–	1	1	1	1	1	5	1	–	1	–	Minimal
23	Yorktown National Cemetery Lodge Tool Bldg. 41Y212G3	–	1	1	1	1	1	5	1	–	1	–	Minimal
24	YMA Bldg D: Warehouse and Main Office 42Y710T4	–	1	1	1	1	1	5	1	–	1	–	Minimal
25	YMA Bldg ABC: MAI Shops and Offices 42Y711T4	–	1	1	1	1	1	5	1	–	1	–	Minimal
26	YMA Bldg K: Cannon Shop and Fire Cache 42Y712T4	–	1	1	1	1	1	5	1	–	1	–	Minimal
27	YMA Bldg E: Warehouse and ENMA Storage 42Y713T4	–	1	1	1	1	1	5	1	–	1	–	Minimal
28	YMA Bldg F: Lumber Storage 42Y714T4	–	1	1	1	1	1	5	1	–	1	–	Minimal
29	YMA Bldg G: Equipment Storage 42Y715T4	–	1	1	1	1	1	5	1	–	1	–	Minimal
30	Dudley Diggs House 41Y214A1	–	1	1	1	1	1	5	1	–	1	–	Minimal
31	Dudley Diggs House Granary 41Y214H4	–	1	1	1	1	1	5	1	–	1	–	Minimal
32	Dudley Diggs House Kitchen 41Y214J4	–	1	1	1	1	1	5	1	–	1	–	Minimal
33	Dudley Diggs House Smokehouse 41Y214L4	–	1	1	1	1	1	5	1	–	1	–	Minimal
34	Cole Diggs House 41Y216A1	–	1	1	1	1	1	5	1	–	1	–	Minimal
35	YMA Bldg H: Equipment Storage 42Y716T4	–	1	1	1	1	1	5	1	–	1	–	Minimal

Table F-1 (continued). Facilities Structures Exposure 2020 and 2050 at Colonial National Historical Park, Virginia.

ID	Structures	FEMA_ VE	FEMA_ A	Erosion	SLR_ 2050	Surge_ Cat3	Historic Flood	Score _Step1	Binned_ Raw	VE_ AutoHigh	Exposure_ Unmod	Flagged	Exposure Rank
36	YMA Bldg I: Equipment Storage 42Y717T4	–	1	1	1	1	1	5	1	–	1	–	Minimal
37	YMA Bldg S: Equipment Storage 42Y718T4	–	1	1	1	1	1	5	1	–	1	–	Minimal
38	Somerwell House 41Y218A1	–	1	1	1	1	1	5	1	–	1	–	Minimal
39	YMA Bldg Z: Oil and Paint Storage Bldg 42Y719T3	–	1	1	1	1	1	5	1	–	1	–	Minimal
40	Somerwell House Stables 41Y218N3	–	1	1	1	1	1	5	1	–	1	–	Minimal
41	Medical Shop 41Y220A3	–	1	1	1	1	1	5	1	–	1	–	Minimal
42	Yorktown Visitor Center 42Y700A3	–	1	1	1	1	1	5	1	–	1	–	Minimal
43	Nelson House 41Y226A1	–	1	1	1	1	1	5	1	–	1	–	Minimal
44	Nelson House Carriage House 41Y226C3	–	1	1	1	1	1	5	1	–	1	–	Minimal
45	Nelson House Stables 41Y226N3	–	1	1	1	1	1	5	1	–	1	–	Minimal
46	Nelson House Wisteria Cottage 41Y226Z3	–	1	1	1	1	1	5	1	–	1	–	Minimal
47	Swan Tavern 41Y222A3	–	1	1	1	1	1	5	1	–	1	–	Minimal
48	Ballard House 41Y228A1	–	1	1	1	1	1	5	1	–	1	–	Minimal
49	Ballard House Smoke House 41Y228L4	–	1	1	1	1	1	5	1	–	1	–	Minimal
50	Swan Tavern Kitchen 41Y222J3	–	1	1	1	1	1	5	1	–	1	–	Minimal
51	Swan Tavern Privy 41Y222K3	–	1	1	1	1	1	5	1	–	1	–	Minimal
52	Swan Tavern Smokehouse 41Y222L3	–	1	1	1	1	1	5	1	–	1	–	Minimal
53	Swan Tavern Stables 41Y222N3	–	1	1	1	1	1	5	1	–	1	–	Minimal
54	Surrender Field Interpretive Center 42Y730A4	–	1	1	1	1	1	5	1	–	1	–	Minimal
55	Swan Tavern Wellhead 41Y222S3	–	1	1	1	1	1	5	1	–	1	–	Minimal

Table F-1 (continued). Facilities Structures Exposure 2020 and 2050 at Colonial National Historical Park, Virginia.

ID	Structures	FEMA_ VE	FEMA_ A	Erosion	SLR_ 2050	Surge_ Cat3	Historic Flood	Score _Step1	Binned_ Raw	VE_ AutoHigh	Exposure_ Unmod	Flagged	Exposure Rank
56	Burcher Cottage 41Y224R7	–	1	1	1	1	1	5	1	–	1	–	Minimal
57	Edmund Smith House 41Y230A1	–	1	1	1	1	1	5	1	–	1	–	Minimal
58	Edmund Smith House Dairy 41Y230E4	–	1	1	1	1	1	5	1	–	1	–	Minimal
59	Archer Cottage 41Y252A1	–	4	4	1	4	4	17	4	–	4	–	High
60	Archer Cottage Outbuilding 41Y252K4	–	1	4	1	4	4	14	3	–	3	–	Moderate
61	Yorktown Beach Comfort Station 42Y300D4	–	1	1	1	1	1	5	1	–	1	–	Minimal
62	Jamestown Historic Research Center 42J570A5	–	4	1	1	4	4	14	3	–	3	–	Moderate
63	Jamestown Visitor Center 42J590A5	–	1	1	1	4	4	11	3	–	3	–	Moderate
64	Neck O Land Visitor Contact Station 42W530A5	–	1	1	1	1	1	5	1	–	1	–	Minimal
65	Yorktown Collection Building 42Y126A5	–	1	1	1	1	1	5	1	–	1	–	Minimal
66	Moore House Hose Station 42Y200Z3	–	1	1	1	1	1	5	1	–	1	–	Minimal
68	British Inner Defense Line Area Fortifications	–	1	1	1	1	1	5	1	–	1	–	Minimal
69	Grand French Battery Area Fortifications	–	1	1	1	1	1	5	1	–	1	–	Minimal
70	Second Siege Line Area Fortifications	–	1	1	1	1	1	5	1	–	1	–	Minimal
71	Second Siege Line - GAB Fortifications	–	1	1	1	1	1	5	1	–	1	–	Minimal
72	Redoubts 9 & 10 Fortifications	–	1	4	1	1	1	8	2	–	2	–	Low
73	Untouched Redoubts Fortifications	–	1	1	1	1	1	5	1	–	1	–	Minimal
74	Yorktown Area Fortifications	–	1	1	1	1	1	5	1	–	1	–	Minimal

Table F-1 (continued). Facilities Structures Exposure 2020 and 2050 at Colonial National Historical Park, Virginia.

ID	Structures	FEMA_ VE	FEMA_ A	Erosion	SLR_ 2050	Surge_ Cat3	Historic Flood	Score _Step1	Binned_ Raw	VE_ AutoHigh	Exposure_ Unmod	Flagged	Exposure Rank
75	Fusilers & French Trench Fortifications	–	1	4	1	1	1	8	2	–	2	–	Low
76	Glasshouse Factory Support Building 42J630Z5	–	1	1	1	4	1	8	2	–	2	–	Low
77	Jamestown 300th Anniversary Monument 7MJ950A3	–	1	1	1	1	1	5	1	–	1	–	Minimal

Table F-2. Facilities Structures Exposure 2100 at Colonial National Historical Park, Virginia.

ID	Structures	FEMA_ VE	FEMA_ A	Erosion	SLR_ 2100	Surge_ Cat3	Historic Flood	Score_ Step1	Binned_ Raw	VE_ AutoHigh	Exposure_ Unmod	Exposure Rank
1	Moore House 41Y200A1	–	1	1	1	1	1	5	1	–	1	Minimal
2	Moore House Ice House 41Y200I3	–	1	1	1	1	1	5	1	–	1	Minimal
3	Moore House Outside Kitchen 41Y200J3	–	1	1	1	1	1	5	1	–	1	Minimal
4	Moore House Wellhead 41Y200S3	–	1	1	1	1	1	5	1	–	1	Minimal
5	Jamestown Maintenance Office / Eq Storage 42J510T3	–	1	1	1	1	4	8	2	–	2	Low
6	Jamestown Maintenance Fire Cache / Storage 42J512T4	–	1	1	1	4	4	11	3	–	3	Moderate
8	Jamestown Rangers Station 42J520T4	–	1	1	1	1	1	5	1	–	1	Minimal
9	Glasshouse Factory 42J630A4	–	4	1	1	4	4	14	3	–	3	Moderate
10	Glasshouse Comfort Station 42J630D4	–	1	1	1	1	1	5	1	–	1	Minimal
12	Glasshouse Factory Ruins Shelter 42J630M4	–	4	4	1	4	4	17	4	–	4	High
13	Jefferson St Employee Qtrs 42W164A4	–	1	1	1	1	1	5	1	–	1	Minimal
14	Yorktown Curatorial Storage Bldg 42Y124A4	–	1	1	1	1	1	5	1	–	1	Minimal
15	Hogge House (LEO) 42Y132A3	–	1	1	1	1	1	5	1	–	1	Minimal
16	Hogge House Storage Shed 42Y132P4	–	1	1	1	1	1	5	1	–	1	Minimal
17	Hamilton House 42Y136A4	–	1	1	1	1	1	5	1	–	1	Minimal
18	Church St Comfort Station 41Y138D3	–	1	1	1	1	1	5	1	–	1	Minimal
19	Moore House Comfort Station Men’s 41Y201D3	–	1	1	1	1	1	5	1	–	1	Minimal

Table F-2 (continued). Facilities Structures Exposure 2100 at Colonial National Historical Park, Virginia.

ID	Structures	FEMA_ VE	FEMA_ A	Erosion	SLR_ 2100	Surge_ Cat3	Historic Flood	Score_ Step1	Binned_ Raw	VE_ AutoHigh	Exposure_ Unmod	Exposure Rank
20	Moore House Comfort Station Womens 41Y202D3	–	1	1	1	1	1	5	1	–	1	Minimal
21	Poor Potters Kiln Shelter 42Y146M4	–	1	1	1	1	1	5	1	–	1	Minimal
22	Yorktown National Cemetery Lodge 41Y212A2	–	1	1	1	1	1	5	1	–	1	Minimal
23	Yorktown National Cemetery Lodge Tool Bldg 41Y212G3	–	1	1	1	1	1	5	1	–	1	Minimal
24	YMA Bldg D: Warehouse and Main Office 42Y710T4	–	1	1	1	1	1	5	1	–	1	Minimal
25	YMA Bldg ABC: MAI Shops and Offices 42Y711T4	–	1	1	1	1	1	5	1	–	1	Minimal
26	YMA Bldg K: Cannon Shop and Fire Cache 42Y712T4	–	1	1	1	1	1	5	1	–	1	Minimal
27	YMA Bldg E: Warehouse and ENMA Storage 42Y713T4	–	1	1	1	1	1	5	1	–	1	Minimal
28	YMA Bldg F: Lumber Storage 42Y714T4	–	1	1	1	1	1	5	1	–	1	Minimal
29	YMA Bldg G: Equipment Storage 42Y715T4	–	1	1	1	1	1	5	1	–	1	Minimal
30	Dudley Diggs House 41Y214A1	–	1	1	1	1	1	5	1	–	1	Minimal
31	Dudley Diggs House Granary 41Y214H4	–	1	1	1	1	1	5	1	–	1	Minimal
32	Dudley Diggs House Kitchen 41Y214J4	–	1	1	1	1	1	5	1	–	1	Minimal
33	Dudley Diggs House Smokehouse 41Y214L4	–	1	1	1	1	1	5	1	–	1	Minimal
34	Cole Diggs House 41Y216A1	–	1	1	1	1	1	5	1	–	1	Minimal
35	YMA Bldg H: Equipment Storage 42Y716T4	–	1	1	1	1	1	5	1	–	1	Minimal
36	YMA Bldg I: Equipment Storage 42Y717T4	–	1	1	1	1	1	5	1	–	1	Minimal

Table F-2 (continued). Facilities Structures Exposure 2100 at Colonial National Historical Park, Virginia.

ID	Structures	FEMA_ VE	FEMA_ A	Erosion	SLR_ 2100	Surge_ Cat3	Historic Flood	Score_ Step1	Binned_ Raw	VE_ AutoHigh	Exposure_ Unmod	Exposure Rank
37	YMA Bldg S: Equipment Storage 42Y718T4	–	1	1	1	1	1	5	1	–	1	Minimal
38	Somerwell House 41Y218A1	–	1	1	1	1	1	5	1	–	1	Minimal
39	YMA Bldg Z: Oil and Paint Storage Bldg 42Y719T3	–	1	1	1	1	1	5	1	–	1	Minimal
40	Somerwell House Stables 41Y218N3	–	1	1	1	1	1	5	1	–	1	Minimal
41	Medical Shop 41Y220A3	–	1	1	1	1	1	5	1	–	1	Minimal
42	Yorktown Visitor Center 42Y700A3	–	1	1	1	1	1	5	1	–	1	Minimal
43	Nelson House 41Y226A1	–	1	1	1	1	1	5	1	–	1	Minimal
44	Nelson House Carriage House 41Y226C3	–	1	1	1	1	1	5	1	–	1	Minimal
45	Nelson House Stables 41Y226N3	–	1	1	1	1	1	5	1	–	1	Minimal
46	Nelson House Wisteria Cottage 41Y226Z3	–	1	1	1	1	1	5	1	–	1	Minimal
47	Swan Tavern 41Y222A3	–	1	1	1	1	1	5	1	–	1	Minimal
48	Ballard House 41Y228A1	–	1	1	1	1	1	5	1	–	1	Minimal
49	Ballard House Smoke House 41Y228L4	–	1	1	1	1	1	5	1	–	1	Minimal
50	Swan Tavern Kitchen 41Y222J3	–	1	1	1	1	1	5	1	–	1	Minimal
51	Swan Tavern Privy 41Y222K3	–	1	1	1	1	1	5	1	–	1	Minimal
52	Swan Tavern Smokehouse 41Y222L3	–	1	1	1	1	1	5	1	–	1	Minimal
53	Swan Tavern Stables 41Y222N3	–	1	1	1	1	1	5	1	–	1	Minimal
54	Surrender Field Interpretive Center 42Y730A4	–	1	1	1	1	1	5	1	–	1	Minimal
55	Swan Tavern Wellhead 41Y222S3	–	1	1	1	1	1	5	1	–	1	Minimal
56	Burcher Cottage 41Y224R7	–	1	1	1	1	1	5	1	–	1	Minimal

Table F-2 (continued). Facilities Structures Exposure 2100 at Colonial National Historical Park, Virginia.

ID	Structures	FEMA_ VE	FEMA_ A	Erosion	SLR_ 2100	Surge_ Cat3	Historic Flood	Score_ Step1	Binned_ Raw	VE_ AutoHigh	Exposure_ Unmod	Exposure Rank
57	Edmund Smith House 41Y230A1	–	1	1	1	1	1	5	1	–	1	Minimal
58	Edmund Smith House Dairy 41Y230E4	–	1	1	1	1	1	5	1	–	1	Minimal
59	Archer Cottage 41Y252A1	–	4	4	1	4	4	17	4	–	4	High
60	Archer Cottage Outbuilding 41Y252K4	–	1	4	1	4	4	14	3	–	3	Moderate
61	Yorktown Beach Comfort Station 42Y300D4	–	1	1	1	1	1	5	1	–	1	Minimal
62	Jamestown Historic Research Center 42J570A5	–	4	1	1	4	4	14	3	–	3	Moderate
63	Jamestown Visitor Center 42J590A5	–	1	1	1	4	4	11	3	–	3	Moderate
64	Neck O Land Visitor Contact Station 42W530A5	–	1	1	1	1	1	5	1	–	1	Minimal
65	Yorktown Collection Building 42Y126A5	–	1	1	1	1	1	5	1	–	1	Minimal
66	Moore House Hose Station 42Y200Z3	–	1	1	1	1	1	5	1	–	1	Minimal
68	British Inner Defense Line Area Fortifications	–	1	1	1	1	1	5	1	–	1	Minimal
69	Grand French Battery Area Fortifications	–	1	1	1	1	1	5	1	–	1	Minimal
70	Second Siege Line Area Fortifications	–	1	1	1	1	1	5	1	–	1	Minimal
71	Second Siege Line - GAB Fortifications	–	1	1	1	1	1	5	1	–	1	Minimal
72	Redoubts 9 & 10 Fortifications	–	1	4	1	1	1	8	2	–	2	Low
73	Untouched Redoubts Fortifications	–	1	1	1	1	1	5	1	–	1	Minimal
74	Yorktown Area Fortifications	–	1	1	1	1	1	5	1	–	1	Minimal

Table F-2 (continued). Facilities Structures Exposure 2100 at Colonial National Historical Park, Virginia.

ID	Structures	FEMA_ VE	FEMA_ A	Erosion	SLR_ 2100	Surge_ Cat3	Historic Flood	Score_ Step1	Binned_ Raw	VE_ AutoHigh	Exposure_ Unmod	Exposure Rank
75	Fusilers & French Trench Fortifications	–	1	4	1	1	1	8	2	–	2	Low
76	Glasshouse Factory Support Building 42J630Z5	–	1	1	1	4	1	8	2	–	2	Low
77	Jamestown 300th Anniversary Monument 7MJ950A3	–	1	1	1	1	1	5	1	–	1	Minimal

Table F-3. Facility Structures Sensitivity at Colonial National Historical Park, Virginia.

ID	Structures	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protective Engineering (Q6)	Flagged Asset	Total Raw (sum step 1)	Sens. Score	Sensitivity Rank
1	Moore House 41Y200A1	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
2	Moore House Ice House 41Y200I3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
3	Moore House Outside Kitchen 41Y200J3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
4	Moore House Wellhead 41Y200S3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
5	Jamestown Maintenance Office /Eq Storage 42J510T3	4	4	1	1	4	–	11.5	3	Moderate
6	Jamestown Maintenance Fire Cache / Storage 42J512T4	4	4	1	1	4	–	11.5	3	Moderate
8	Jamestown Rangers Station 42J520T4	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
9	Glasshouse Factory 42J630A4	4	4	1	4	4	Q1. see notes	14.5	4	High
10	Glasshouse Comfort Station 42J630D4	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
12	Glasshouse Factory Ruins Shelter 42J630M4	4	4	1	4	1	Q1 & Q6. see notes	11.5	3	Moderate
13	Jefferson St Employee Qtrs 42W164A4	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
14	Yorktown Curatorial Storage Bldg 42Y124A4	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
15	Hogge House (LEO) 42Y132A3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
16	Hogge House Storage Shed 42Y132P4	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
17	Hamilton House 42Y136A4	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A

Table F-3 (continued). Facility Structures Sensitivity at Colonial National Historical Park, Virginia.

ID	Structures	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protective Engineering (Q6)	Flagged Asset	Total Raw (sum step 1)	Sens. Score	Sensitivity Rank
18	Church St Comfort Station 41Y138D3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
19	Moore House Comfort Station Men's 41Y201D3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
20	Moore House Comfort Station Womens 41Y202D3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
21	Poor Potters Kiln Shelter 42Y146M4	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
22	Yorktown National Cemetery Lodge 41Y212A2	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
23	Yorktown National Cemetery Lodge Tool Bldg 41Y212G3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
24	YMA Bldg D: Warehouse and Main Office 42Y710T4	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
25	YMA Bldg ABC: MAI Shops and Offices 42Y711T4	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
26	YMA Bldg K: Cannon Shop and Fire Cache 42Y712T4	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
27	YMA Bldg E: Warehouse and ENMA Storage 42Y713T4	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
28	YMA Bldg F: Lumber Storage 42Y714T4	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
29	YMA Bldg G: Equipment Storage 42Y715T4	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
30	Dudley Diggs House 41Y214A1	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
31	Dudley Diggs House Granary 41Y214H4	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
32	Dudley Diggs House Kitchen 41Y214J4	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A

Table F-3 (continued). Facility Structures Sensitivity at Colonial National Historical Park, Virginia.

ID	Structures	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protective Engineering (Q6)	Flagged Asset	Total Raw (sum step 1)	Sens. Score	Sensitivity Rank
33	Dudley Diggs House Smokehouse 41Y214L4	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
34	Cole Diggs House 41Y216A1	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
35	YMA Bldg H: Equipment Storage 42Y716T4	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
36	YMA Bldg I: Equipment Storage 42Y717T4	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
37	YMA Bldg S: Equipment Storage 42Y718T4	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
38	Somerwell House 41Y218A1	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
39	YMA Bldg Z: Oil and Paint Storage Bldg 42Y719T3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
40	Somerwell House Stables 41Y218N3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
41	Medical Shop 41Y220A3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
42	Yorktown Visitor Center 42Y700A3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
43	Nelson House 41Y226A1	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
44	Nelson House Carriage House 41Y226C3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
45	Nelson House Stables 41Y226N3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
46	Nelson House Wisteria Cottage 41Y226Z3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
47	Swan Tavern 41Y222A3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A

Table F-3 (continued). Facility Structures Sensitivity at Colonial National Historical Park, Virginia.

ID	Structures	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protective Engineering (Q6)	Flagged Asset	Total Raw (sum step 1)	Sens. Score	Sensitivity Rank
48	Ballard House 41Y228A1	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
49	Ballard House Smoke House 41Y228L4	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
50	Swan Tavern Kitchen 41Y222J3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
51	Swan Tavern Privy 41Y222K3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
52	Swan Tavern Smokehouse 41Y222L3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
53	Swan Tavern Stables 41Y222N3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
54	Surrender Field Interpretive Center 42Y730A4	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
55	Swan Tavern Wellhead 41Y222S3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
56	Burcher Cottage 41Y224R7	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
57	Edmund Smith House 41Y230A1	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
58	Edmund Smith House Dairy 41Y230E4	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
59	Archer Cottage 41Y252A1	1	4	1	4	1	Q1 & Q6. see notes	8.5	3	Moderate
60	Archer Cottage Outbuilding 41Y252K4	4	4	1	4	1	Q1 & Q6. see notes	11.5	3	Moderate
61	Yorktown Beach Comfort Station 42Y300D4	4	4	1	4	4	–	14.5	4	High
62	Jamestown Historic Research Center 42J570A5	1	4	1	1	4	Q1. see notes	8.5	3	Moderate

Table F-3 (continued). Facility Structures Sensitivity at Colonial National Historical Park, Virginia.

ID	Structures	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protective Engineering (Q6)	Flagged Asset	Total Raw (sum step 1)	Sens. Score	Sensitivity Rank
63	Jamestown Visitor Center 42J590A5	4	4	1	1	4	–	11.5	3	Moderate
64	Neck O Land Visitor Contact Station 42W530A5	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
65	Yorktown Collection Building 42Y126A5	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
66	Moore House Hose Station 42Y200Z3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
68	British Inner Defense Line Area Fortifications	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
69	Grand French Battery Area Fortifications	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
70	Second Siege Line Area Fortifications	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
71	Second Siege Line - GAB Fortifications	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
72	Redoubts 9 & 10 Fortifications	4	4	4	1	1	Q6. see notes	10	3	Moderate
73	Untouched Redoubts Fortifications	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
74	Yorktown Area Fortifications	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A
75	Fusilers & French Trench Fortifications	4	4	4	1	1	Q6. see notes	10	3	Moderate
76	Glasshouse Factory Support Building 42J630Z5	4	4	1	1	4	minimal exposure	11.5	3	Moderate
77	Jamestown 300th Anniversary Monument 7MJ950A3	N/A	N/A	N/A	N/A	N/A	minimal exposure	N/A	N/A	N/A

Table F-4. Facilities Structures Vulnerability at Colonial National Historical Park, Virginia.

ID	Structures	ExpRaw_ 2020/50	ExpBin_ 2020/50	ExpRank_2020/50	ExpRaw_2100	ExpBin_ 2100	ExpRank_ 2100	Sens_Raw	Sens_Bin	Sens_ Rank	VulRaw_ 2020/50	VulBin_2020/50	VulRank_2020/50	VulRaw_2100	VulBin_2100	VulRank_2100
1	Moore House 41Y200A1	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
2	Moore House Ice House 41Y200I3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
3	Moore House Outside Kitchen 41Y200J3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
4	Moore House Wellhead 41Y200S3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
5	Jamestown Maintenance Office / Eq Storage 42J510T3	8	2	Low	8	2	Low	11.5	3	Moderate	5	2	Low	5	2	Low
6	Jamestown Maintenance Fire Cache / Storage 42J512T4	11	3	Moderate	11	3	Moderate	11.5	3	Moderate	6	3	Moderate	6	3	Moderate
8	Jamestown Rangers Station 42J520T4	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
9	Glasshouse Factory 42J630A4	14	3	Moderate	14	3	Moderate	14.5	4	High	7	4	High	7	4	High
10	Glasshouse Comfort Station 42J630D4	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
12	Glasshouse Factory Ruins Shelter 42J630M4	17	4	High	17	4	High	11.5	3	Moderate	7	4	High	7	4	High
13	Jefferson St Employee Qtrs 42W164A4	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
14	Yorktown Curatorial Storage Bldg 42Y124A4	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
15	Hogge House (LEO) 42Y132A3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
16	Hogge House Storage Shed 42Y132P4	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
17	Hamilton House 42Y136A4	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
18	Church St Comfort Station 41Y138D3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
19	Moore House Comfort Station Men’s 41Y201D3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
20	Moore House Comfort Station Womens 41Y202D3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
21	Poor Potters Kiln Shelter 42Y146M4	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
22	Yorktown National Cemetery Lodge 41Y212A2	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
23	Yorktown National Cemetery Lodge Tool Bldg 41Y212G3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
24	YMA Bldg D: Warehouse and Main Office 42Y710T4	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal

Table F-4 (continued). Facilities Structures Vulnerability at Colonial National Historical Park, Virginia.

ID	Structures	ExpRaw_ 2020/50	ExpBin_ 2020/50	ExpRank_2020/50	ExpRaw_2100	ExpBin_ 2100	ExpRank_ 2100	Sens_Raw	Sens_Bin	Sens_ Rank	VulRaw_ 2020/50	VulBin_2020/50	VulRank_2020/50	VulRaw_2100	VulBin_2100	VulRank_2100
25	YMA Bldg ABC: MAI Shops and Offices 42Y711T4	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
26	YMA Bldg K: Cannon Shop and Fire Cache 42Y712T4	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
27	YMA Bldg E: Warehouse and ENMA Storage 42Y713T4	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
28	YMA Bldg F: Lumber Storage 42Y714T4	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
29	YMA Bldg G: Equipment Storage 42Y715T4	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
30	Dudley Diggs House 41Y214A1	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
31	Dudley Diggs House Granary 41Y214H4	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
32	Dudley Diggs House Kitchen 41Y214J4	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
33	Dudley Diggs House Smokehouse 41Y214L4	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
34	Cole Diggs House 41Y216A1	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
35	YMA Bldg H: Equipment Storage 42Y716T4	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
36	YMA Bldg I: Equipment Storage 42Y717T4	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
37	YMA Bldg S: Equipment Storage 42Y718T4	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
38	Somerwell House 41Y218A1	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
39	YMA Bldg Z: Oil and Paint Storage Bldg 42Y719T3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
40	Somerwell House Stables 41Y218N3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
41	Medical Shop 41Y220A3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
42	Yorktown Visitor Center 42Y700A3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
43	Nelson House 41Y226A1	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
44	Nelson House Carriage House 41Y226C3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
45	Nelson House Stables 41Y226N3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
46	Nelson House Wisteria Cottage 41Y226Z3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
47	Swan Tavern 41Y222A3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
48	Ballard House 41Y228A1	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal

Table F-4 (continued). Facilities Structures Vulnerability at Colonial National Historical Park, Virginia.

ID	Structures	ExpRaw_ 2020/50	ExpBin_ 2020/50	ExpRank_2020/50	ExpRaw_2100	ExpBin_ 2100	ExpRank_ 2100	Sens_Raw	Sens_Bin	Sens_ Rank	VulRaw_ 2020/50	VulBin_2020/50	VulRank_2020/50	VulRaw_2100	VulBin_2100	VulRank_2100
49	Ballard House Smoke House 41Y228L4	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
50	Swan Tavern Kitchen 41Y222J3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
51	Swan Tavern Privy 41Y222K3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
52	Swan Tavern Smokehouse 41Y222L3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
53	Swan Tavern Stables 41Y222N3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
54	Surrender Field Interpretive Center 42Y730A4	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
55	Swan Tavern Wellhead 41Y222S3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
56	Burcher Cottage 41Y224R7	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
57	Edmund Smith House 41Y230A1	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
58	Edmund Smith House Dairy 41Y230E4	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
59	Archer Cottage 41Y252A1	17	4	High	17	4	High	8.5	3	Moderate	7	4	High	7	4	High
60	Archer Cottage Outbuilding 41Y252K4	14	3	Moderate	14	3	Moderate	11.5	3	Moderate	6	3	Moderate	6	3	Moderate
61	Yorktown Beach Comfort Station 42Y300D4	5	1	Minimal	5	1	Minimal	14.5	4	High	5	2	Low	5	2	Low
62	Jamestown Historic Research Center 42J570A5	14	3	Moderate	14	3	Moderate	8.5	3	Moderate	6	3	Moderate	6	3	Moderate
63	Jamestown Visitor Center 42J590A5	11	3	Moderate	11	3	Moderate	11.5	3	Moderate	6	3	Moderate	6	3	Moderate
64	Neck O Land Visitor Contact Station 42W530A5	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
65	Yorktown Collection Building 42Y126A5	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
66	Moore House Hose Station 42Y200Z3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
68	British Inner Defense Line Area Fortifications	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
69	Grand French Battery Area Fortifications	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
70	Second Siege Line Area Fortifications	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
71	Second Siege Line - GAB Fortifications	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
72	Redoubts 9 & 10 Fortifications	8	2	Low	8	2	Low	10	3	Moderate	5	2	Low	5	2	Low

Table F-4 (continued). Facilities Structures Vulnerability at Colonial National Historical Park, Virginia.

ID	Structures	ExpRaw_ 2020/50	ExpBin_ 2020/50	ExpRank_2020/50	ExpRaw_2100	ExpBin_ 2100	ExpRank_ 2100	Sens_Raw	Sens_Bin	Sens_ Rank	VulRaw_ 2020/50	VulBin_2020/50	VulRank_2020/50	VulRaw_2100	VulBin_2100	VulRank_2100
73	Untouched Redoubts Fortifications	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal
74	Yorktown Area Fortifications	5	1	Minimal	5	1	Minimal	N/A	–	N/A	1	1	Minimal	1	1	Minimal
75	Fusilers & French Trench Fortifications	8	2	Low	8	2	Low	10	3	Moderate	5	2	Low	5	2	Low
76	Glasshouse Factory Support Building 42J630Z5	8	2	Low	8	2	Low	11.5	3	Moderate	5	2	Low	5	2	Low
77	Jamestown 300th Anniversary Monument 7MJ950A3	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	1	Minimal	1	1	Minimal

Table F-5. Facilities Transportation Exposure 2020 and 2050 at Colonial National Historical Park, Virginia.

ID	Transportation	FEMA_VE	FEMA_A	Erosion	SLR_2050	Surge_Cat3	Historic_Flood	Score_Step1	Binned_Raw	VE_AutoHigh	Exp._Unmod	Exposure Rank
1	COLO PKWY: Jamestown: Start of Road to Just East of Powhatan Creek Bridge	–	1	1	1	4	4	11	3	–	3	Moderate
2	COLO PKWY: Jamestown: Just East of Powhatan Creek Bridge to Colonial Pkwy Real Estate Parking	–	1	1	1	4	4	11	3	–	3	Moderate
3	COLO PKWY: Jamestown: Colonial Pkwy Real Estate Parking to Just North of College Creek Bridge	4	–	1	1	4	4	14	3	4	4	High
4	COLO PKWY: Jamestown: Just North of College Creek Bridge to Just North of Halfway Creek Bridge	–	1	1	1	1	1	5	1	–	1	Minimal
5	COLO PKWY: Central Pkwy: Just North of Halfway Creek Bridge to PKWY Palisades Great Oaks Parking	–	1	1	1	1	4	8	2	–	2	Low
6	COLO PKWY: Central Pkwy: Colonial Pkwy Palisades Great Oaks Parking to I-64	–	1	1	1	1	1	5	1	–	1	Minimal
7	COLO PKWY: Central Pkwy: I-64 to Colonial Pkwy Jones Mill Parking	–	1	1	1	1	1	5	1	–	1	Minimal
8	COLO PKWY: Central Pkwy: Colonial Pkwy Jones Mill Parking to Just West of Kings Creek Bridge	–	1	1	1	1	1	5	1	–	1	Minimal
9	COLO PKWY: Yorktown: Just West of Kings Creek Bridge to Just West of Felgates Creek Bridge	–	1	1	1	1	4	8	2	–	2	Low
10	COLO PKWY: Yorktown: Just West of Felgates Creek Bridge to Just West of Indian Field Creek Bridge	–	1	1	1	1	4	8	2	–	2	Low
11	COLO PKWY: Yorktown: Just West of Indian Field Creek Bridge to Colonial Pkwy Yorktown River Parking	–	1	1	1	4	4	11	3	–	3	Moderate
12	COLO PKWY: Yorktown: Colonial Pkwy Yorktown River Parking to Mine Depot Overpass	–	4	4	1	4	4	17	4	–	4	High
13	COLO PKWY: Yorktown: Mine Depot Overpass to Old Williamsburg Road Bridge	–	1	1	1	1	4	8	2	–	2	Low
14	COLO PKWY: Yorktown: Old Williamsburg Road Bridge to US 17	–	1	1	1	1	1	5	1	–	1	Minimal
15	COLO PKWY: Yorktown: US 17 to East End of Road	–	1	1	1	1	1	5	1	–	1	Minimal
16	Halfway Creek Bridge #4290-022P	–	4	4	4	4	1	17	4	–	4	High
17	Powhatan Creek Bridge	–	4	4	4	4	1	17	4	–	4	High

Table F-5 (continued). Facilities Transportation Exposure 2020 and 2050 at Colonial National Historical Park, Virginia.

ID	Transportation	FEMA _VE	FEMA _A	Erosion	SLR_ 2050	Surge _Cat3	Historic _Flood	Score _Step1	Binned _Raw	VE_ AutoHigh	Exp._ Unmod	Exposure Rank
18	Isthmus Bridge #4290-026P	–	4	4	4	4	4	20	4	–	4	High
19	Mill Creek Bridge #4290-024P	–	4	4	4	4	1	17	4	–	4	High
20	Kings Creek Bridge #4290-012P	–	4	4	4	4	1	17	4	–	4	High
21	Penniman Road Bridge	–	1	1	1	1	1	5	1	–	1	Minimal
22	Hubbards Lane Bridge #4290-014P	–	1	1	1	1	1	5	1	–	1	Minimal
23	Yorktown Creek Bridge #4290-005P	–	1	1	1	4	1	8	2	–	2	Low
24	U.S. Route 17 Parkway Bridge	–	1	1	1	1	1	5	1	–	1	Minimal
25	North Pier Naval Access Road Bridge #4290-008	–	1	1	1	1	1	5	1	–	1	Minimal
26	Mine Depot Overpass #4290-009	–	1	1	1	4	1	8	2	–	2	Low
27	Indian Field Creek Bridge #4290-010P	4	–	4	4	4	4	20	4	4	4	High
28	Felgates Creek Bridge #4290-011P	4	–	4	4	4	4	20	4	4	4	High
29	Old Williamsburg Road Bridge #4290-007	–	1	1	1	1	1	5	1	–	1	Minimal
30	Parkway Drive Bridge #4290-016	–	1	1	1	1	1	5	1	–	1	Minimal
31	Page Street Bridge #4290-018P	–	1	1	1	1	1	5	1	–	1	Minimal
32	Lafayette Street Bridge #4290-019P	–	1	1	1	1	1	5	1	–	1	Minimal
33	Newport Avenue Bridge	–	1	1	1	1	1	5	1	–	1	Minimal
34	C&O Railroad Bridge	–	1	1	1	1	1	5	1	–	1	Minimal
35	College Creek Bridge #4290-023P	–	4	4	4	4	1	17	4	–	4	High
36	Jamestown Access Road Rt 011	–	4	1	1	4	4	14	3	–	3	Moderate
37	Island Drive Short Loop Rt 501A	–	1	4	1	4	4	14	3	–	3	Moderate
38	Island Drive (Outer Loop) Rt 501B	–	4	1	1	4	4	14	3	–	3	Moderate
39	Pitch and Tar Bridge	–	4	1	4	4	4	17	4	–	4	High
40	Blacks Point Bridge #4290-029P	–	4	4	4	4	4	20	4	–	4	High
41	Travis Graveyard Bridge #4290-030P	–	4	4	4	4	4	20	4	–	4	High
42	Long Bridge #4290-031P	–	4	4	4	4	4	20	4	–	4	High
43	Surrender Rd Rt 225	–	1	1	1	1	1	5	1	–	1	Minimal
44	Grand French Battery Road Rt 0101	–	1	1	1	1	1	5	1	–	1	Minimal

Table F-5 (continued). Facilities Transportation Exposure 2020 and 2050 at Colonial National Historical Park, Virginia.

ID	Transportation	FEMA _VE	FEMA _A	Erosion	SLR_ 2050	Surge _Cat3	Historic _Flood	Score _Step1	Binned _Raw	VE_ AutoHigh	Exp._ Unmod	Exposure Rank
45	Redoubt Access Rd Rt 103	–	1	1	1	1	1	5	1	–	1	Minimal
46	Moore House Access Rd Rt 104	–	1	1	1	1	1	5	1	–	1	Minimal
47	Untouched Redoubt Rt 100	–	1	1	1	1	1	5	1	–	1	Minimal
48	Washingtons Troop Loop Rt 224	–	1	1	1	1	1	5	1	–	1	Minimal
49	French Encampment Tour Rd Rt 226	–	1	1	1	1	1	5	1	–	1	Minimal
50	Battlefield Tour Rt 500	–	1	1	1	1	1	5	1	–	1	Minimal
51	Beaverdam Creek Bridge	–	1	1	1	1	1	5	1	–	1	Minimal
52	U.S. Route 17 Tour Road Bridge #4290-004P	–	1	1	1	1	1	5	1	–	1	Minimal
53	Yorktown Visitor Center Parking Lot Rt 0901	–	1	1	1	1	1	5	1	–	1	Minimal
54	Redoubt 9, 10 Access Road Parking Rt 0902	–	1	1	1	1	1	5	1	–	1	Minimal
55	Untouched Redoubt Loop/Parking Rt 0903	–	1	1	1	1	1	5	1	–	1	Minimal
56	Glasshouse Access Rd Parking Rt 0904	–	1	1	1	1	1	5	1	–	1	Minimal
57	Fusiliers Parking Rt 0905	–	1	4	1	1	1	8	2	–	2	Low
58	Colonial Parkway NWS Parking Rt 0906	–	1	4	1	1	1	8	2	–	2	Low
59	Colonial Parkway Yorktown River Parking Rt 0907	–	1	4	1	1	1	8	2	–	2	Low
60	Colonial Parkway Powhatan Parking Rt 0908	–	1	1	1	4	1	8	2	–	2	Low
61	Short Loop Rd (On Surrender) Rt 502	–	1	1	1	1	1	5	1	–	1	Minimal
62	Yorktown East Tour Road Rt 503	–	1	1	1	1	1	5	1	–	1	Minimal
63	Colonial Parkway Indian Field Creek Parking Rt 0909	–	1	1	1	4	1	8	2	–	2	Low
64	Colonial Parkway Bellfield Plantation Parking Rt 0910	–	1	4	1	1	1	8	2	–	2	Low
65	Colonial Parkway Ringfield Plantation Parking Rt 0911	–	4	1	1	4	1	11	3	–	3	Moderate
66	Colonial Parkway Jones Mill Parking Rt 0912	–	1	1	1	1	1	5	1	–	1	Minimal
67	Colonial Parkway Palisades Great Oaks Parking Rt 0913	–	1	1	1	1	1	5	1	–	1	Minimal
68	Colonial Parkway Great Neck Parking Rt 0914	–	1	1	1	4	1	8	2	–	2	Low
69	Colonial Parkway College Creek Parking Rt 0915	–	1	1	1	4	1	8	2	–	2	Low
70	Colonial Parkway James River Parking Rt 0916	–	1	4	1	4	1	11	3	–	3	Moderate
71	Colonial Parkway Archers Hope Parking Rt 0917	–	1	1	1	1	1	5	1	–	1	Minimal

Table F-5 (continued). Facilities Transportation Exposure 2020 and 2050 at Colonial National Historical Park, Virginia.

ID	Transportation	FEMA _VE	FEMA _A	Erosion	SLR_ 2050	Surge _Cat3	Historic _Flood	Score _Step1	Binned _Raw	VE_ AutoHigh	Exp._ Unmod	Exposure Rank
72	Colonial Parkway Glebe Land Parking Rt 0918	–	1	4	1	4	1	11	3	–	3	Moderate
73	Colonial Parkway Real Estate Parking Rt 0919	–	1	1	1	4	1	8	2	–	2	Low
74	Colonial Parkway Neck O Land Parking Rt 0920	–	1	1	1	1	1	5	1	–	1	Minimal
75	Jamestown Entrance Parking Rt 0921	–	1	1	1	4	4	11	3	–	3	Moderate
76	Yorktown Visitor Parking (Church St) Rt 0922	–	1	1	1	1	1	5	1	–	1	Minimal
77	Monument To Victory and Alliance Parking Rt 0923	–	1	1	1	1	1	5	1	–	1	Minimal
78	Yorktown Beach Parking Rt 0924	4	–	1	1	4	4	14	3	4	4	High
79	Cornwallis Cave Parking Rt 0925	–	4	4	1	4	4	17	4	–	4	High
80	Yorktown National Cemetery Second Siege Parking RT 0926	–	1	1	1	1	1	5	1	–	1	Minimal
81	Grand French Battery Parking Rt 0927	–	1	1	1	1	1	5	1	–	1	Minimal
82	Moore House Parking RT 0928	–	1	1	1	1	1	5	1	–	1	Minimal
83	Surrender Field Access Parking Rt 0929	–	1	1	1	1	1	5	1	–	1	Minimal
84	Washington s Headquarters Parking Rt 0930	–	1	1	1	1	1	5	1	–	1	Minimal
85	French Cemetery Parking Rt 0931	–	1	1	1	1	1	5	1	–	1	Minimal
86	Jamestown Visitor Parking Rt 0950	–	1	1	1	4	4	11	3	–	3	Moderate
87	Jamestown Maintenance Parking Rt 0990	–	1	1	1	4	4	11	3	–	3	Moderate
88	YMA Parking Rt 999	–	1	1	1	1	1	5	1	–	1	Minimal
89	Crawford Road Bridge #4290-003	–	1	1	1	1	1	5	1	–	1	Minimal
90	Yorktown Maintenance Utility Road Rt 400	–	1	1	1	1	1	5	1	–	1	Minimal
91	Yortown Maintenance Area Residence Rd Rt 401	–	1	1	1	1	1	5	1	–	1	Minimal
92	Yorktown V. C. Access Rd Rt 010	–	1	1	1	1	1	5	1	–	1	Minimal
93	Neck O Land Visitor Contact Parking Rt 0932	–	1	1	1	1	1	5	1	–	1	Minimal
94	US Route 17 Access Rt 105A	–	1	1	1	1	1	5	1	–	1	Minimal
95	US Rt 17 Access Rd Rt105B	–	1	1	1	1	1	5	1	–	1	Minimal
96	Fusiliers Rd Rt 106	–	1	4	1	1	1	8	2	–	2	Low
97	Cheatam Annex Access Rt 107A	–	1	1	1	1	1	5	1	–	1	Minimal

Table F-5 (continued). Facilities Transportation Exposure 2020 and 2050 at Colonial National Historical Park, Virginia.

ID	Transportation	FEMA _VE	FEMA _A	Erosion	SLR_ 2050	Surge _Cat3	Historic _Flood	Score _Step1	Binned _Raw	VE_ AutoHigh	Exp._ Unmod	Exposure Rank
98	Cheatam Annex Access Rt 107B	–	1	1	1	1	1	5	1	–	1	Minimal
99	Queens Lake Access Rd Rt 108A	–	1	1	1	1	1	5	1	–	1	Minimal
100	Queens Lake Access Rd Rt 108B	–	1	1	1	1	1	5	1	–	1	Minimal
101	Parkway Drive Access Rd Rt109A	–	1	1	1	1	1	5	1	–	1	Minimal
102	Parkway Drive Access Rd Rt109B	–	1	1	1	1	1	5	1	–	1	Minimal
103	Tazewell Hall Avenue Access Rd Rt 110A	–	1	1	1	4	1	8	2	–	2	Low
104	State Route 199 Interchange A Rt 0111A	–	1	1	1	1	1	5	1	–	1	Minimal
105	State Route 199 Interchange Rt 0111B	–	1	1	1	1	1	5	1	–	1	Minimal
106	State Route 199 Interchange Rt 0111C	–	1	1	1	1	1	5	1	–	1	Minimal
107	State Route 199 Interchange Rt 0111D	–	1	1	1	1	1	5	1	–	1	Minimal
108	Jamestown Maintenance Rd Rt 403	–	1	1	1	1	4	8	2	–	2	Low
109	Surrender Field Access Rd Rt 102	–	1	1	1	1	1	5	1	–	1	Minimal
110	Colonial Parkway Newport Avenue Access Rt 112A	–	1	1	1	1	1	5	1	–	1	Minimal
111	Colonial Parkway Newport Avenue Access 112B	–	1	1	1	1	1	5	1	–	1	Minimal
112	Cape Henry Parking Lot Rt 0940	–	1	1	1	1	1	5	1	–	1	Minimal
113	APVA Access Rd Rt 0402	–	1	1	1	4	4	11	3	–	3	Moderate
114	Wormley Pond Bridge	–	1	4	1	4	1	11	3	–	3	Moderate
115	Paper Mill Creek Culvert #1 4290-040	–	4	1	1	4	4	14	3	–	3	Moderate
116	Williamsburg Tunnel #4290-033P	–	1	1	1	1	1	5	1	–	1	Minimal
117	YMA Fueling System	–	1	1	1	1	1	5	1	–	1	Minimal
118	JMA Fueling System	–	1	1	1	1	4	8	2	–	2	Low
119	Yorktown Automatic Tank Gauging Site Sentinel SSIIC	–	1	1	1	1	1	5	1	–	1	Minimal
120	Jamestown V.C. Pedestrian Bridge 4290-039T	–	4	1	4	4	4	17	4	–	4	High
121	Yorktown Pedestrian Bridge	–	1	1	1	1	1	5	1	–	1	Minimal
122	York River Shoreline	4	–	4	1	4	4	17	4	4	4	High
123	James River Shoreline	–	4	4	1	4	4	17	4	–	4	High
124	Jamestown Island Shoreline	4	–	4	1	4	4	17	4	4	4	High

Table F-5 (continued). Facilities Transportation Exposure 2020 and 2050 at Colonial National Historical Park, Virginia.

ID	Transportation	FEMA _VE	FEMA _A	Erosion	SLR_ 2050	Surge _Cat3	Historic _Flood	Score _Step1	Binned _Raw	VE_ AutoHigh	Exp._ Unmod	Exposure Rank
125	Swans Point Shoreline	–	1	1	1	4	4	11	3	–	3	Moderate
126	Culvert; Mile: 0, Type: Circular, Size: 48	–	1	1	1	1	1	5	1	–	1	Minimal
127	Culvert; Mile: 0, Type: Circular/Arch, Size: 48 to 44 x 30	–	1	1	1	1	1	5	1	–	1	Minimal
128	Culvert; Mile: 0.38, Type: Circular, Size: 36	–	1	1	1	1	1	5	1	–	1	Minimal
129	Culvert; Mile: 0.41, Type: Circular, Size: 12	–	1	1	1	1	1	5	1	–	1	Minimal
130	Culvert; Mile: 0.83, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
131	Culvert; Mile: 1.16, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
132	Culvert; Mile: 1.3, Type: Pipe Arch, Size: 4's x 3'r	–	1	1	1	1	1	5	1	–	1	Minimal
133	Culvert; Mile: 1.52, Type: Circular, Size: 18	–	4	1	1	4	4	14	3	–	3	Moderate
134	Culvert; Mile: 1.53, Type: Circular, Size: 18	–	4	1	1	4	4	14	3	–	3	Moderate
135	Culvert; Mile: 1.62, Type: Arch, Size: 8's x 5'r	–	4	1	1	4	4	14	3	–	3	Moderate
136	Culvert; Mile: 1.77, Type: Circular, Size: (?)	–	1	1	1	1	1	5	1	–	1	Minimal
137	Culvert; Mile: 1.8, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
138	Culvert; Mile: 1.85, Type: Circular, Size: 12-15	–	1	1	1	1	1	5	1	–	1	Minimal
139	Culvert; Mile: 10.1, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
140	Culvert; Mile: 10.2, Type: Circular, Size: 30	–	1	1	1	1	1	5	1	–	1	Minimal
141	Culvert; Mile: 10.31, Type: Arch, Size: 4's x 3'r	–	1	1	1	1	1	5	1	–	1	Minimal
142	Culvert; Mile: 10.35, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
143	Culvert; Mile: 10.5, Type: Arch, Size: 6's x 3'r	–	1	1	1	1	1	5	1	–	1	Minimal
144	Culvert; Mile: 10.65, Type: Circular, Size: 24	–	1	1	1	1	1	5	1	–	1	Minimal
145	Culvert; Mile: 10.79, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
146	Culvert; Mile: 10.88, Type: Arch, Size: 8's x 5'r	–	1	1	1	1	1	5	1	–	1	Minimal
147	Culvert; Mile: 10.95, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
148	Culvert; Mile: 11.22, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
149	Culvert; Mile: 11.26, Type: Arch, Size: 4's x 3'r	–	1	1	1	1	1	5	1	–	1	Minimal
150	Culvert; Mile: 11.31, Type:, Size:	–	1	1	1	1	1	5	1	–	1	Minimal
151	Culvert; Mile: 11.43, Type: Arch, Size: 4's x 3'r	–	1	1	1	1	1	5	1	–	1	Minimal

Table F-5 (continued). Facilities Transportation Exposure 2020 and 2050 at Colonial National Historical Park, Virginia.

ID	Transportation	FEMA _VE	FEMA _A	Erosion	SLR_ 2050	Surge _Cat3	Historic _Flood	Score _Step1	Binned _Raw	VE_ AutoHigh	Exp._ Unmod	Exposure Rank
152	Culvert; Mile: 11.44, Type: Arch, Size: 5's x 4'r	–	1	1	1	1	1	5	1	–	1	Minimal
153	Culvert; Mile: 11.51, Type: Circular, Size: 24	–	1	1	1	1	1	5	1	–	1	Minimal
154	Culvert; Mile: 11.58, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
155	Culvert; Mile: 11.98, Type: Arch, Size: 4's x 3'r	–	1	1	1	1	1	5	1	–	1	Minimal
156	Culvert; Mile: 12.01, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
157	Culvert; Mile: 12.1, Type: Drop inlets (9), Size: varies	–	1	1	1	1	1	5	1	–	1	Minimal
158	Culvert; Mile: 12.3, Type: Circular, Size: 24	–	1	1	1	1	1	5	1	–	1	Minimal
159	Culvert; Mile: 12.4, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
160	Culvert; Mile: 13.4, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
161	Culvert; Mile: 13.6, Type: Circular, Size: 36	–	1	1	1	1	1	5	1	–	1	Minimal
162	Culvert; Mile: 13.69, Type: Circular, Size: 18/24	–	1	1	1	1	1	5	1	–	1	Minimal
163	Culvert; Mile: 13.87, Type: No type data, Size:	–	1	1	1	1	1	5	1	–	1	Minimal
164	Culvert; Mile: 13.93, Type: Circular, Size: 18	–	1	1	1	4	1	8	2	–	2	Low
165	Culvert; Mile: 13.98, Type: ?, Size: ?	–	1	1	1	4	1	8	2	–	2	Low
166	Culvert; Mile: 14.23, Type: Box, Size: 8's x 4'r	–	4	1	1	4	4	14	3	–	3	Moderate
167	Culvert; Mile: 14.32, Type: Arch, Size: 3's x 2'r	–	1	1	1	1	1	5	1	–	1	Minimal
168	Culvert; Mile: 14.44, Type: Circular, Size: 24	–	1	1	1	1	1	5	1	–	1	Minimal
169	Culvert; Mile: 14.58, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
170	Culvert; Mile: 14.74, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
171	Culvert; Mile: 14.8, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
172	Culvert; Mile: 14.84, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
173	Culvert; Mile: 15.15, Type: Circular, Size: 36	–	1	1	1	1	1	5	1	–	1	Minimal
174	Culvert; Mile: 15.32, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
175	Culvert; Mile: 16.07, Type: Circular, Size: 24	–	1	1	1	1	1	5	1	–	1	Minimal
176	Culvert; Mile: 16.12, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
177	Culvert; Mile: 16.18, Type: Circular, Size: 18	–	4	4	4	4	4	20	4	–	4	High
178	Culvert; Mile: 16.4, Type: Circular, Size: 18	–	1	1	1	4	1	8	2	–	2	Low

Table F-5 (continued). Facilities Transportation Exposure 2020 and 2050 at Colonial National Historical Park, Virginia.

ID	Transportation	FEMA _VE	FEMA _A	Erosion	SLR_ 2050	Surge _Cat3	Historic _Flood	Score _Step1	Binned _Raw	VE_ AutoHigh	Exp._ Unmod	Exposure Rank
179	Culvert; Mile: 16.89, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
180	Culvert; Mile: 17.26, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
181	Culvert; Mile: 17.48, Type: Circular, Size: 18	–	4	1	1	4	4	14	3	–	3	Moderate
182	Culvert; Mile: 17.61, Type: Circular, Size: 18	–	1	1	1	4	1	8	2	–	2	Low
183	Culvert; Mile: 18.01, Type: ?, Size: ?	–	1	1	1	4	1	8	2	–	2	Low
184	Culvert; Mile: 18.45, Type: Box, Size: 10's x 7'r	–	1	1	1	4	1	8	2	–	2	Low
185	Culvert; Mile: 18.61, Type: Circular, Size: 24	–	1	1	1	4	1	8	2	–	2	Low
186	Culvert; Mile: 18.69, Type: Circular, Size: 18	–	1	1	1	4	1	8	2	–	2	Low
187	Culvert; Mile: 19.01, Type: Box, Size: 10's x 10'r?	–	1	4	1	4	4	14	3	–	3	Moderate
188	Culvert; Mile: 19.84, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
189	Culvert; Mile: 19.89, No data on type	–	1	1	1	1	1	5	1	–	1	Minimal
190	Culvert; Mile: 2.13, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
191	Culvert; Mile: 2.28, Type: ?, Size: ?	–	1	1	1	4	1	8	2	–	2	Low
192	Culvert; Mile: 2.67, Type: Circular, Size: 18	–	1	4	1	1	4	11	3	–	3	Moderate
193	Culvert; Mile: 2.74, Type: Arch, Size: 14's x 6.5'r	–	4	4	1	4	4	17	4	–	4	High
194	Culvert; Mile: 20, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
195	Culvert; Mile: 20.07, Type: Circular, Size: 12	–	1	1	1	1	1	5	1	–	1	Minimal
196	Culvert; Mile: 20.12, Type: No data, Size:	–	1	1	1	1	1	5	1	–	1	Minimal
197	Culvert; Mile: 20.2, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
198	Culvert; Mile: 20.39, Type: Circular, Size: 24	–	1	1	1	4	1	8	2	–	2	Low
199	Culvert; Mile: 20.6, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
200	Culvert; Mile: 20.68, Type: Circular, Size: 15/24	–	1	1	1	1	1	5	1	–	1	Minimal
201	Culvert; Mile: 20.95, Type: Circular, Size: 12	–	1	1	1	4	1	8	2	–	2	Low
202	Culvert; Mile: 20.96, Type: Circular, Size: 18	–	1	1	1	4	1	8	2	–	2	Low
203	Culvert; Mile: 21.8, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
204	Culvert; Mile: 21.9, Type: Circular, Size: 18	–	1	1	1	4	1	8	2	–	2	Low
205	Culvert; Mile: 3.1, Type: Circular, Size: 30	–	4	1	1	4	4	14	3	–	3	Moderate

Table F-5 (continued). Facilities Transportation Exposure 2020 and 2050 at Colonial National Historical Park, Virginia.

ID	Transportation	FEMA_VE	FEMA_A	Erosion	SLR_2050	Surge_Cat3	Historic_Flood	Score_Step1	Binned_Raw	VE_AutoHigh	Exp._Unmod	Exposure Rank
206	Culvert; Mile: 3.22, Type: Circular, Size: 18	–	1	4	1	1	4	11	3	–	3	Moderate
207	Culvert; Mile: 3.41, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
208	Culvert; Mile: 3.53, Type: ?, Size: ?	–	1	1	1	4	1	8	2	–	2	Low
209	Culvert; Mile: 4.4, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
210	Culvert; Mile: 4.49, Type: Circular, Size: 18	–	1	4	1	1	4	11	3	–	3	Moderate
211	Culvert; Mile: 4.74, Type: Circular, Size: 18	–	1	4	1	1	4	11	3	–	3	Moderate
212	Culvert; Mile: 5.13, Type: Circular, Size: 24	–	1	1	1	1	1	5	1	–	1	Minimal
213	Culvert; Mile: 5.23, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
214	Culvert; Mile: 6.21, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
215	Culvert; Mile: 6.4, Type: Circular, Size: 24	–	1	1	1	1	1	5	1	–	1	Minimal
216	Culvert; Mile: 6.43, Type: Circular, Size: 15	–	1	1	1	1	1	5	1	–	1	Minimal
217	Culvert; Mile: 6.48, Type: Circular, Size: 36	–	1	1	1	1	1	5	1	–	1	Minimal
218	Culvert; Mile: 6.55, Type: Circular, Size: 18/15	–	1	1	1	1	1	5	1	–	1	Minimal
219	Culvert; Mile: 6.89, Type: Pipe Arch, Size: 5's x 2.5r	–	1	1	1	1	1	5	1	–	1	Minimal
220	Culvert; Mile: 6.93, Type: Circular, Size: 12	–	1	1	1	4	1	8	2	–	2	Low
221	Culvert; Mile: 7.38, Type: Circular, Size: 30	–	1	1	1	1	1	5	1	–	1	Minimal
222	Culvert; Mile: 7.88, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
223	Culvert; Mile: 8.01, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
224	Culvert; Mile: 8.26, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
225	Culvert; Mile: 8.35, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
226	Culvert; Mile: 8.56, Type: Arch, Size: 4's x 3'r	–	1	1	1	1	1	5	1	–	1	Minimal
227	Culvert; Mile: 8.58, Type: Arch, Size: 4's x 3'r	–	1	1	1	1	1	5	1	–	1	Minimal
228	Culvert; Mile: 8.77, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
229	Culvert; Mile: 8.89, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
230	Culvert; Mile: 8.98, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
231	Culvert; Mile: 9, Type: Arch, Size: 16's x 8'r	–	1	1	1	1	1	5	1	–	1	Minimal
232	Culvert; Mile: 9.05, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal

Table F-5 (continued). Facilities Transportation Exposure 2020 and 2050 at Colonial National Historical Park, Virginia.

ID	Transportation	FEMA _VE	FEMA _A	Erosion	SLR_ 2050	Surge _Cat3	Historic _Flood	Score _Step1	Binned _Raw	VE_ AutoHigh	Exp._ Unmod	Exposure Rank
233	Culvert; Mile: 9.39, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
234	Culvert; Mile: 9.42, Type: Circular, Size: 24	–	1	1	1	1	1	5	1	–	1	Minimal
235	Culvert; Mile: 9.62, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
236	Culvert; Mile: 9.74, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
237	Culvert; Mile: 9.8, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
238	Culvert; Mile: 9.86, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
239	Culvert; Mile: 9.88, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal

Table F-6. Facilities Transportation Exposure 2100 at Colonial National Historical Park, Virginia.

ID	Transportation	FEMA _VE	FEMA _A	Erosion	SLR_ 2100	Surge _Cat3	Historic_ Flood	Score_ Step1	Binned_ Raw	VE_ AutoHigh	Exp._ Unmod	Exposure Rank
1	COLO PKWY: Jamestown: Start of Road to Just East of Powhatan Creek Bridge	–	1	1	1	4	4	11	3	–	3	Moderate
2	COLO PKWY: Jamestown: Just East of Powhatan Creek Bridge to Colonial Pkwy Real Estate Parking	–	1	1	1	4	4	11	3	–	3	Moderate
3	COLO PKWY: Jamestown: Colonial Pkwy Real Estate Parking to Just North of College Creek Bridge	4	–	1	1	4	4	14	3	4	4	High
4	COLO PKWY: Jamestown: Just North of College Creek Bridge to Just North of Halfway Creek Bridge	–	1	1	1	1	1	5	1	–	1	Minimal
5	COLO PKWY: Central Pkwy: Just North of Halfway Creek Bridge to PKWY Palisades Great Oaks Parking	–	1	1	1	1	4	8	2	–	2	Low
6	COLO PKWY: Central Pkwy: Colonial Pkwy Palisades Great Oaks Parking to I-64	–	1	1	1	1	1	5	1	–	1	Minimal
7	COLO PKWY: Central Pkwy: I-64 to Colonial Pkwy Jones Mill Parking	–	1	1	1	1	1	5	1	–	1	Minimal
8	COLO PKWY: Central Pkwy: Colonial Pkwy Jones Mill Parking to Just West of Kings Creek Bridge	–	1	1	1	1	1	5	1	–	1	Minimal
9	COLO PKWY: Yorktown: Just West of Kings Creek Bridge to Just West of Felgates Creek Bridge	–	1	1	1	1	4	8	2	–	2	Low
10	COLO PKWY: Yorktown: Just West of Felgates Creek Bridge to Just West of Indian Field Creek Bridge	–	1	1	1	1	4	8	2	–	2	Low
11	COLO PKWY: Yorktown: Just West of Indian Field Creek Bridge to Colonial Pkwy Yorktown River Parking	–	1	1	1	4	4	11	3	–	3	Moderate
12	COLO PKWY: Yorktown: Colonial Pkwy Yorktown River Parking to Mine Depot Overpass	–	4	4	1	4	4	17	4	–	4	High
13	COLO PKWY: Yorktown: Mine Depot Overpass to Old Williamsburg Road Bridge	–	1	1	1	1	4	8	2	–	2	Low
14	COLO PKWY: Yorktown: Old Williamsburg Road Bridge to US 17	–	1	1	1	1	1	5	1	–	1	Minimal
15	COLO PKWY: Yorktown: US 17 to East End of Road	–	1	1	1	1	1	5	1	–	1	Minimal

Table F-6 (continued). Facilities Transportation Exposure 2100 at Colonial National Historical Park, Virginia.

ID	Transportation	FEMA _VE	FEMA _A	Erosion	SLR_ 2100	Surge _Cat3	Historic_ Flood	Score_ Step1	Binned_ Raw	VE_ AutoHigh	Exp._ Unmod	Exposure Rank
16	Halfway Creek Bridge #4290-022P	–	4	4	4	4	1	17	4	–	4	High
17	Powhatan Creek Bridge	–	4	4	4	4	1	17	4	–	4	High
18	Isthmus Bridge #4290-026P	–	4	4	4	4	4	20	4	–	4	High
19	Mill Creek Bridge #4290-024P	–	4	4	4	4	1	17	4	–	4	High
20	Kings Creek Bridge #4290-012P	–	4	4	4	4	1	17	4	–	4	High
21	Penniman Road Bridge	–	1	1	1	1	1	5	1	–	1	Minimal
22	Hubbards Lane Bridge #4290-014P	–	1	1	1	1	1	5	1	–	1	Minimal
23	Yorktown Creek Bridge #4290-005P	–	1	1	1	4	1	8	2	–	2	Low
24	U.S. Route 17 Parkway Bridge	–	1	1	1	1	1	5	1	–	1	Minimal
25	North Pier Naval Access Road Bridge #4290-008	–	1	1	1	1	1	5	1	–	1	Minimal
26	Mine Depot Overpass #4290-009	–	1	1	1	4	1	8	2	–	2	Low
27	Indian Field Creek Bridge #4290-010P	4	–	4	4	4	4	20	4	4	4	High
28	Felgates Creek Bridge #4290-011P	4	–	4	4	4	4	20	4	4	4	High
29	Old Williamsburg Road Bridge #4290-007	–	1	1	1	1	1	5	1	–	1	Minimal
30	Parkway Drive Bridge #4290-016	–	1	1	1	1	1	5	1	–	1	Minimal
31	Page Street Bridge #4290-018P	–	1	1	1	1	1	5	1	–	1	Minimal
32	Lafayette Street Bridge #4290-019P	–	1	1	1	1	1	5	1	–	1	Minimal
33	Newport Avenue Bridge	–	1	1	1	1	1	5	1	–	1	Minimal
34	C&O Railroad Bridge	–	1	1	1	1	1	5	1	–	1	Minimal
35	College Creek Bridge #4290-023P	–	4	4	4	4	1	17	4	–	4	High
36	Jamestown Access Road Rt 011	–	4	1	1	4	4	14	3	–	3	Moderate
37	Island Drive Short Loop Rt 501A	–	1	4	1	4	4	14	3	–	3	Moderate
38	Island Drive (Outer Loop) Rt 501B	–	4	1	4	4	4	17	4	–	4	High
39	Pitch and Tar Bridge	–	4	1	4	4	4	17	4	–	4	High
40	Blacks Point Bridge #4290-029P	–	4	4	4	4	4	20	4	–	4	High
41	Travis Graveyard Bridge #4290-030P	–	4	4	4	4	4	20	4	–	4	High
42	Long Bridge #4290-031P	–	4	4	4	4	4	20	4	–	4	High

Table F-6 (continued). Facilities Transportation Exposure 2100 at Colonial National Historical Park, Virginia.

ID	Transportation	FEMA _VE	FEMA _A	Erosion	SLR_ 2100	Surge _Cat3	Historic_ Flood	Score_ Step1	Binned_ Raw	VE_ AutoHigh	Exp._ Unmod	Exposure Rank
43	Surrender Rd Rt 225	–	1	1	1	1	1	5	1	–	1	Minimal
44	Grand French Battery Road Rt 0101	–	1	1	1	1	1	5	1	–	1	Minimal
45	Redoubt Access Rd Rt 103	–	1	1	1	1	1	5	1	–	1	Minimal
46	Moore House Access Rd Rt 104	–	1	1	1	1	1	5	1	–	1	Minimal
47	Untouched Redoubt Rt 100	–	1	1	1	1	1	5	1	–	1	Minimal
48	Washingtons Troop Loop Rt 224	–	1	1	1	1	1	5	1	–	1	Minimal
49	French Encampment Tour Rd Rt 226	–	1	1	1	1	1	5	1	–	1	Minimal
50	Battlefield Tour Rt 500	–	1	1	1	1	1	5	1	–	1	Minimal
51	Beaverdam Creek Bridge	–	1	1	1	1	1	5	1	–	1	Minimal
52	U.S. Route 17 Tour Road Bridge #4290-004P	–	1	1	1	1	1	5	1	–	1	Minimal
53	Yorktown Visitor Center Parking Lot Rt 0901	–	1	1	1	1	1	5	1	–	1	Minimal
54	Redoubt 9, 10 Access Road Parking Rt 0902	–	1	1	1	1	1	5	1	–	1	Minimal
55	Untouched Redoubt Loop/Parking Rt 0903	–	1	1	1	1	1	5	1	–	1	Minimal
56	Glasshouse Access Rd Parking Rt 0904	–	1	1	1	1	1	5	1	–	1	Minimal
57	Fusiliers Parking Rt 0905	–	1	4	1	1	1	8	2	–	2	Low
58	Colonial Parkway NWS Parking Rt 0906	–	1	4	1	1	1	8	2	–	2	Low
59	Colonial Parkway Yorktown River Parking Rt 0907	–	1	4	1	1	1	8	2	–	2	Low
60	Colonial Parkway Powhatan Parking Rt 0908	–	1	1	1	4	1	8	2	–	2	Low
61	Short Loop Rd (On Surrender) Rt 502	–	1	1	1	1	1	5	1	–	1	Minimal
62	Yorktown East Tour Road Rt 503	–	1	1	1	1	1	5	1	–	1	Minimal
63	Colonial Parkway Indian Field Creek Parking Rt 0909	–	1	1	1	4	1	8	2	–	2	Low
64	Colonial Parkway Bellfield Plantation Parking Rt 0910	–	1	4	1	1	1	8	2	–	2	Low
65	Colonial Parkway Ringfield Plantation Parking Rt 0911	–	4	1	1	4	1	11	3	–	3	Moderate
66	Colonial Parkway Jones Mill Parking Rt 0912	–	1	1	1	1	1	5	1	–	1	Minimal

Table F-6 (continued). Facilities Transportation Exposure 2100 at Colonial National Historical Park, Virginia.

ID	Transportation	FEMA _VE	FEMA _A	Erosion	SLR_ 2100	Surge _Cat3	Historic_ Flood	Score_ Step1	Binned_ Raw	VE_ AutoHigh	Exp._ Unmod	Exposure Rank
67	Colonial Parkway Palisades Great Oaks Parking Rt 0913	–	1	1	1	1	1	5	1	–	1	Minimal
68	Colonial Parkway Great Neck Parking Rt 0914	–	1	1	1	4	1	8	2	–	2	Low
69	Colonial Parkway College Creek Parking Rt 0915	–	1	1	1	4	1	8	2	–	2	Low
70	Colonial Parkway James River Parking Rt 0916	–	1	4	1	4	1	11	3	–	3	Moderate
71	Colonial Parkway Archers Hope Parking Rt 0917	–	1	1	1	1	1	5	1	–	1	Minimal
72	Colonial Parkway Glebe Land Parking Rt 0918	–	1	4	1	4	1	11	3	–	3	Moderate
73	Colonial Parkway Real Estate Parking Rt 0919	–	1	1	1	4	1	8	2	–	2	Low
74	Colonial Parkway Neck O Land Parking Rt 0920	–	1	1	1	1	1	5	1	–	1	Minimal
75	Jamestown Entrance Parking Rt 0921	–	1	1	1	4	4	11	3	–	3	Moderate
76	Yorktown Visitor Parking (Church St) Rt 0922	–	1	1	1	1	1	5	1	–	1	Minimal
77	Monument To Victory and Alliance Parking Rt 0923	–	1	1	1	1	1	5	1	–	1	Minimal
78	Yorktown Beach Parking Rt 0924	4	–	1	1	4	4	14	3	4	4	High
79	Cornwallis Cave Parking Rt 0925	–	4	4	1	4	4	17	4	–	4	High
80	Yorktown National Cemetery Second Siege Parking RT 0926	–	1	1	1	1	1	5	1	–	1	Minimal
81	Grand French Battery Parking Rt 0927	–	1	1	1	1	1	5	1	–	1	Minimal
82	Moore House Parking RT 0928	–	1	1	1	1	1	5	1	–	1	Minimal
83	Surrender Field Access Parking Rt 0929	–	1	1	1	1	1	5	1	–	1	Minimal
84	Washington s Headquarters Parking Rt 0930	–	1	1	1	1	1	5	1	–	1	Minimal
85	French Cemetery Parking Rt 0931	–	1	1	1	1	1	5	1	–	1	Minimal
86	Jamestown Visitor Parking Rt 0950	–	1	1	1	4	4	11	3	–	3	Moderate
87	Jamestown Maintenance Parking Rt 0990	–	1	1	1	4	4	11	3	–	3	Moderate
88	YMA Parking Rt 999	–	1	1	1	1	1	5	1	–	1	Minimal
89	Crawford Road Bridge #4290-003	–	1	1	1	1	1	5	1	–	1	Minimal
90	Yorktown Maintenance Utility Road Rt 400	–	1	1	1	1	1	5	1	–	1	Minimal
91	Yorktown Maintenance Area Residence Rd Rt 401	–	1	1	1	1	1	5	1	–	1	Minimal
92	Yorktown V. C. Access Rd Rt 010	–	1	1	1	1	1	5	1	–	1	Minimal

Table F-6 (continued). Facilities Transportation Exposure 2100 at Colonial National Historical Park, Virginia.

ID	Transportation	FEMA _VE	FEMA _A	Erosion	SLR_ 2100	Surge _Cat3	Historic_ Flood	Score_ Step1	Binned_ Raw	VE_ AutoHigh	Exp._ Unmod	Exposure Rank
93	Neck O Land Visitor Contact Parking Rt 0932	–	1	1	1	1	1	5	1	–	1	Minimal
94	US Route 17 Access Rt 105A	–	1	1	1	1	1	5	1	–	1	Minimal
95	US Rt 17 Access Rd Rt105B	–	1	1	1	1	1	5	1	–	1	Minimal
96	Fusiliers Rd Rt 106	–	1	4	1	1	1	8	2	–	2	Low
97	Cheatam Annex Access Rt 107A	–	1	1	1	1	1	5	1	–	1	Minimal
98	Cheatam Annex Access Rt 107B	–	1	1	1	1	1	5	1	–	1	Minimal
99	Queens Lake Access Rd Rt 108A	–	1	1	1	1	1	5	1	–	1	Minimal
100	Queens Lake Access Rd Rt 108B	–	1	1	1	1	1	5	1	–	1	Minimal
101	Parkway Drive Access Rd Rt109A	–	1	1	1	1	1	5	1	–	1	Minimal
102	Parkway Drive Access Rd Rt109B	–	1	1	1	1	1	5	1	–	1	Minimal
103	Tazewell Hall Avenue Access Rd Rt 110A	–	1	1	1	4	1	8	2	–	2	Low
104	State Route 199 Interchange A Rt 0111A	–	1	1	1	1	1	5	1	–	1	Minimal
105	State Route 199 Interchange Rt 0111B	–	1	1	1	1	1	5	1	–	1	Minimal
106	State Route 199 Interchange Rt 0111C	–	1	1	1	1	1	5	1	–	1	Minimal
107	State Route 199 Interchange Rt 0111D	–	1	1	1	1	1	5	1	–	1	Minimal
108	Jamestown Maintenance Rd Rt 403	–	1	1	1	1	4	8	2	–	2	Low
109	Surrender Field Access Rd Rt 102	–	1	1	1	1	1	5	1	–	1	Minimal
110	Colonial Parkway Newport Avenue Access Rt 112A	–	1	1	1	1	1	5	1	–	1	Minimal
111	Colonial Parkway Newport Avenue Access 112B	–	1	1	1	1	1	5	1	–	1	Minimal
112	Cape Henry Parking Lot Rt 0940	–	1	1	1	1	1	5	1	–	1	Minimal
113	APVA Access Rd Rt 0402	–	1	1	1	4	4	11	3	–	3	Moderate
114	Wormley Pond Bridge	–	1	4	1	4	1	11	3	–	3	Moderate
115	Paper Mill Creek Culvert #1 4290-040	–	4	1	1	4	4	14	3	–	3	Moderate
116	Williamsburg Tunnel #4290-033P	–	1	1	1	1	1	5	1	–	1	Minimal
117	YMA Fueling System	–	1	1	1	1	1	5	1	–	1	Minimal
118	JMA Fueling System	–	1	1	1	1	4	8	2	–	2	Low

Table F-6 (continued). Facilities Transportation Exposure 2100 at Colonial National Historical Park, Virginia.

ID	Transportation	FEMA _VE	FEMA _A	Erosion	SLR_ 2100	Surge _Cat3	Historic_ Flood	Score_ Step1	Binned_ Raw	VE_ AutoHigh	Exp._ Unmod	Exposure Rank
119	Yorktown Automatic Tank Gauging Site Sentinel SSIIC	–	1	1	1	1	1	5	1	–	1	Minimal
120	Jamestown V.C. Pedestrian Bridge 4290-039T	–	4	1	4	4	4	17	4	–	4	High
121	Yorktown Pedestrian Bridge	–	1	1	1	1	1	5	1	–	1	Minimal
122	York River Shoreline	4	–	4	1	4	4	17	4	4	4	High
123	James River Shoreline	–	4	4	4	4	4	20	4	–	4	High
124	Jamestown Island Shoreline	4	–	4	1	4	4	17	4	4	4	High
125	Swans Point Shoreline	–	1	1	4	4	4	14	3	–	3	Moderate
126	Culvert; Mile: 0, Type: Circular, Size: 48	–	1	1	1	1	1	5	1	–	1	Minimal
127	Culvert; Mile: 0, Type: Circular/Arch, Size: 48 to 44 x 30	–	1	1	1	1	1	5	1	–	1	Minimal
128	Culvert; Mile: 0.38, Type: Circular, Size: 36	–	1	1	1	1	1	5	1	–	1	Minimal
129	Culvert; Mile: 0.41, Type: Circular, Size: 12	–	1	1	1	1	1	5	1	–	1	Minimal
130	Culvert; Mile: 0.83, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
131	Culvert; Mile: 1.16, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
132	Culvert; Mile: 1.3, Type: Pipe Arch, Size: 4's x 3'r	–	1	1	1	1	1	5	1	–	1	Minimal
133	Culvert; Mile: 1.52, Type: Circular, Size: 18	–	4	1	1	4	4	14	3	–	3	Moderate
134	Culvert; Mile: 1.53, Type: Circular, Size: 18	–	4	1	1	4	4	14	3	–	3	Moderate
135	Culvert; Mile: 1.62, Type: Arch, Size: 8's x 5'r	–	4	1	1	4	4	14	3	–	3	Moderate
136	Culvert; Mile: 1.77, Type: Circular, Size: ?	–	1	1	1	1	1	5	1	–	1	Minimal
137	Culvert; Mile: 1.8, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
138	Culvert; Mile: 1.85, Type: Circular, Size: 12-15	–	1	1	1	1	1	5	1	–	1	Minimal
139	Culvert; Mile: 10.1, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
140	Culvert; Mile: 10.2, Type: Circular, Size: 30	–	1	1	1	1	1	5	1	–	1	Minimal
141	Culvert; Mile: 10.31, Type: Arch, Size: 4's x 3'r	–	1	1	1	1	1	5	1	–	1	Minimal
142	Culvert; Mile: 10.35, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
143	Culvert; Mile: 10.5, Type: Arch, Size: 6's x 3'r	–	1	1	1	1	1	5	1	–	1	Minimal
144	Culvert; Mile: 10.65, Type: Circular, Size: 24	–	1	1	1	1	1	5	1	–	1	Minimal

Table F-6 (continued). Facilities Transportation Exposure 2100 at Colonial National Historical Park, Virginia.

ID	Transportation	FEMA _VE	FEMA _A	Erosion	SLR_ 2100	Surge _Cat3	Historic_ Flood	Score_ Step1	Binned_ Raw	VE_ AutoHigh	Exp._ Unmod	Exposure Rank
145	Culvert; Mile: 10.79, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
146	Culvert; Mile: 10.88, Type: Arch, Size: 8's x 5'r	–	1	1	1	1	1	5	1	–	1	Minimal
147	Culvert; Mile: 10.95, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
148	Culvert; Mile: 11.22, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
149	Culvert; Mile: 11.26, Type: Arch, Size: 4's x 3'r	–	1	1	1	1	1	5	1	–	1	Minimal
150	Culvert; Mile: 11.31, Type: ?, Size: ?	–	1	1	1	1	1	5	1	–	1	Minimal
151	Culvert; Mile: 11.43, Type: Arch, Size: 4's x 3'r	–	1	1	1	1	1	5	1	–	1	Minimal
152	Culvert; Mile: 11.44, Type: Arch, Size: 5's x 4'r	–	1	1	1	1	1	5	1	–	1	Minimal
153	Culvert; Mile: 11.51, Type: Circular, Size: 24	–	1	1	1	1	1	5	1	–	1	Minimal
154	Culvert; Mile: 11.58, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
155	Culvert; Mile: 11.98, Type: Arch, Size: 4's x 3'r	–	1	1	1	1	1	5	1	–	1	Minimal
156	Culvert; Mile: 12.01, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
157	Culvert; Mile: 12.1, Type: Drop inlets (9), Size: varies	–	1	1	1	1	1	5	1	–	1	Minimal
158	Culvert; Mile: 12.3, Type: Circular, Size: 24	–	1	1	1	1	1	5	1	–	1	Minimal
159	Culvert; Mile: 12.4, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
160	Culvert; Mile: 13.4, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
161	Culvert; Mile: 13.6, Type: Circular, Size: 36	–	1	1	1	1	1	5	1	–	1	Minimal
162	Culvert; Mile: 13.69, Type: Circular, Size: 18/24	–	1	1	1	1	1	5	1	–	1	Minimal
163	Culvert; Mile: 13.87, Type: Could not locate, Size: ?	–	1	1	1	1	1	5	1	–	1	Minimal
164	Culvert; Mile: 13.93, Type: Circular, Size: 18	–	1	1	1	4	1	8	2	–	2	Low
165	Culvert; Mile: 13.98, Type: ?, Size: ?	–	1	1	1	4	1	8	2	–	2	Low
166	Culvert; Mile: 14.23, Type: Box, Size: 8's x 4'r	–	4	1	1	4	4	14	3	–	3	Moderate
167	Culvert; Mile: 14.32, Type: Arch, Size: 3's x 2'r	–	1	1	1	1	1	5	1	–	1	Minimal
168	Culvert; Mile: 14.44, Type: Circular, Size: 24	–	1	1	1	1	1	5	1	–	1	Minimal
169	Culvert; Mile: 14.58, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
170	Culvert; Mile: 14.74, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
171	Culvert; Mile: 14.8, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal

Table F-6 (continued). Facilities Transportation Exposure 2100 at Colonial National Historical Park, Virginia.

ID	Transportation	FEMA _VE	FEMA _A	Erosion	SLR_ 2100	Surge _Cat3	Historic_ Flood	Score_ Step1	Binned_ Raw	VE_ AutoHigh	Exp._ Unmod	Exposure Rank
172	Culvert; Mile: 14.84, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
173	Culvert; Mile: 15.15, Type: Circular, Size: 36	–	1	1	1	1	1	5	1	–	1	Minimal
174	Culvert; Mile: 15.32, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
175	Culvert; Mile: 16.07, Type: Circular, Size: 24	–	1	1	1	1	1	5	1	–	1	Minimal
176	Culvert; Mile: 16.12, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
177	Culvert; Mile: 16.18, Type: Circular, Size: 18	–	4	4	4	4	4	20	4	–	4	High
178	Culvert; Mile: 16.4, Type: Circular, Size: 18	–	1	1	1	4	1	8	2	–	2	Low
179	Culvert; Mile: 16.89, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
180	Culvert; Mile: 17.26, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
181	Culvert; Mile: 17.48, Type: Circular, Size: 18	–	4	1	1	4	4	14	3	–	3	Moderate
182	Culvert; Mile: 17.61, Type: Circular, Size: 18	–	1	1	1	4	1	8	2	–	2	Low
183	Culvert; Mile: 18.01, Type: ?, Size: ?	–	1	1	1	4	1	8	2	–	2	Low
184	Culvert; Mile: 18.45, Type: Box, Size: 10's x 7'r	–	1	1	1	4	1	8	2	–	2	Low
185	Culvert; Mile: 18.61, Type: Circular, Size: 24	–	1	1	1	4	1	8	2	–	2	Low
186	Culvert; Mile: 18.69, Type: Circular, Size: 18	–	1	1	1	4	1	8	2	–	2	Low
187	Culvert; Mile: 19.01, Type: Box, Size: 10's x 10'r?	–	1	4	1	4	4	14	3	–	3	Moderate
188	Culvert; Mile: 19.84, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
189	Culvert; Mile: 19.89, "Could not locate, may be same as culvert at MP 19.84	–	1	1	1	1	1	5	1	–	1	Minimal
190	Culvert; Mile: 2.13, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
191	Culvert; Mile: 2.28, Type: ?, Size: ?	–	1	1	1	4	1	8	2	–	2	Low
192	Culvert; Mile: 2.67, Type: Circular, Size: 18	–	1	4	1	1	4	11	3	–	3	Moderate
193	Culvert; Mile: 2.74, Type: Arch, Size: 14's x 6.5'r	–	4	4	1	4	4	17	4	–	4	High
194	Culvert; Mile: 20, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
195	Culvert; Mile: 20.07, Type: Circular, Size: 12	–	1	1	1	1	1	5	1	–	1	Minimal
196	Culvert; Mile: 20.12, Type: Could not locate, Size: ?	–	1	1	1	1	1	5	1	–	1	Minimal
197	Culvert; Mile: 20.2, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal

Table F-6 (continued). Facilities Transportation Exposure 2100 at Colonial National Historical Park, Virginia.

ID	Transportation	FEMA _VE	FEMA _A	Erosion	SLR_ 2100	Surge _Cat3	Historic_ Flood	Score_ Step1	Binned_ Raw	VE_ AutoHigh	Exp._ Unmod	Exposure Rank
198	Culvert; Mile: 20.39, Type: Circular, Size: 24	–	1	1	1	4	1	8	2	–	2	Low
199	Culvert; Mile: 20.6, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
200	Culvert; Mile: 20.68, Type: Circular, Size: 15/24	–	1	1	1	1	1	5	1	–	1	Minimal
201	Culvert; Mile: 20.95, Type: Circular, Size: 12	–	1	1	1	4	1	8	2	–	2	Low
202	Culvert; Mile: 20.96, Type: Circular, Size: 18	–	1	1	1	4	1	8	2	–	2	Low
203	Culvert; Mile: 21.8, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
204	Culvert; Mile: 21.9, Type: Circular, Size: 18	–	1	1	1	4	1	8	2	–	2	Low
205	Culvert; Mile: 3.1, Type: Circular, Size: 30	–	4	1	1	4	4	14	3	–	3	Moderate
206	Culvert; Mile: 3.22, Type: Circular, Size: 18	–	1	4	1	1	4	11	3	–	3	Moderate
207	Culvert; Mile: 3.41, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
208	Culvert; Mile: 3.53, Type: ?, Size: ?	–	1	1	1	4	1	8	2	–	2	Low
209	Culvert; Mile: 4.4, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
210	Culvert; Mile: 4.49, Type: Circular, Size: 18	–	1	4	1	1	4	11	3	–	3	Moderate
211	Culvert; Mile: 4.74, Type: Circular, Size: 18	–	1	4	1	1	4	11	3	–	3	Moderate
212	Culvert; Mile: 5.13, Type: Circular, Size: 24	–	1	1	1	1	1	5	1	–	1	Minimal
213	Culvert; Mile: 5.23, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
214	Culvert; Mile: 6.21, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
215	Culvert; Mile: 6.4, Type: Circular, Size: 24	–	1	1	1	1	1	5	1	–	1	Minimal
216	Culvert; Mile: 6.43, Type: Circular, Size: 15	–	1	1	1	1	1	5	1	–	1	Minimal
217	Culvert; Mile: 6.48, Type: Circular, Size: 36	–	1	1	1	1	1	5	1	–	1	Minimal
218	Culvert; Mile: 6.55, Type: Circular, Size: 18/15	–	1	1	1	1	1	5	1	–	1	Minimal
219	Culvert; Mile: 6.89, Type: Pipe Arch, Size: 5's x 2.5r	–	1	1	1	1	1	5	1	–	1	Minimal
220	Culvert; Mile: 6.93, Type: Circular, Size: 12	–	1	1	1	4	1	8	2	–	2	Low
221	Culvert; Mile: 7.38, Type: Circular, Size: 30	–	1	1	1	1	1	5	1	–	1	Minimal
222	Culvert; Mile: 7.88, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
223	Culvert; Mile: 8.01, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
224	Culvert; Mile: 8.26, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal

Table F-6 (continued). Facilities Transportation Exposure 2100 at Colonial National Historical Park, Virginia.

ID	Transportation	FEMA _VE	FEMA _A	Erosion	SLR_ 2100	Surge _Cat3	Historic_ Flood	Score_ Step1	Binned_ Raw	VE_ AutoHigh	Exp._ Unmod	Exposure Rank
225	Culvert; Mile: 8.35, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
226	Culvert; Mile: 8.56, Type: Arch, Size: 4's x 3'r	–	1	1	1	1	1	5	1	–	1	Minimal
227	Culvert; Mile: 8.58, Type: Arch, Size: 4's x 3'r	–	1	1	1	1	1	5	1	–	1	Minimal
228	Culvert; Mile: 8.77, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
229	Culvert; Mile: 8.89, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
230	Culvert; Mile: 8.98, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
231	Culvert; Mile: 9, Type: Arch, Size: 16's x 8'r	–	1	1	1	1	1	5	1	–	1	Minimal
232	Culvert; Mile: 9.05, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
233	Culvert; Mile: 9.39, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
234	Culvert; Mile: 9.42, Type: Circular, Size: 24	–	1	1	1	1	1	5	1	–	1	Minimal
235	Culvert; Mile: 9.62, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
236	Culvert; Mile: 9.74, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
237	Culvert; Mile: 9.8, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
238	Culvert; Mile: 9.86, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal
239	Culvert; Mile: 9.88, Type: Circular, Size: 18	–	1	1	1	1	1	5	1	–	1	Minimal

Table F-7. Transportation Sensitivity at Colonial National Historical Park, Virginia.

ID	Transportation	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protect Engineer. (Q6)	Bridge Clearance	Bridge Scour Rating	Bridge Condition	Bridge Age	Total Raw Score (sum step 1)	Sens. Score	Sens. Rank
1	COLO PKWY: Jamestown: Start of Road to Just East of Powhatan Creek Bridge	1	4	4	1	1	N/A	N/A	N/A	N/A	7	2	Low
2	COLO PKWY: Jamestown: Just East of Powhatan Creek Bridge to Colonial Pkwy Real Estate Parking	1	4	1	1	4	N/A	N/A	N/A	N/A	8.5	3	Moderate
3	COLO PKWY: Jamestown: Colonial Pkwy Real Estate Parking to Just North of College Creek Bridge	1	4	1	1	4	N/A	N/A	N/A	N/A	8.5	3	Moderate
4	COLO PKWY: Jamestown: Just North of College Creek Bridge to Just North of Halfway Creek Bridge	1	4	4	1	4	N/A	N/A	N/A	N/A	10	3	Moderate
5	COLO PKWY: Central Pkwy: Just North of Halfway Creek Bridge to PKWY Palisades Great Oaks Parking	1	4	1	1	4	N/A	N/A	N/A	N/A	8.5	3	Moderate
6	COLO PKWY: Central Pkwy: Colonial Pkwy Palisades Great Oaks Parking to I-64	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7	COLO PKWY: Central Pkwy: I-64 to Colonial Pkwy Jones Mill Parking	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table F-7 (continued). Transportation Sensitivity at Colonial National Historical Park, Virginia.

ID	Transportation	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protect Engineer. (Q6)	Bridge Clearance	Bridge Scour Rating	Bridge Condition	Bridge Age	Total Raw Score (sum step 1)	Sens. Score	Sens. Rank
8	COLO PKWY: Central Pkwy: Colonial Pkwy Jones Mill Parking to Just West of Kings Creek Bridge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9	COLO PKWY: Yorktown: Just West of Kings Creek Bridge to Just West of Felgates Creek Bridge	1	4	4	1	4	N/A	N/A	N/A	N/A	10	3	Moderate
10	COLO PKWY: Yorktown: Just West of Felgates Creek Bridge to Just West of Indian Field Creek Bridge	1	4	4	4	1	N/A	N/A	N/A	N/A	10	3	Moderate
11	COLO PKWY: Yorktown: Just West of Indian Field Creek Bridge to Colonial Pkwy Yorktown River Parking	1	4	4	4	4	N/A	N/A	N/A	N/A	13	4	High
12	COLO PKWY: Yorktown: Colonial Pkwy Yorktown River Parking to Mine Depot Overpass	1	4	4	1	4	N/A	N/A	N/A	N/A	10	3	Moderate
13	COLO PKWY: Yorktown: Mine Depot Overpass to Old Williamsburg Road Bridge	1	4	4	1	4	N/A	N/A	N/A	N/A	10	3	Moderate
14	COLO PKWY: Yorktown: Old Williamsburg Road Bridge to US 17	1	4	4	1	4	N/A	N/A	N/A	N/A	10	3	Moderate

Table F-7 (continued). Transportation Sensitivity at Colonial National Historical Park, Virginia.

ID	Transportation	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protect Engineer. (Q6)	Bridge Clearance	Bridge Scour Rating	Bridge Condition	Bridge Age	Total Raw Score (sum step 1)	Sens. Score	Sens. Rank
15	COLO PKWY: Yorktown: US 17 to East End of Road	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
16	Halfway Creek Bridge #4290-022P	1	4	–	1	4	–	2	3	3	14.5	3	Moderate
17	Powhatan Creek Bridge	1	4	–	1	4	–	2	3	3	14.5	3	Moderate
18	Isthmus Bridge #4290-026P	1	4	–	1	1	3	2	4	3	15	2	Low
19	Mill Creek Bridge #4290-024P	1	4	–	1	1	–	2	4	3	12	2	Low
20	Kings Creek Bridge #4290-012P	1	4	–	1	4	–	2	3	2	13.5	2	Low
21	Penniman Road Bridge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
22	Hubbards Lane Bridge #4290-014P	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
23	Yorktown Creek Bridge #4290-005P	1	4	–	1	4	–	2	3.3	3	14.7	3	Moderate
24	U.S. Route 17 Parkway Bridge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
25	North Pier Naval Access Road Bridge #4290-008	1	4	1	1	4	–	–	–	3	11	2	Low
26	Mine Depot Overpass #4290-009	1	4	–	1	4	–	1	3.3	2	12.7	2	Low
27	Indian Field Creek Bridge #4290-010P	1	4	–	4	1	–	2	3	2	13.5	2	Low
28	Felgates Creek Bridge #4290-011P	1	4	–	4	1	–	2	3.3	2	13.7	2	Low
29	Old Williamsburg Road Bridge #4290-007	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table F-7 (continued). Transportation Sensitivity at Colonial National Historical Park, Virginia.

ID	Transportation	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protect Engineer. (Q6)	Bridge Clearance	Bridge Scour Rating	Bridge Condition	Bridge Age	Total Raw Score (sum step 1)	Sens. Score	Sens. Rank
30	Parkway Drive Bridge #4290-016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
31	Page Street Bridge #4290-018P	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
32	Lafayette Street Bridge #4290-019P	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
33	Newport Avenue Bridge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
34	C&O Railroad Bridge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
35	College Creek Bridge #4290-023P	1	4	–	1	1	–	2	3.7	3	11.8	2	Low
36	Jamestown Access Road Rt 011	4	4	4	1	4	N/A	N/A	N/A	N/A	13	4	High
37	Island Drive Short Loop Rt 501A	4	4	1	1	4	N/A	N/A	N/A	N/A	11.5	3	Moderate
38	Island Drive (Outer Loop) Rt 501B	4	4	1	1	4	N/A	N/A	N/A	N/A	11.5	3	Moderate
39	Pitch and Tar Bridge	4	4	–	1	4	–	2	4	1	16	3	Moderate
40	Blacks Point Bridge #4290-029P	4	4	–	4	4	–	2	3.7	1	18.8	3	Moderate
41	Travis Graveyard Bridge #4290-030P	1	4	–	1	4	–	2	3.7	1	12.8	2	Low
42	Long Bridge #4290-031P	4	4	–	1	4	–	2	3.7	1	15.8	3	Moderate
43	Surrender Rd Rt 225	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
44	Grand French Battery Road Rt 0101	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
45	Redoubt Access Rd Rt 103	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
46	Moore House Access Rd Rt 104	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table F-7 (continued). Transportation Sensitivity at Colonial National Historical Park, Virginia.

ID	Transportation	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protect Engineer. (Q6)	Bridge Clearance	Bridge Scour Rating	Bridge Condition	Bridge Age	Total Raw Score (sum step 1)	Sens. Score	Sens. Rank
47	Untouched Redoubt Rt 100	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
48	Washingtons Troop Loop Rt 224	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
49	French Encampment Tour Rd Rt 226	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
50	Battlefield Tour Rt 500	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
51	Beaverdam Creek Bridge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
52	U.S. Route 17 Tour Road Bridge #4290-004P	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
53	Yorktown Visitor Center Parking Lot Rt 0901	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
54	Redoubt 9, 10 Access Road Parking Rt 0902	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
55	Untouched Redoubt Loop/Parking Rt 0903	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
56	Glasshouse Access Rd Parking Rt 0904	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
57	Fusiliers Parking Rt 0905	1	4	1	1	1	N/A	N/A	N/A	N/A	5.5	2	Low
58	Colonial Parkway NWS Parking Rt 0906	1	4	1	1	4	N/A	N/A	N/A	N/A	8.5	3	Moderate
59	Colonial Parkway Yorktown River Parking Rt 0907	1	4	1	1	1	N/A	N/A	N/A	N/A	5.5	2	Low
60	Colonial Parkway Powhatan Parking Rt 0908	1	4	1	1	4	N/A	N/A	N/A	N/A	8.5	3	Moderate

Table F-7 (continued). Transportation Sensitivity at Colonial National Historical Park, Virginia.

ID	Transportation	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protect Engineer. (Q6)	Bridge Clearance	Bridge Scour Rating	Bridge Condition	Bridge Age	Total Raw Score (sum step 1)	Sens. Score	Sens. Rank
61	Short Loop Rd (On Surrender) Rt 502	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
62	Yorktown East Tour Road Rt 503	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
63	Colonial Parkway Indian Field Creek Parking Rt 0909	1	4	1	1	4	N/A	N/A	N/A	N/A	8.5	3	Moderate
64	Colonial Parkway Bellfield Plantation Parking Rt 0910	1	4	1	1	1	N/A	N/A	N/A	N/A	5.5	2	Low
65	Colonial Parkway Ringfield Plantation Parking Rt 0911	1	4	1	1	4	N/A	N/A	N/A	N/A	8.5	3	Moderate
66	Colonial Parkway Jones Mill Parking Rt 0912	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
67	Colonial Parkway Palisades Great Oaks Parking Rt 0913	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
68	Colonial Parkway Great Neck Parking Rt 0914	1	4	1	1	4	N/A	N/A	N/A	N/A	8.5	3	Moderate
69	Colonial Parkway College Creek Parking Rt 0915	1	4	1	1	4	N/A	N/A	N/A	N/A	8.5	3	Moderate
70	Colonial Parkway James River Parking Rt 0916	1	4	1	1	4	N/A	N/A	N/A	N/A	8.5	3	Moderate
71	Colonial Parkway Archers Hope Parking Rt 0917	1	4	1	1	4	N/A	N/A	N/A	N/A	8.5	3	Moderate
72	Colonial Parkway Glebe Land Parking Rt 0918	1	4	1	1	4	N/A	N/A	N/A	N/A	8.5	3	Moderate

Table F-7 (continued). Transportation Sensitivity at Colonial National Historical Park, Virginia.

ID	Transportation	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protect Engineer. (Q6)	Bridge Clearance	Bridge Scour Rating	Bridge Condition	Bridge Age	Total Raw Score (sum step 1)	Sens. Score	Sens. Rank
73	Colonial Parkway Real Estate Parking Rt 0919	1	4	1	1	4	N/A	N/A	N/A	N/A	8.5	3	Moderate
74	Colonial Parkway Neck O Land Parking Rt 0920	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
75	Jamestown Entrance Parking Rt 0921	1	4	1	1	1	N/A	N/A	N/A	N/A	5.5	2	Low
76	Yorktown Visitor Parking (Church St) Rt 0922	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
77	Monument To Victory and Alliance Parking Rt 0923	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
78	Yorktown Beach Parking Rt 0924	4	4	1	1	1	N/A	N/A	N/A	N/A	8.5	3	Moderate
79	Cornwallis Cave Parking Rt 0925	4	4	1	1	4	N/A	N/A	N/A	N/A	11.5	3	Moderate
80	Yorktown National Cemetery Second Siege Parking RT 0926	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
81	Grand French Battery Parking Rt 0927	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
82	Moore House Parking RT 0928	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
83	Surrender Field Access Parking Rt 0929	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
84	Washington s Headquarters Parking Rt 0930	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
85	French Cemetery Parking Rt 0931	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table F-7 (continued). Transportation Sensitivity at Colonial National Historical Park, Virginia.

ID	Transportation	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protect Engineer. (Q6)	Bridge Clearance	Bridge Scour Rating	Bridge Condition	Bridge Age	Total Raw Score (sum step 1)	Sens. Score	Sens. Rank
86	Jamestown Visitor Parking Rt 0950	1	4	1	1	1	N/A	N/A	N/A	N/A	5.5	2	Low
87	Jamestown Maintenance Parking Rt 0990	1	4	4	1	4	N/A	N/A	N/A	N/A	10	3	Moderate
88	YMA Parking Rt 999	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
89	Crawford Road Bridge #4290-003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
90	Yorktown Maintenance Utility Road Rt 400	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
91	Yorktown Maintenance Area Residence Rd Rt 401	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
92	Yorktown V. C. Access Rd Rt 010	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
93	Neck O Land Visitor Contact Parking Rt 0932	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
94	US Route 17 Access Rt 105A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
95	US Rt 17 Access Rd Rt105B	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
96	Fusiliers Rd Rt 106	1	4	1	1	1	N/A	N/A	N/A	N/A	5.5	2	Low
97	Cheatam Annex Access Rt 107A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
98	Cheatam Annex Access Rt 107B	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
99	Queens Lake Access Rd Rt 108A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100	Queens Lake Access Rd Rt 108B	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table F-7 (continued). Transportation Sensitivity at Colonial National Historical Park, Virginia.

ID	Transportation	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protect Engineer. (Q6)	Bridge Clearance	Bridge Scour Rating	Bridge Condition	Bridge Age	Total Raw Score (sum step 1)	Sens. Score	Sens. Rank
101	Parkway Drive Access Rd Rt109A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
102	Parkway Drive Access Rd Rt109B	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
103	Tazewell Hall Avenue Access Rd Rt 110A	1	4	1	1	4	N/A	N/A	N/A	N/A	8.5	3	Moderate
104	State Route 199 Interchange A Rt 0111A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
105	State Route 199 Interchange Rt 0111B	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
106	State Route 199 Interchange Rt 0111C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
107	State Route 199 Interchange Rt 0111D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
108	Jamestown Maintenance Rd Rt 403	1	4	4	1	4	N/A	N/A	N/A	N/A	10	3	Moderate
109	Surrender Field Access Rd Rt 102	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
110	Colonial Parkway Newport Avenue Access Rt 112A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
111	Colonial Parkway Newport Avenue Access 112B	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
112	Cape Henry Parking Lot Rt 0940	4	4	4	1	1	N/A	N/A	N/A	N/A	10	3	Moderate
113	APVA Access Rd Rt 0402	4	4	1	1	4	N/A	N/A	N/A	N/A	11.5	3	Moderate
114	Wormley Pond Bridge	1	4	–	1	4	–	3	3.7	3	15.9	3	Moderate

Table F-7 (continued). Transportation Sensitivity at Colonial National Historical Park, Virginia.

ID	Transportation	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protect Engineer. (Q6)	Bridge Clearance	Bridge Scour Rating	Bridge Condition	Bridge Age	Total Raw Score (sum step 1)	Sens. Score	Sens. Rank
115	Paper Mill Creek Culvert #1 4290-040	1	4	–	1	4	–	2	1	1	11.5	2	Low
116	Williamsburg Tunnel #4290-033P	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
117	YMA Fueling System	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
118	JMA Fueling System	4	4	1	1	4	N/A	N/A	N/A	N/A	11.5	3	Moderate
119	Yorktown Automatic Tank Gauging Site Sentinel SSIIC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
120	Jamestown V.C. Pedestrian Bridge 4290-039T	1	1	1	1	4	N/A	N/A	N/A	N/A	7	2	Low
121	Yorktown Pedestrian Bridge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
122	York River Shoreline	4	1	4	4	4	N/A	N/A	N/A	N/A	14.5	4	High
123	James River Shoreline	4	1	4	4	4	N/A	N/A	N/A	N/A	14.5	4	High
124	Jamestown Island Shoreline	4	1	4	4	4	N/A	N/A	N/A	N/A	14.5	4	High
125	Swans Point Shoreline	4	1	1	4	4	N/A	N/A	N/A	N/A	13	4	High
126	Culvert; Mile: 0, Type: Circular, Size: 48	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
127	Culvert; Mile: 0, Type: Circular/Arch, Size: 48 to 44 x 30	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
128	Culvert; Mile: 0.38, Type: Circular, Size: 36	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	8	3	Moderate
129	Culvert; Mile: 0.41, Type: Circular, Size: 12	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal

Table F-7 (continued). Transportation Sensitivity at Colonial National Historical Park, Virginia.

ID	Transportation	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protect Engineer. (Q6)	Bridge Clearance	Bridge Scour Rating	Bridge Condition	Bridge Age	Total Raw Score (sum step 1)	Sens. Score	Sens. Rank
130	Culvert; Mile: 0.83, Type: Circular, Size: 18	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
131	Culvert; Mile: 1.16, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
132	Culvert; Mile: 1.3, Type: Pipe Arch, Size: 4's x 3'r	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
133	Culvert; Mile: 1.52, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
134	Culvert; Mile: 1.53, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
135	Culvert; Mile: 1.62, Type: Arch, Size: 8's x 5'r	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
136	Culvert; Mile: 1.77, Type: Circular, Size: ?	N/A	N/A	–	N/A	N/A	N/A	N/A	N/A	N/A	–	–	Minimal
137	Culvert; Mile: 1.8, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
138	Culvert; Mile: 1.85, Type: Circular, Size: 12-15	N/A	N/A	–	N/A	N/A	N/A	N/A	N/A	N/A	–	–	Minimal
139	Culvert; Mile: 10.1, Type: Circular, Size: 18	N/A	N/A	–	N/A	N/A	N/A	N/A	N/A	N/A	–	–	Minimal
140	Culvert; Mile: 10.2, Type: Circular, Size: 30	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
141	Culvert; Mile: 10.31, Type: Arch, Size: 4's x 3'r	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	8	3	Moderate
142	Culvert; Mile: 10.35, Type: Circular, Size: 18	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
143	Culvert; Mile: 10.5, Type: Arch, Size: 6's x 3'r	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	6	2	Low

Table F-7 (continued). Transportation Sensitivity at Colonial National Historical Park, Virginia.

ID	Transportation	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protect Engineer. (Q6)	Bridge Clearance	Bridge Scour Rating	Bridge Condition	Bridge Age	Total Raw Score (sum step 1)	Sens. Score	Sens. Rank
144	Culvert; Mile: 10.65, Type: Circular, Size: 24	N/A	N/A	–	N/A	N/A	N/A	N/A	N/A	N/A	–	–	Minimal
145	Culvert; Mile: 10.79, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
146	Culvert; Mile: 10.88, Type: Arch, Size: 8's x 5'r	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	8	3	Moderate
147	Culvert; Mile: 10.95, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	8	3	Moderate
148	Culvert; Mile: 11.22, Type: Circular, Size: 18	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
149	Culvert; Mile: 11.26, Type: Arch, Size: 4's x 3'r	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	8	3	Moderate
150	Culvert; Mile: 11.31, Type: ?, Size: ?	N/A	N/A	–	N/A	N/A	N/A	N/A	N/A	N/A	–	–	Minimal
151	Culvert; Mile: 11.43, Type: Arch, Size: 4's x 3'r	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
152	Culvert; Mile: 11.44, Type: Arch, Size: 5's x 4'r	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
153	Culvert; Mile: 11.51, Type: Circular, Size: 24	N/A	N/A	–	N/A	N/A	N/A	N/A	N/A	N/A	–	–	Minimal
154	Culvert; Mile: 11.58, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	8	3	Moderate
155	Culvert; Mile: 11.98, Type: Arch, Size: 4's x 3'r	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
156	Culvert; Mile: 12.01, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal

Table F-7 (continued). Transportation Sensitivity at Colonial National Historical Park, Virginia.

ID	Transportation	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protect Engineer. (Q6)	Bridge Clearance	Bridge Scour Rating	Bridge Condition	Bridge Age	Total Raw Score (sum step 1)	Sens. Score	Sens. Rank
157	Culvert; Mile: 12.1, Type: Drop inlets (9), Size: varies	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	8	3	Moderate
158	Culvert; Mile: 12.3, Type: Circular, Size: 24	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	6	2	Low
159	Culvert; Mile: 12.4, Type: Circular, Size: 18	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
160	Culvert; Mile: 13.4, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
161	Culvert; Mile: 13.6, Type: Circular, Size: 36	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
162	Culvert; Mile: 13.69, Type: Circular, Size: 18/24	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	8	3	Moderate
163	Culvert; Mile: 13.87, Type: No Data type, Size: ?	N/A	N/A	–	N/A	N/A	N/A	N/A	N/A	N/A	–	–	N/A
164	Culvert; Mile: 13.93, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	8	3	Moderate
165	Culvert; Mile: 13.98, Type: ?, Size: ?	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
166	Culvert; Mile: 14.23, Type: Box, Size: 8's x 4'r	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	8	3	Moderate
167	Culvert; Mile: 14.32, Type: Arch, Size: 3's x 2'r	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	8	3	Moderate
168	Culvert; Mile: 14.44, Type: Circular, Size: 24	N/A	N/A	–	N/A	N/A	N/A	N/A	N/A	N/A	–	–	Minimal
169	Culvert; Mile: 14.58, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal

Table F-7 (continued). Transportation Sensitivity at Colonial National Historical Park, Virginia.

ID	Transportation	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protect Engineer. (Q6)	Bridge Clearance	Bridge Scour Rating	Bridge Condition	Bridge Age	Total Raw Score (sum step 1)	Sens. Score	Sens. Rank
170	Culvert; Mile: 14.74, Type: Circular, Size: 18	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
171	Culvert; Mile: 14.8, Type: Circular, Size: 18	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
172	Culvert; Mile: 14.84, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
173	Culvert; Mile: 15.15, Type: Circular, Size: 36	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
174	Culvert; Mile: 15.32, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
175	Culvert; Mile: 16.07, Type: Circular, Size: 24	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	8	3	Moderate
176	Culvert; Mile: 16.12, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	8	3	Moderate
177	Culvert; Mile: 16.18, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	8	3	Moderate
178	Culvert; Mile: 16.4, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
179	Culvert; Mile: 16.89, Type: Circular, Size: 18	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
180	Culvert; Mile: 17.26, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
181	Culvert; Mile: 17.48, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	6	2	Low
182	Culvert; Mile: 17.61, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	6	2	Low
183	Culvert; Mile: 18.01, Type: ?, Size: ?	N/A	N/A	–	N/A	N/A	N/A	N/A	N/A	N/A	–	–	Minimal

Table F-7 (continued). Transportation Sensitivity at Colonial National Historical Park, Virginia.

ID	Transportation	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protect Engineer. (Q6)	Bridge Clearance	Bridge Scour Rating	Bridge Condition	Bridge Age	Total Raw Score (sum step 1)	Sens. Score	Sens. Rank
184	Culvert; Mile: 18.45, Type: Box, Size: 10's x 7'r	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	6	2	Low
185	Culvert; Mile: 18.61, Type: Circular, Size: 24	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
186	Culvert; Mile: 18.69, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	6	2	Low
187	Culvert; Mile: 19.01, Type: Box, Size: 10's x 10'r?	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	8	3	Moderate
188	Culvert; Mile: 19.84, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
189	Culvert; Mile: 19.89, No data on type	N/A	N/A	–	N/A	N/A	N/A	N/A	N/A	N/A	N/A	–	N/A
190	Culvert; Mile: 2.13, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	6	2	Low
191	Culvert; Mile: 2.28, Type: ?, Size: ?	N/A	N/A	–	N/A	N/A	N/A	N/A	N/A	N/A	–	–	Minimal
192	Culvert; Mile: 2.67, Type: Circular, Size: 18	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
193	Culvert; Mile: 2.74, Type: Arch, Size: 14's x 6.5'r	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	6	2	Low
194	Culvert; Mile: 20, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	6	2	Low
195	Culvert; Mile: 20.07, Type: Circular, Size: 12	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	6	2	Low
196	Culvert; Mile: 20.12, Type: ?, Size: ?	N/A	N/A	–	N/A	N/A	N/A	N/A	N/A	N/A	–	–	N/A
197	Culvert; Mile: 20.2, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	6	2	Low

Table F-7 (continued). Transportation Sensitivity at Colonial National Historical Park, Virginia.

ID	Transportation	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protect Engineer. (Q6)	Bridge Clearance	Bridge Scour Rating	Bridge Condition	Bridge Age	Total Raw Score (sum step 1)	Sens. Score	Sens. Rank
198	Culvert; Mile: 20.39, Type: Circular, Size: 24	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	8	3	Moderate
199	Culvert; Mile: 20.6, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
200	Culvert; Mile: 20.68, Type: Circular, Size: 15/24	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
201	Culvert; Mile: 20.95, Type: Circular, Size: 12	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	6	2	Low
202	Culvert; Mile: 20.96, Type: Circular, Size: 18	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
203	Culvert; Mile: 21.8, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
204	Culvert; Mile: 21.9, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	8	3	Moderate
205	Culvert; Mile: 3.1, Type: Circular, Size: 30	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
206	Culvert; Mile: 3.22, Type: Circular, Size: 18	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
207	Culvert; Mile: 3.41, Type: Circular, Size: 18	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
208	Culvert; Mile: 3.53, Type:, Size:	N/A	N/A	–	N/A	N/A	N/A	N/A	N/A	N/A	–	–	Minimal
209	Culvert; Mile: 4.4, Type: Circular, Size: 18	N/A	N/A	–	N/A	N/A	N/A	N/A	N/A	N/A	–	–	Minimal
210	Culvert; Mile: 4.49, Type: Circular, Size: 18	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
211	Culvert; Mile: 4.74, Type: Circular, Size: 18	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High

Table F-7 (continued). Transportation Sensitivity at Colonial National Historical Park, Virginia.

ID	Transportation	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protect Engineer. (Q6)	Bridge Clearance	Bridge Scour Rating	Bridge Condition	Bridge Age	Total Raw Score (sum step 1)	Sens. Score	Sens. Rank
212	Culvert; Mile: 5.13, Type: Circular, Size: 24	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
213	Culvert; Mile: 5.23, Type: Circular, Size: 18	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
214	Culvert; Mile: 6.21, Type: Circular, Size: 18	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
215	Culvert; Mile: 6.4, Type: Circular, Size: 24	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	6	2	Low
216	Culvert; Mile: 6.43, Type: Circular, Size: 15	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
217	Culvert; Mile: 6.48, Type: Circular, Size: 36	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
218	Culvert; Mile: 6.55, Type: Circular, Size: 18/15	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	6	2	Low
219	Culvert; Mile: 6.89, Type: Pipe Arch, Size: 5's x 2.5r	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
220	Culvert; Mile: 6.93, Type: Circular, Size: 12	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	6	2	Low
221	Culvert; Mile: 7.38, Type: Circular, Size: 30	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	8	3	Moderate
222	Culvert; Mile: 7.88, Type: Circular, Size: 18	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
223	Culvert; Mile: 8.01, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
224	Culvert; Mile: 8.26, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
225	Culvert; Mile: 8.35, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal

Table F-7 (continued). Transportation Sensitivity at Colonial National Historical Park, Virginia.

ID	Transportation	Flood Damage Potential (Elevated) (Q2)	Storm Resist (Q3)	Condition (Q4)	Historical Damage (Q5)	Protect Engineer. (Q6)	Bridge Clearance	Bridge Scour Rating	Bridge Condition	Bridge Age	Total Raw Score (sum step 1)	Sens. Score	Sens. Rank
226	Culvert; Mile: 8.56, Type: Arch, Size: 4's x 3'r	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	6	2	Low
227	Culvert; Mile: 8.58, Type: Arch, Size: 4's x 3'r	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	13	4	High
228	Culvert; Mile: 8.77, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
229	Culvert; Mile: 8.89, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	6	2	Low
230	Culvert; Mile: 8.98, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
231	Culvert; Mile: 9, Type: Arch, Size: 16's x 8'r	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	8	3	Moderate
232	Culvert; Mile: 9.05, Type: Circular, Size: 18	N/A	N/A	–	N/A	N/A	N/A	N/A	N/A	N/A	–	–	Minimal
233	Culvert; Mile: 9.39, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
234	Culvert; Mile: 9.42, Type: Circular, Size: 24	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	8	3	Moderate
235	Culvert; Mile: 9.62, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
236	Culvert; Mile: 9.74, Type: Circular, Size: 18	N/A	N/A	–	N/A	N/A	N/A	N/A	N/A	N/A	–	–	Minimal
237	Culvert; Mile: 9.8, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
238	Culvert; Mile: 9.86, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	5	1	Minimal
239	Culvert; Mile: 9.88, Type: Circular, Size: 18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	6	2	Low

Table F-8. Facilities Transportation Vulnerability at Colonial National Historical Park, Virginia.

ID	Transportation	ExpRaw_ 2020/50	ExpBin_ 2020/50	ExpRank_ 2020/50	ExpRaw_ 2100	ExpBin_2100	ExpRank_ 2100	Sens_Raw	Sens _Bin	Sens_ Rank	VulBin_2050	VulRank_ 2050	VulRaw_2100	VulBin_2100	VulRank_ 2100
1	COLO PKWY: Jamestown: Start of Road to Just East of Powhatan Creek Bridge	11	3	Moderate	11	3	Moderate	7.0	2	Low	2	Low	5	2	Low
2	COLO PKWY: Jamestown: Just East of Powhatan Creek Bridge to Colonial Pkwy Real Estate Parking	11	3	Moderate	11	3	Moderate	8.5	3	Moderate	3	Moderate	6	3	Moderate
3	COLO PKWY: Jamestown: Colonial Pkwy Real Estate Parking to Just North of College Creek Bridge	14	4	High	14	4	High	8.5	3	Moderate	4	High	7	4	High
4	COLO PKWY: Jamestown: Just North of College Creek Bridge to Just North of Halfway Creek Bridge	5	1	Minimal	5	1	Minimal	10.0	3	Moderate	2	Low	4	2	Low
5	COLO PKWY: Central Pkwy: Just North of Halfway Creek Bridge to PKWY Palisades Great Oaks Parking	8	2	Low	8	2	Low	8.5	3	Moderate	2	Low	5	2	Low
6	COLO PKWY: Central Pkwy: Colonial Pkwy Palisades Great Oaks Parking to I-64	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
7	COLO PKWY: Central Pkwy: I-64 to Colonial Pkwy Jones Mill Parking	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
8	COLO PKWY: Central Pkwy: Colonial Pkwy Jones Mill Parking to Just West of Kings Creek Bridge	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
9	COLO PKWY: Yorktown: Just West of Kings Creek Bridge to Just West of Felgates Creek Bridge	8	2	Low	8	2	Low	10.0	3	Moderate	2	Low	5	2	Low
10	COLO PKWY: Yorktown: Just West of Felgates Creek Bridge to Just West of Indian Field Creek Bridge	8	2	Low	8	2	Low	10.0	3	Moderate	2	Low	5	2	Low
11	COLO PKWY: Yorktown: Just West of Indian Field Creek Bridge to Colonial Pkwy Yorktown River Parking	11	3	Moderate	11	3	Moderate	13.0	4	High	4	High	7	4	High
12	COLO PKWY: Yorktown: Colonial Pkwy Yorktown River Parking to Mine Depot Overpass	17	4	High	17	4	High	10.0	3	Moderate	4	High	7	4	High
13	COLO PKWY: Yorktown: Mine Depot Overpass to Old Williamsburg Road Bridge	8	2	Low	8	2	Low	10.0	3	Moderate	2	Low	5	2	Low
14	COLO PKWY: Yorktown: Old Williamsburg Road Bridge to US 17	5	1	Minimal	5	1	Minimal	10.0	3	Moderate	2	Low	4	2	Low
15	COLO PKWY: Yorktown: US 17 to East End of Road	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
16	Halfway Creek Bridge #4290-022P	17	4	High	17	4	High	14.5	3	Moderate	4	High	7	4	High
17	Powhatan Creek Bridge	17	4	High	17	4	High	14.5	3	Moderate	4	High	7	4	High
18	Isthmus Bridge #4290-026P	20	4	High	20	4	High	15.0	2	Low	3	Moderate	6	3	Moderate
19	Mill Creek Bridge #4290-024P	17	4	High	17	4	High	12.0	2	Low	3	Moderate	6	3	Moderate
20	Kings Creek Bridge #4290-012P	17	4	High	17	4	High	13.5	2	Low	3	Moderate	6	3	Moderate
21	Penniman Road Bridge	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
22	Hubbards Lane Bridge #4290-014P	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
23	Yorktown Creek Bridge #4290-005P	8	2	Low	8	2	Low	14.7	3	Moderate	2	Low	5	2	Low
24	U.S. Route 17 Parkway Bridge	5	1	Minimal	5	1	Minimal	–	–	–	1	Minimal	1	1	Minimal
25	North Pier Naval Access Road Bridge #4290-008	5	1	Minimal	5	1	Minimal	11.0	2	Low	2	Low	3	2	Low
26	Mine Depot Overpass #4290-009	8	2	Low	8	2	Low	12.7	2	Low	2	Low	4	2	Low
27	Indian Field Creek Bridge #4290-010P	20	4	High	20	4	High	13.5	2	Low	3	Moderate	6	3	Moderate
28	Felgates Creek Bridge #4290-011P	20	4	High	20	4	High	13.7	2	Low	3	Moderate	6	3	Moderate
29	Old Williamsburg Road Bridge #4290-007	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal

Table F-8 (continued). Facilities Transportation Vulnerability at Colonial National Historical Park, Virginia.

ID	Transportation	ExpRaw_ 2020/50	ExpBin_ 2020/50	ExpRank_ 2020/50	ExpRaw_ 2100	ExpBin_2100	ExpRank_ 2100	Sens_Raw	Sens _Bin	Sens_ Rank	VulBin_2050	VulRank_ 2050	VulRaw_2100	VulBin_2100	VulRank_ 2100
30	Parkway Drive Bridge #4290-016	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
31	Page Street Bridge #4290-018P	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
32	Lafayette Street Bridge #4290-019P	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
33	Newport Avenue Bridge	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
34	C&O Railroad Bridge	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
35	College Creek Bridge #4290-023P	17	4	High	17	4	High	11.8	2	Low	3	Moderate	6	3	Moderate
36	Jamestown Access Road Rt 011	14	3	Moderate	14	3	Moderate	13.0	4	High	4	High	7	4	High
37	Island Drive Short Loop Rt 501A	14	3	Moderate	14	3	Moderate	11.5	3	Moderate	3	Moderate	6	3	Moderate
38	Island Drive (Outer Loop) Rt 501B	14	3	Moderate	17	4	High	11.5	3	Moderate	3	Moderate	7	4	High
39	Pitch and Tar Bridge	17	4	High	17	4	High	16.0	3	Moderate	4	High	7	4	High
40	Blacks Point Bridge #4290-029P	20	4	High	20	4	High	18.8	3	Moderate	4	High	7	4	High
41	Travis Graveyard Bridge #4290-030P	20	4	High	20	4	High	12.8	2	Low	3	Moderate	6	3	Moderate
42	Long Bridge #4290-031P	20	4	High	20	4	High	15.8	3	Moderate	4	High	7	4	High
43	Surrender Rd Rt 225	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
44	Grand French Battery Road Rt 0101	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
45	Redoubt Access Rd Rt 103	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
46	Moore House Access Rd Rt 104	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
47	Untouched Redoubt Rt 100	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
48	Washingtons Troop Loop Rt 224	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
49	French Encampment Tour Rd Rt 226	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
50	Battlefield Tour Rt 500	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
51	Beaverdam Creek Bridge	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
52	U.S. Route 17 Tour Road Bridge #4290-004P	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
53	Yorktown Visitor Center Parking Lot Rt 0901	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
54	Redoubt 9, 10 Access Road Parking Rt 0902	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
55	Untouched Redoubt Loop/Parking Rt 0903	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
56	Glasshouse Access Rd Parking Rt 0904	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
57	Fusiliers Parking Rt 0905	8	2	Low	8	2	Low	5.5	2	Low	2	Low	4	2	Low
58	Colonial Parkway NWS Parking Rt 0906	8	2	Low	8	2	Low	8.5	3	Moderate	2	Low	5	2	Low
59	Colonial Parkway Yorktown River Parking Rt 0907	8	2	Low	8	2	Low	5.5	2	Low	2	Low	4	2	Low
60	Colonial Parkway Powhatan Parking Rt 0908	8	2	Low	8	2	Low	8.5	3	Moderate	2	Low	5	2	Low
61	Short Loop Rd (On Surrender) Rt 502	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
62	Yorktown East Tour Road Rt 503	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
63	Colonial Parkway Indian Field Creek Parking Rt 0909	8	2	Low	8	2	Low	8.5	3	Moderate	2	Low	5	2	Low
64	Colonial Parkway Bellfield Plantation Parking Rt 0910	8	2	Low	8	2	Low	5.5	2	Low	2	Low	4	2	Low
65	Colonial Parkway Ringfield Plantation Parking Rt 0911	11	3	Moderate	11	3	Moderate	8.5	3	Moderate	3	Moderate	6	3	Moderate
66	Colonial Parkway Jones Mill Parking Rt 0912	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
67	Colonial Parkway Palisades Great Oaks Parking Rt 0913	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
68	Colonial Parkway Great Neck Parking Rt 0914	8	2	Low	8	2	Low	8.5	3	Moderate	2	Low	5	2	Low

Table F-8 (continued). Facilities Transportation Vulnerability at Colonial National Historical Park, Virginia.

ID	Transportation	ExpRaw_ 2020/50	ExpBin_ 2020/50	ExpRank_ 2020/50	ExpRaw_ 2100	ExpBin_2100	ExpRank_ 2100	Sens_Raw	Sens _Bin	Sens_ Rank	VulBin_2050	VulRank_ 2050	VulRaw_2100	VulBin_2100	VulRank_ 2100
69	Colonial Parkway College Creek Parking Rt 0915	8	2	Low	8	2	Low	8.5	3	Moderate	2	Low	5	2	Low
70	Colonial Parkway James River Parking Rt 0916	11	3	Moderate	11	3	Moderate	8.5	3	Moderate	3	Moderate	6	3	Moderate
71	Colonial Parkway Archers Hope Parking Rt 0917	5	1	Minimal	5	1	Minimal	8.5	3	Moderate	2	Low	4	2	Low
72	Colonial Parkway Glebe Land Parking Rt 0918	11	3	Moderate	11	3	Moderate	8.5	3	Moderate	3	Moderate	6	3	Moderate
73	Colonial Parkway Real Estate Parking Rt 0919	8	2	Low	8	2	Low	8.5	3	Moderate	2	Low	5	2	Low
74	Colonial Parkway Neck O Land Parking Rt 0920	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
75	Jamestown Entrance Parking Rt 0921	11	3	Moderate	11	3	Moderate	5.5	2	Low	2	Low	5	2	Low
76	Yorktown Visitor Parking (Church St) Rt 0922	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
77	Monument To Victory and Alliance Parking Rt 0923	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
78	Yorktown Beach Parking Rt 0924	14	4	High	14	4	High	8.5	3	Moderate	4	High	7	4	High
79	Cornwallis Cave Parking Rt 0925	17	4	High	17	4	High	11.5	3	Moderate	4	High	7	4	High
80	Yorktown National Cemetery Second Siege Parking RT 0926	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
81	Grand French Battery Parking Rt 0927	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
82	Moore House Parking RT 0928	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
83	Surrender Field Access Parking Rt 0929	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
84	Washington s Headquarters Parking Rt 0930	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
85	French Cemetery Parking Rt 0931	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
86	Jamestown Visitor Parking Rt 0950	11	3	Moderate	11	3	Moderate	5.5	2	Low	2	Low	5	2	Low
87	Jamestown Maintenance Parking Rt 0990	11	3	Moderate	11	3	Moderate	10.0	3	Moderate	3	Moderate	6	3	Moderate
88	YMA Parking Rt 999	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
89	Crawford Road Bridge #4290-003	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
90	Yorktown Maintenance Utility Road Rt 400	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
91	Yortown Maintenance Area Residence Rd Rt 401	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
92	Yorktown V. C. Access Rd Rt 010	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
93	Neck O Land Visitor Contact Parking Rt 0932	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
94	US Route 17 Access Rt 105A	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
95	US Rt 17 Access Rd Rt105B	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
96	Fusiliers Rd Rt 106	8	2	Low	8	2	Low	5.5	2	Low	2	Low	4	2	Low
97	Cheatam Annex Access Rt 107A	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
98	Cheatam Annex Access Rt 107B	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
99	Queens Lake Access Rd Rt 108A	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
100	Queens Lake Access Rd Rt 108B	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
101	Parkway Drive Access Rd Rt109A	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
102	Parkway Drive Access Rd Rt109B	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
103	Tazewell Hall Avenue Access Rd Rt 110A	8	2	Low	8	2	Low	8.5	3	Moderate	2	Low	5	2	Low
104	State Route 199 Interchange A Rt 0111A	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
105	State Route 199 Interchange Rt 0111B	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
106	State Route 199 Interchange Rt 0111C	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal

Table F-8 (continued). Facilities Transportation Vulnerability at Colonial National Historical Park, Virginia.

ID	Transportation	ExpRaw_ 2020/50	ExpBin_ 2020/50	ExpRank_ 2020/50	ExpRaw_ 2100	ExpBin_2100	ExpRank_ 2100	Sens_Raw	Sens _Bin	Sens_ Rank	VulBin_2050	VulRank_ 2050	VulRaw_2100	VulBin_2100	VulRank_ 2100
107	State Route 199 Interchange Rt 0111D	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
108	Jamestown Maintenance Rd Rt 403	8	2	Low	8	2	Low	10.0	3	Moderate	2	Low	5	2	Low
109	Surrender Field Access Rd Rt 102	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
110	Colonial Parkway Newport Avenue Access Rt 112A	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
111	Colonial Parkway Newport Avenue Access 112B	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
112	Cape Henry Parking Lot Rt 0940	5	1	Minimal	5	1	Minimal	10.0	3	Moderate	2	Low	4	2	Low
113	APVA Access Rd Rt 0402	11	3	Moderate	11	3	Moderate	11.5	3	Moderate	3	Moderate	6	3	Moderate
114	Wormley Pond Bridge	11	3	Moderate	11	3	Moderate	15.9	3	Moderate	3	Moderate	6	3	Moderate
115	Paper Mill Creek Culvert #1 4290-040	14	3	Moderate	14	3	Moderate	11.5	2	Low	2	Low	5	2	Low
116	Williamsburg Tunnel #4290-033P	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
117	YMA Fueling System	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
118	JMA Fueling System	8	2	Low	8	2	Low	11.5	3	Moderate	2	Low	5	2	Low
119	Yorktown Automatic Tank Gauging SiteSentinel SSIIC	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
120	Jamestown V.C. Pedestrian Bridge 4290-039T	17	4	High	17	4	High	7.0	2	Low	3	Moderate	6	3	Moderate
121	Yorktown Pedestrian Bridge	5	1	Minimal	5	1	Minimal	–	–	–	1	Minimal	1	1	Minimal
122	York River Shoreline	17	4	High	17	4	High	14.5	4	High	4	High	8	4	High
123	James River Shoreline	17	4	High	20	4	High	14.5	4	High	4	High	8	4	High
124	Jamestown Island Shoreline	17	4	High	17	4	High	14.5	4	High	4	High	8	4	High
125	Swans Point Shoreline	11	3	Moderate	14	3	Moderate	13.0	4	High	4	High	7	4	High
126	Culvert; Mile: 0, Type: Circular, Size: 48	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
127	Culvert; Mile: 0, Type: Circular/Arch, Size: 48 to 44 x 30	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
128	Culvert; Mile: 0.38, Type: Circular, Size: 36	5	1	Minimal	5	1	Minimal	8.0	3	Moderate	2	Low	4	2	Low
129	Culvert; Mile: 0.41, Type: Circular, Size: 12	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
130	Culvert; Mile: 0.83, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
131	Culvert; Mile: 1.16, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
132	Culvert; Mile: 1.3, Type: Pipe Arch, Size: 4's x 3'r	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
133	Culvert; Mile: 1.52, Type: Circular, Size: 18	14	3	Moderate	14	3	Moderate	5.0	1	Minimal	2	Low	4	2	Low
134	Culvert; Mile: 1.53, Type: Circular, Size: 18	14	3	Moderate	14	3	Moderate	5.0	1	Minimal	2	Low	4	2	Low
135	Culvert; Mile: 1.62, Type: Arch, Size: 8's x 5'r	14	3	Moderate	14	3	Moderate	5.0	1	Minimal	2	Low	4	2	Low
136	Culvert; Mile: 1.77, Type: Circular, Size: ?	5	1	Minimal	5	1	Minimal	–	–	–	1	Minimal	1	1	Minimal
137	Culvert; Mile: 1.8, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
138	Culvert; Mile: 1.85, Type: Circular, Size: 12-15	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
139	Culvert; Mile: 10.1, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
140	Culvert; Mile: 10.2, Type: Circular, Size: 30	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
141	Culvert; Mile: 10.31, Type: Arch, Size: 4's x 3'r	5	1	Minimal	5	1	Minimal	8.0	3	Moderate	2	Low	4	2	Low
142	Culvert; Mile: 10.35, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
143	Culvert; Mile: 10.5, Type: Arch, Size: 6's x 3'r	5	1	Minimal	5	1	Minimal	6.0	2	Low	2	Low	3	2	Low
144	Culvert; Mile: 10.65, Type: Circular, Size: 24	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
145	Culvert; Mile: 10.79, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal

Table F-8 (continued). Facilities Transportation Vulnerability at Colonial National Historical Park, Virginia.

ID	Transportation	ExpRaw_ 2020/50	ExpBin_ 2020/50	ExpRank_ 2020/50	ExpRaw_ 2100	ExpBin_2100	ExpRank_ 2100	Sens_Raw	Sens _Bin	Sens_ Rank	VulBin_2050	VulRank_ 2050	VulRaw_2100	VulBin_2100	VulRank_ 2100
146	Culvert; Mile: 10.88, Type: Arch, Size: 8's x 5'r	5	1	Minimal	5	1	Minimal	8.0	3	Moderate	2	Low	4	2	Low
147	Culvert; Mile: 10.95, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	8.0	3	Moderate	2	Low	4	2	Low
148	Culvert; Mile: 11.22, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
149	Culvert; Mile: 11.26, Type: Arch, Size: 4's x 3'r	5	1	Minimal	5	1	Minimal	8.0	3	Moderate	2	Low	4	2	Low
150	Culvert; Mile: 11.31, Type: ?, Size: ?	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
151	Culvert; Mile: 11.43, Type: Arch, Size: 4's x 3'r	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
152	Culvert; Mile: 11.44, Type: Arch, Size: 5's x 4'r	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
153	Culvert; Mile: 11.51, Type: Circular, Size: 24	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
154	Culvert; Mile: 11.58, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	8.0	3	Moderate	2	Low	4	2	Low
155	Culvert; Mile: 11.98, Type: Arch, Size: 4's x 3'r	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
156	Culvert; Mile: 12.01, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
157	Culvert; Mile: 12.1, Type: Drop inlets (9), Size: varies	5	1	Minimal	5	1	Minimal	8.0	3	Moderate	2	Low	4	2	Low
158	Culvert; Mile: 12.3, Type: Circular, Size: 24	5	1	Minimal	5	1	Minimal	6.0	2	Low	2	Low	3	2	Low
159	Culvert; Mile: 12.4, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
160	Culvert; Mile: 13.4, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
161	Culvert; Mile: 13.6, Type: Circular, Size: 36	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
162	Culvert; Mile: 13.69, Type: Circular, Size: 18/24	5	1	Minimal	5	1	Minimal	8.0	3	Moderate	2	Low	4	2	Low
163	Culvert; Mile: 13.87, Type: No type data, Size:	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
164	Culvert; Mile: 13.93, Type: Circular, Size: 18	8	2	Low	8	2	Low	8.0	3	Moderate	2	Low	5	2	Low
165	Culvert; Mile: 13.98, Type: ?, Size: ?	8	2	Low	8	2	Low	5.0	1	Minimal	2	Low	3	2	Low
166	Culvert; Mile: 14.23, Type: Box, Size: 8's x 4'r	14	3	Moderate	14	3	Moderate	8.0	3	Moderate	3	Moderate	6	3	Moderate
167	Culvert; Mile: 14.32, Type: Arch, Size: 3's x 2'r	5	1	Minimal	5	1	Minimal	8.0	3	Moderate	2	Low	4	2	Low
168	Culvert; Mile: 14.44, Type: Circular, Size: 24	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
169	Culvert; Mile: 14.58, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
170	Culvert; Mile: 14.74, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
171	Culvert; Mile: 14.8, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
172	Culvert; Mile: 14.84, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
173	Culvert; Mile: 15.15, Type: Circular, Size: 36	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
174	Culvert; Mile: 15.32, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
175	Culvert; Mile: 16.07, Type: Circular, Size: 24	5	1	Minimal	5	1	Minimal	8.0	3	Moderate	2	Low	4	2	Low
176	Culvert; Mile: 16.12, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	8.0	3	Moderate	2	Low	4	2	Low
177	Culvert; Mile: 16.18, Type: Circular, Size: 18	20	4	High	20	4	High	8.0	3	Moderate	4	High	7	4	High
178	Culvert; Mile: 16.4, Type: Circular, Size: 18	8	2	Low	8	2	Low	5.0	1	Minimal	2	Low	3	2	Low
179	Culvert; Mile: 16.89, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
180	Culvert; Mile: 17.26, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
181	Culvert; Mile: 17.48, Type: Circular, Size: 18	14	3	Moderate	14	3	Moderate	6.0	2	Low	2	Low	5	2	Low
182	Culvert; Mile: 17.61, Type: Circular, Size: 18	8	2	Low	8	2	Low	6.0	2	Low	2	Low	4	2	Low
183	Culvert; Mile: 18.01, Type: ?, Size: ?	8	2	Low	8	2	Low	–	–	–	1	Minimal	2	1	Minimal
184	Culvert; Mile: 18.45, Type: Box, Size: 10's x 7'r	8	2	Low	8	2	Low	6.0	2	Low	2	Low	4	2	Low

Table F-8 (continued). Facilities Transportation Vulnerability at Colonial National Historical Park, Virginia.

ID	Transportation	ExpRaw_ 2020/50	ExpBin_ 2020/50	ExpRank_ 2020/50	ExpRaw_ 2100	ExpBin_2100	ExpRank_ 2100	Sens_Raw	Sens _Bin	Sens_ Rank	VulBin_2050	VulRank_ 2050	VulRaw_2100	VulBin_2100	VulRank_ 2100
185	Culvert; Mile: 18.61, Type: Circular, Size: 24	8	2	Low	8	2	Low	5.0	1	Minimal	2	Low	3	2	Low
186	Culvert; Mile: 18.69, Type: Circular, Size: 18	8	2	Low	8	2	Low	6.0	2	Low	2	Low	4	2	Low
187	Culvert; Mile: 19.01, Type: Box, Size: 10's x 10'r?	14	3	Moderate	14	3	Moderate	8.0	3	Moderate	3	Moderate	6	3	Moderate
188	Culvert; Mile: 19.84, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
189	Culvert; Mile: 19.89, No data on type	5	1	Minimal	5	1	Minimal	–	–	–	1	Minimal	1	1	Minimal
190	Culvert; Mile: 2.13, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	6.0	2	Low	2	Low	3	2	Low
191	Culvert; Mile: 2.28, Type: ?, Size: ?	8	2	Low	8	2	Low	–	–	–	1	Minimal	2	1	Minimal
192	Culvert; Mile: 2.67, Type: Circular, Size: 18	11	3	Moderate	11	3	Moderate	13.0	4	High	4	High	7	4	High
193	Culvert; Mile: 2.74, Type: Arch, Size: 14's x 6.5'r	17	4	High	17	4	High	6.0	2	Low	3	Moderate	6	3	Moderate
194	Culvert; Mile: 20, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	6.0	2	Low	2	Low	3	2	Low
195	Culvert; Mile: 20.07, Type: Circular, Size: 12	5	1	Minimal	5	1	Minimal	6.0	2	Low	2	Low	3	2	Low
196	Culvert; Mile: 20.12, Type: No data, Size: ?	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
197	Culvert; Mile: 20.2, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	6.0	2	Low	2	Low	3	2	Low
198	Culvert; Mile: 20.39, Type: Circular, Size: 24	8	2	Low	8	2	Low	8.0	3	Moderate	2	Low	5	2	Low
199	Culvert; Mile: 20.6, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
200	Culvert; Mile: 20.68, Type: Circular, Size: 15/24	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
201	Culvert; Mile: 20.95, Type: Circular, Size: 12	8	2	Low	8	2	Low	6.0	2	Low	2	Low	4	2	Low
202	Culvert; Mile: 20.96, Type: Circular, Size: 18	8	2	Low	8	2	Low	13.0	4	High	3	Moderate	6	3	Moderate
203	Culvert; Mile: 21.8, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
204	Culvert; Mile: 21.9, Type: Circular, Size: 18	8	2	Low	8	2	Low	8.0	3	Moderate	2	Low	5	2	Low
205	Culvert; Mile: 3.1, Type: Circular, Size: 30	14	3	Moderate	14	3	Moderate	13.0	4	High	4	High	7	4	High
206	Culvert; Mile: 3.22, Type: Circular, Size: 18	11	3	Moderate	11	3	Moderate	13.0	4	High	4	High	7	4	High
207	Culvert; Mile: 3.41, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
208	Culvert; Mile: 3.53, Type: ?, Size: ?	8	2	Low	8	2	Low	–	–	–	1	Minimal	2	1	Minimal
209	Culvert; Mile: 4.4, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
210	Culvert; Mile: 4.49, Type: Circular, Size: 18	11	3	Moderate	11	3	Moderate	13.0	4	High	4	High	7	4	High
211	Culvert; Mile: 4.74, Type: Circular, Size: 18	11	3	Moderate	11	3	Moderate	13.0	4	High	4	High	7	4	High
212	Culvert; Mile: 5.13, Type: Circular, Size: 24	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
213	Culvert; Mile: 5.23, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
214	Culvert; Mile: 6.21, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
215	Culvert; Mile: 6.4, Type: Circular, Size: 24	5	1	Minimal	5	1	Minimal	6.0	2	Low	2	Low	3	2	Low
216	Culvert; Mile: 6.43, Type: Circular, Size: 15	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
217	Culvert; Mile: 6.48, Type: Circular, Size: 36	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
218	Culvert; Mile: 6.55, Type: Circular, Size: 18/15	5	1	Minimal	5	1	Minimal	6.0	2	Low	2	Low	3	2	Low
219	Culvert; Mile: 6.89, Type: Pipe Arch, Size: 5's x 2.5r	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
220	Culvert; Mile: 6.93, Type: Circular, Size: 12	8	2	Low	8	2	Low	6.0	2	Low	2	Low	4	2	Low
221	Culvert; Mile: 7.38, Type: Circular, Size: 30	5	1	Minimal	5	1	Minimal	8.0	3	Moderate	2	Low	4	2	Low
222	Culvert; Mile: 7.88, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
223	Culvert; Mile: 8.01, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal

Table F-8 (continued). Facilities Transportation Vulnerability at Colonial National Historical Park, Virginia.

ID	Transportation	ExpRaw_ 2020/50	ExpBin_ 2020/50	ExpRank_ 2020/50	ExpRaw_ 2100	ExpBin_2100	ExpRank_ 2100	Sens_Raw	Sens _Bin	Sens_ Rank	VulBin_2050	VulRank_ 2050	VulRaw_2100	VulBin_2100	VulRank_ 2100
224	Culvert; Mile: 8.26, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
225	Culvert; Mile: 8.35, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
226	Culvert; Mile: 8.56, Type: Arch, Size: 4's x 3'r	5	1	Minimal	5	1	Minimal	6.0	2	Low	2	Low	3	2	Low
227	Culvert; Mile: 8.58, Type: Arch, Size: 4's x 3'r	5	1	Minimal	5	1	Minimal	13.0	4	High	2	Low	5	2	Low
228	Culvert; Mile: 8.77, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
229	Culvert; Mile: 8.89, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	6.0	2	Low	2	Low	3	2	Low
230	Culvert; Mile: 8.98, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
231	Culvert; Mile: 9, Type: Arch, Size: 16's x 8'r	5	1	Minimal	5	1	Minimal	8.0	3	Moderate	2	Low	4	2	Low
232	Culvert; Mile: 9.05, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
233	Culvert; Mile: 9.39, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
234	Culvert; Mile: 9.42, Type: Circular, Size: 24	5	1	Minimal	5	1	Minimal	8.0	3	Moderate	2	Low	4	2	Low
235	Culvert; Mile: 9.62, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
236	Culvert; Mile: 9.74, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	N/A	N/A	N/A	1	Minimal	1	1	Minimal
237	Culvert; Mile: 9.8, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
238	Culvert; Mile: 9.86, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	5.0	1	Minimal	1	Minimal	2	1	Minimal
239	Culvert; Mile: 9.88, Type: Circular, Size: 18	5	1	Minimal	5	1	Minimal	6.0	2	Low	2	Low	3	2	Low

Appendix G. Facility Assets Adaptive Capacity Assessment Data Set at Colonial National Historical Park.

Table G-1. Facilities structures adaptive capacity at Colonial National Historical Park, Virginia.

ID	Structures	Physical	Organizational	Social	Economic	Overlap	Flag - why?	AC_Adjusted	ACRank
12	Glasshouse Factory Ruins Shelter 42J630M4	Low	Moderate	Moderate	Moderate	Cultural and natural	yes talk to cultural	7	Moderate
59	Archer Cottage	Low	Moderate	Moderate	Moderate	Cultural and natural	–	7	Moderate
9	Glasshouse Factory	Low	Moderate	Moderate	Moderate	Cultural and natural	–	7	Moderate
60	Archer Cottage Outbuilding	High	Moderate	Moderate	Low	Cultural	–	8	Moderate
62	Jamestown Historic Research Center	Low	Moderate	High	Moderate	Cultural- pv	–	8	Moderate
6	Jamestown Maintenance Fire Cache / Storage	Low	Moderate	High	High	Cultural	–	9	Moderate
63	Jamestown Visitor Center	High	Moderate	Moderate	Moderate	–	–	9	Moderate
5	Jamestown Maintenance Office / Eq Storage	High	High	High	Low	–	–	10	High
72	Redoubts 9 & 10 Fortifications	High	High	High	Low	–	–	10	High
75	Fusilers & French Trench Fortifications	High	High	High	Moderate	–	–	11	High
76	Glasshouse Factory Support Building	High	High	High	Moderate	Cultural	–	11	High
61	Yorktown Beach Comfort Station	High	High	High	High	Cultural	–	12	High

Table G-2. Facilities transportation adaptive capacity at Colonial National Historical Park, Virginia.

ID	Transportation	Physical	Organizational	Social	Economic	Overlap	Flag - why?	AC_ Adjusted	AC RANK
1	COLO PKWY: Jamestown: Start of Road to Just East of Powhatan Creek Bridge	High	High	High	High	Commuter interest to maintain	–	12	High
2	COLO PKWY: Jamestown: Just East of Powhatan Creek Bridge to Colonial Pkwy Real Estate Parking	High	High	High	High	Commuter interest to maintain	–	12	High
3	COLO PKWY: Jamestown: Colonial Pkwy Real Estate Parking to Just North of College Creek Bridge	High	High	High	High	Commuter interest to maintain	–	12	High
4	COLO PKWY: Jamestown: Just North of College Creek Bridge to Just North of Halfway Creek Bridge	High	High	High	High	Commuter interest to maintain	–	12	High
5	COLO PKWY: Central Pkwy: Just North of Halfway Creek Bridge to PKWY Palisades Great Oaks Parking	High	High	High	High	Commuter interest to maintain	–	12	High
6	COLO PKWY: Central Pkwy: Colonial Pkwy Palisades Great Oaks Parking to I-64	Moderate	Moderate	Moderate	High	–	–	12	High
7	COLO PKWY: Central Pkwy: I-64 to Colonial Pkwy Jones Mill Parking	High	Low	Low	Low	Closed to public so no support	–	6	Low
8	COLO PKWY: Central Pkwy: Colonial Pkwy Jones Mill Parking to Just West of Kings Creek Bridge	High	Moderate	High	Low	Able to protect the road though not a priority NPS asset for LT cost coverage	Natural	9	Moderate

Table G-2 (continued). Facilities transportation adaptive capacity at Colonial National Historical Park, Virginia.

ID	Transportation	Physical	Organizational	Social	Economic	Overlap	Flag - why?	AC_ Adjusted	AC RANK
9	COLO PKWY: Yorktown: Just West of Kings Creek Bridge to Just West of Felgates Creek Bridge	High	Moderate	High	Low	Able to protect the road though not a priority NPS asset for LT cost coverage	Natural	9	Moderate
10	COLO PKWY: Yorktown: Just West of Felgates Creek Bridge to Just West of Indian Field Creek Bridge	High	Moderate	Moderate	Moderate	Commuter traffic not an issue	–	9	Moderate
11	COLO PKWY: Yorktown: Just West of Indian Field Creek Bridge to Colonial Pkwy Yorktown River Parking	High	Moderate	High	Low	Able to protect the road though not a priority NPS asset for LT cost coverage	Natural	9	Moderate
12	COLO PKWY: Yorktown: Colonial Pkwy Yorktown River Parking to Mine Depot Overpass	High	Moderate	High	Low	Able to protect the road though not a priority NPS asset for LT cost coverage	Natural	9	Moderate
13	COLO PKWY: Yorktown: Mine Depot Overpass to Old Williamsburg Road Bridge	High	Moderate	Moderate	Moderate	Commuter traffic not an issue	–	9	Moderate
14	COLO PKWY: Yorktown: Old Williamsburg Road Bridge to US 17	High	Moderate	Moderate	Moderate	Commuter traffic not an issue	–	9	Moderate
15	COLO PKWY: Yorktown: US 17 to East End of Road	High	Moderate	Moderate	Moderate	Commuter traffic not an issue	–	9	Moderate
16	Halfway Creek Bridge #4290-022P	High	Moderate	Moderate	Moderate	Commuter traffic not an issue	–	9	Moderate
17	Powhatan Creek Bridge	High	Moderate	Moderate	Moderate	–	–	9	Moderate
18	Isthmus Bridge #4290-026P	High	Moderate	High	Low	Able to protect the road though not a priority NPS asset for LT cost coverage	–	9	Moderate

Table G-2 (continued). Facilities transportation adaptive capacity at Colonial National Historical Park, Virginia.

ID	Transportation	Physical	Organizational	Social	Economic	Overlap	Flag - why?	AC_ Adjusted	AC RANK
19	Mill Creek Bridge #4290-024P	High	Moderate	High	Low	Able to protect the road though not a priority NPS asset for LT cost coverage	Natural	9	Moderate
20	Kings Creek Bridge #4290-012P	High	Moderate	Moderate	Moderate	Commuter traffic not an issue	–	9	Moderate
21	Penniman Road Bridge	High	Moderate	Moderate	Moderate	–	–	9	Moderate
22	Hubbards Lane Bridge #4290-014P	High	High	Low	Low	Low interest	–	8	Moderate
23	Yorktown Creek Bridge #4290-005P	High	Moderate	Moderate	Moderate	–	–	9	Moderate
25	North Pier Naval Access Road Bridge #4290-008	Moderate	Moderate	High	Moderate	Strong public use	–	9	Moderate
26	Mine Depot Overpass #4290-009	Moderate	Moderate	High	Moderate	Strong public use	–	9	Moderate
27	Indian Field Creek Bridge #4290-010P	High	Moderate	Moderate	Moderate	–	–	9	Moderate
28	Felgates Creek Bridge #4290-011P	High	Moderate	Moderate	Moderate	spans only access to James City Marina	–	9	Moderate
29	Old Williamsburg Road Bridge #4290-007	High	Moderate	Moderate	Moderate	–	–	9	Moderate
30	Parkway Drive Bridge #4290-016	High	Moderate	Moderate	Moderate	–	–	9	Moderate
31	Page Street Bridge #4290-018P	Moderate	Moderate	High	Moderate	–	–	9	Moderate
32	Lafayette Street Bridge #4290-019P	Moderate	Moderate	High	Moderate	–	–	9	Moderate
33	Newport Avenue Bridge	Moderate	Moderate	High	Moderate	–	–	9	Moderate
34	C&O Railroad Bridge	Moderate	Moderate	High	Moderate	Strong public use	–	9	Moderate

Table G-2 (continued). Facilities transportation adaptive capacity at Colonial National Historical Park, Virginia.

ID	Transportation	Physical	Organizational	Social	Economic	Overlap	Flag - why?	AC_ Adjusted	AC RANK
35	College Creek Bridge #4290-023P	Moderate	Moderate	High	Moderate	Strong public use	–	9	Moderate
36	Jamestown Access Road Rt 011	Moderate	Moderate	High	Moderate	Strong public use	–	9	Moderate
37	Island Drive Short Loop Rt 501A	High	Moderate	Moderate	Moderate	Not used by pubic, minimal value	–	9	Moderate
38	Island Drive (Outer Loop) Rt 501B	High	Moderate	Moderate	Moderate	–	–	9	Moderate
39	Pitch and Tar Bridge	High	Moderate	Moderate	Moderate	–	–	9	Moderate
40	Blacks Point Bridge #4290-029P	High	Moderate	Moderate	Moderate	–	–	9	Moderate
41	Travis Graveyard Bridge #4290-030P	Moderate	Moderate	High	Moderate	–	–	9	Moderate
42	Long Bridge #4290-031P	Moderate	Moderate	High	Moderate	–	–	9	Moderate
57	Fusiliers Parking Rt 0905	Moderate	Moderate	High	Moderate	–	–	9	Moderate
58	Colonial Parkway NWS Parking Rt 0906	Moderate	Moderate	High	Moderate	Strong public use	–	9	Moderate
59	Colonial Parkway Yorktown River Parking Rt 0907	High	Moderate	Moderate	Moderate	–	–	9	Moderate
60	Colonial Parkway Powhatan Parking Rt 0908	High	Moderate	Moderate	Moderate	–	–	9	Moderate
63	Colonial Parkway Indian Field Creek Parking Rt 0909	High	Moderate	Moderate	Moderate	–	–	9	Moderate
64	Colonial Parkway Bellfield Plantation Parking Rt 0910	High	Moderate	Moderate	Moderate	–	–	9	Moderate
65	Colonial Parkway Ringfield Plantation Parking Rt 0911	High	Moderate	Moderate	Moderate	Commuter traffic not an issue	–	9	Moderate
68	Colonial Parkway Great Neck Parking Rt 0914	High	Moderate	Moderate	Moderate	Commuter traffic not an issue	–	9	Moderate
69	Colonial Parkway College Creek Parking Rt 0915	High	High	High	High	Commuter interest to mainatin	–	12	High

Table G-2 (continued). Facilities transportation adaptive capacity at Colonial National Historical Park, Virginia.

ID	Transportation	Physical	Organizational	Social	Economic	Overlap	Flag - why?	AC_ Adjusted	AC RANK
70	Colonial Parkway James River Parking Rt 0916	High	High	High	High	Commuter interest to mainatin	–	12	High
71	Colonial Parkway Archers Hope Parking Rt 0917	Moderate	High	High	High	–	–	11	High
72	Colonial Parkway Glebe Land Parking Rt 0918	Moderate	High	High	High	–	–	11	High
73	Colonial Parkway Real Estate Parking Rt 0919	High	Moderate	High	Moderate	High priority asset to protect JT though significant costs required and action in advance of major storm to have success	Cultural	10	High
75	Jamestown Entrance Parking Rt 0921	High	High	High	High	–	−	12	High
78	Yorktown Beach Parking Rt 0924	High	High	High	High	High Public interest	–	12	High
79	Cornwallis Cave Parking Rt 0925	High	Moderate	High	High	High local user rates, though along dynamic bluff, Exposure scores underestimate PI	–	11	High
86	Jamestown Visitor Parking Rt 0950	High	High	High	High	–	–	12	High
87	Jamestown Maintenance Parking Rt 0990	High	High	Moderate	Moderate	General scoring on avg for Cluverts.	–	10	High
95	U.S. Route 17 Parkway Bridge	High	High	Moderate	High	In List of Classified Structures (LCS)	−	11	High

Table G-2 (continued). Facilities transportation adaptive capacity at Colonial National Historical Park, Virginia.

ID	Transportation	Physical	Organizational	Social	Economic	Overlap	Flag - why?	AC_ Adjusted	AC RANK
96	Fusiliers Rd Rt 106	High	Moderate	High	High	High local user rates, though along dynamic bluff, Exposure scores underestimate PI	–	11	High
103	Tazewell Hall Avenue Access Rd Rt 110A	High	High	High	High	–	–	12	High
108	Jamestown Maintenance Rd Rt 403	Moderate	High	High	High	–	–	11	High
112	Cape Henry Parking Lot Rt 0940	High	High	High	High	High Public interest	–	12	High
113	APVA Access Rd Rt 0402	High	High	High	High	–	–	12	High
114	Wormley Pond Bridge	High	High	High	High	Commuter interest to mainatin	–	12	High
115	Paper Mill Creek Culvert #1 4290-040	High	Moderate	High	High	High local user rates, though along dynamic bluff, Exposure scores underestimate PI	–	11	High
118	JMA Fueling System	High	Moderate	High	High	High local user rates, though along dynamic bluff, Exposure scores underestimate PI	–	11	High
120	Jamestown V.C. Pedestrian Bridge 4290-039T	High	Moderate	High	High	High local user rates, though along dynamic bluff, Exposure scores underestimate PI	–	11	High
122	York River Shoreline	High	High	High	High	High Interest	–	12	High

Table G-2 (continued). Facilities transportation adaptive capacity at Colonial National Historical Park, Virginia.

ID	Transportation	Physical	Organizational	Social	Economic	Overlap	Flag - why?	AC_ Adjusted	AC RANK
123	James River Shoreline	High	High	High	High	Miltary interest to maintain	–	12	High
124	Jamestown Island Shoreline	High	Moderate	High	High	High local user rates, though along dynamic bluff, Exposure scores underestimate PI	–	11	High
125	Swans Point Shoreline	High	Moderate	High	High	High local user rates, though along dynamic bluff, Exposure scores underestimate PI	–	11	High
205	Culvert; Mile: 3.1,Type: Circular, Size:30	High	High	High	High	Commuter traffic not an issue	–	12	High
N/A	113 Culverts ranked as high adaptive capacity	High	High	High	High	–	–	12	High

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

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