National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science

Chaco Culture National Historical Park and Aztec Ruins National Monument

Climate Change Adaptation Workshop

Executive Summary

This page: A window, Pueblo del Arroyo, Chaco Culture National Historical Park.
NPS

Cover: Pueblo del Arroyo, Chaco Culture National Historical Park.
NPS/WYLIE CARR

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A greywacke sandstone band in a wall at Aztec Ruins National Monument.
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Cross-section of a wood beam.
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Climate Change Planning Purpose and Need

Both the Aztec Ruins National Monument-Chaco Culture National Historical Park Resource Stewardship Strategy (2020) and the Cultural Resources Stewardship Assessment (2021) identify several climate vulnerabilities and call specifically for scenario planning and adaptation workshops to fully understand and respond to those vulnerabilities.

The National Park Service (NPS) Climate Change Response Program and the Intermountain Region Landscape Conservation and Climate Change Program accepted a technical assistance request to develop a scenario planning workshop for Aztec Ruins National Monument and Chaco Canyon National Historical Park. We established a planning team and began work in October 2021. This ultimately became a complex process that included:

1. Climate change scenario planning training for cultural resources managers servicewide using resources at Aztec Ruins National Monument-Chaco Culture National Historical Park as the focus (May 2022);
2. A climate change adaptation workshop based on Planning for a Changing Climate (P4CC; April 2023);
3. Testing and improving the functionality of the Cultural Resources Environmental Vulnerability Assessment Tool (CREVAT), a decision support tool developed by the NPS and University of Arizona for rapidly assessing cultural resources vulnerabilities; and
4. Training Denver Service Center facilitators to increase our capacity to host park- and program-based climate adaptation workshops.

The overarching goal of the training and workshop was to bring together practitioners from NPS and partners to exchange information and identify and prioritize possible adaptation strategies and approaches considering plausible future climate trajectories.

Objectives included:

- Develop science-based projections of climate change exposure at Chaco Culture National Historical Park and Aztec Ruins National Monument;
- Determine cultural and natural resource vulnerabilities to climate change;
- Engage Tribal partners in creating knowledge about climate change impacts and adaptation approaches;
- Examine existing resource management goals and how they might need to be updated in response to climate change vulnerabilities;
- Identify adaptation strategies and approaches that will inform preservation planning and treatment on cultural resources at Chaco Culture National Historical Park and Aztec Ruins National Monument; and
- Empower park staff to conduct climate adaptation planning for other priority park resources.

This document provides a high-level overview of the adaptation planning process methods and a detailed table of key adaptation strategies and actions identified by workshop participants. A complete listing of workshop participants can be found in the appendix.

Claret cup cactus flowers.
NPS

Adaptation Planning Workshop Process

Planning for a Changing Climate (NPS 2021) guides NPS planners and managers through a process to develop robust climate change adaptation strategies to better protect park resources and assets today and for future generations. In addition to outlining steps for adaptation planning, *Planning for a Changing Climate* emphasizes the importance of developing forward-looking management goals and considering more than one scenario of the future. These two key principles were incorporated throughout the adaptation planning process. Figure 1 outlines the steps in the NPS climate change adaptation planning and the process specifically used for the Chaco Culture National Historical Park and Aztec Ruins National Monument adaptation planning workshop.

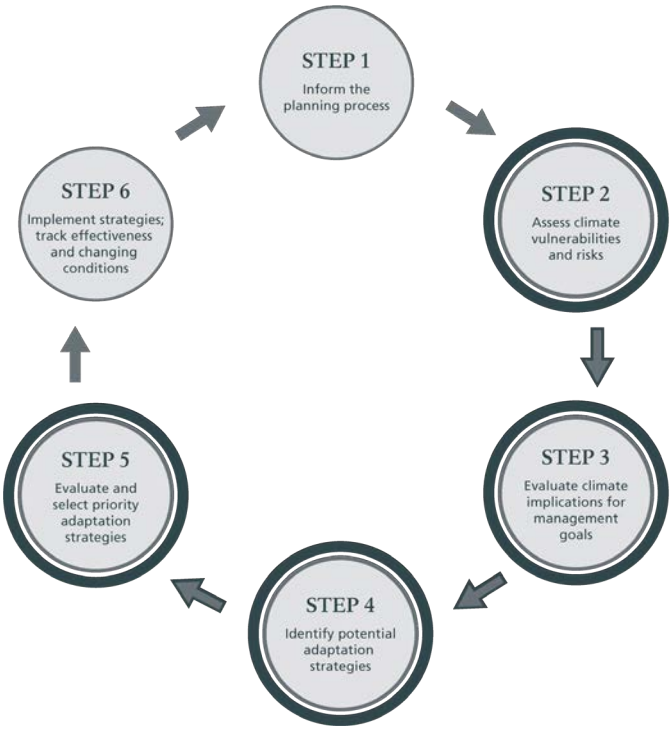

Figure 1. Generalized NPS adaptation planning process. The concentric circles of Steps 2 through 5 represent the steps that integrate future climate change information and scenarios for developing adaptation strategies and approaches. NPS 2021

To accomplish the first three steps in the P4CC adaptation planning process the NPS national and regional planners and park managers (planning team) used a series of internal planning calls and three virtual workshops that engaged all interested park partners/stakeholders. We then held a three-day in-person workshop April 25-27, 2023, to complete steps 4 and 5. We present a summary of the work completed in each step below.

Step 1: Inform the Planning Process

In Step 1, the planning team (1) identified representative park resources were the focus of the planning effort; (2) defined existing management goals related to those resources; (3) identified the spatial and temporal scope of the planning for each focal resource; (4) identified key internal and external partners to engage in the process; and (5) compiled relevant context and background information for the identified focal resources. Three focal case studies were identified for this effort: Pueblo Bonito, Pueblo del Arroyo, and Roberts Great House including upwash archeological sites. These three case studies capture a wide array of park management concerns related to potential climate change driven impacts, including higher temperatures, changing rockfall, changes in precipitation, and changes in erosion due to increased extreme precipitation and flooding. The adaptation strategies and approaches developed for these case studies are transferable to other Great Houses and at-risk sites in Chaco Culture National Historical Park and Aztec Ruins National Monument.

A virtual workshop (the first of three virtual workshops held prior to the three-day in-person workshop) inclusive of all interested stakeholders was held January 12, 2023, to introduce everyone to the P4CC process and to the three focal resources identified for the planning process. Current management goals for Great Houses and at-risk sites at Chaco Culture National Historical Park, as identified in the Chaco Culture National Historical Park Foundation Document and Chaco Culture National Historical Park and Aztec Ruins National Monument Resource Stewardship Strategy, include:

- Protect and preserve Great Houses and other at-risk sites according to NPS policy and guidelines (e.g., NPS 2006 and NPS 28, Managing Cultural Resources).

Under the most extreme hot/dry future climate scenario, there may be a total loss of precipitation as snow.
NPS

- Manage Great Houses as "vanishing treasures" resources.
- Manage in "as found" condition.
- Preserve values with minimal intervention.
- Retain information and value (with tribal input). Retain and preserve not reinstate or restore.
- Improve and maintain condition of priority resources.
- Manage integrated resources in a regional context (i.e., Chacoan Great House resources), consider cross-boundary agency collaboration and cross-boundary resource concerns, while being mindful that all managed resources have the potential to be culturally significant to Tribes.
- Improve scientific understanding of Great House communities, and the appropriate options to manage them.
- To the extent possible, protect and preserve geologic features and processes (including soils) while minimizing human-caused deterioration from visitor use, development, and park facilities/operations.

Step 2: Assess Climate Vulnerabilities and Risks

Step 2 of the P4CC process is focused on defining climate drivers/stressors and the associated impacts, vulnerabilities, and risks (implications for management) that those climate stressors may create for the focal resource. The general process for Step 2 included the following activities:

- Identify climate stressors of most concern for each of the three focal Great Houses;
- Present and discuss two divergent, downscaled climate futures ("Warmer/Drier" and "Hot/Dry") specific to Chaco Culture National Historical Park;
- Define likely impacts or vulnerabilities under the two divergent climate futures; and
- Identify management implications (risks) under each climate future based on defined vulnerabilities.

Preliminary information for activities in Step 2 was first completed by the planning team and then presented for discussion and revision with all participating stakeholders in the second virtual workshop held on February 6, 2023. Table 1 compares future climate conditions from the Warmer/Drier, Hot/Dry futures with historical conditions.

Table 1. Comparison between the Warmer/Drier and Hot/Dry future climate scenarios for 2050 with historical conditions.

	Warmer/Drier	Common Across Scenarios	Hot/Dry
Warming	Average temperature increases about 3°F. Number of days >95°F increases to 14. Number of days <32°F decreases to 20.	Warming in all seasons. Days over 95°F increase more than 2 weeks/year. Freezing days decline by 20-30 days/year.	Average temperature increases about 5.2°F. Number of days >95°F increases to 33. Number of days <32°F decreases to 30.
Precipitation	Precipitation increases in summer and fall. Increases in extreme precipitation events.	Precipitation same or decreases in the spring. Increase in extreme precipitation events.	Precipitation decreases in the spring, summer, and fall. Loss of winter precipitation as snow. Increases in extreme precipitation events.
Drought	About the same as historical conditions. Warming temperatures will result in overall drier conditions.	Generally drier. "Good" (non-drought) years extremely infrequent.	Longer duration drought. Much more intense/severe drought conditions. Extreme aridity.

Step 3: Evaluate Climate Implications for Management Goals

Step 3 of the P4CC process focuses on assessing the viability of existing management goals in response to the vulnerabilities and management implications identified in Step 2 for each of the two climate futures (Warmer/Drier and Hot/Dry). Step 3 was completed in four breakout groups on the third virtual workshop (March 30, 2023) using preliminary goals developed by the planning team and focusing on four questions:

1. What is most notable about existing management goals?
2. In what ways does the prospect of climate change affect how we should think about our management goals?
3. In what ways do other factors affect how we should think about our management goals? and
4. What adjustments or additions would you suggest should be made to the management goals, and why?

The planning team collated responses identified by the four breakout groups during the third virtual workshop. This information was then reviewed and further refined during the three-day in-person workshop held on April 25-27, 2023. Recommendations for updated management goals based on projected changes in climate include:

- Continue to focus goals on managing as found/minimal intervention/retention of information and tribal values.
- Develop specific goals about collaborating/co-managing with Tribes.
- Prioritize which sites to preserve, and which to let go. We can't do everything, not today, not in the future.
- Resource goals need to include interpreting the sites.
- Increase the pace of resource documentation.

- Shift management goals to be more integrated between cultural and natural resources. Are there overlaps or better ways to align them?
- Use Resist-Adapt-Direct Framework (RAD; Schuurman et al. 2020) to determine goals for individual sites and build justification for retention, intervention, managed loss, etc.
- Consider the need for National Environmental Protection Act (NEPA)/NPS process if goals are changed dramatically.

Step 4: Identify Potential Adaptation Strategies

In Step 4, workshop participants brainstormed a broad array of possible actions to address climate vulnerabilities and risks. Step 4 is the stage for creativity and innovation, including considering actions that might not be immediately useful but could become more viable as the impacts of climate change accelerate. We completed this exercise at the in-person workshop by splitting workshop participants into three break-out groups focused on the three case studies (Pueblo Bonito, Pueblo del Arroyo, and Roberts Great House and associated upwash archeological sites), brainstorming potential adaptation actions for each of the two climate futures (Warmer/Drier and Hot/Dry).

After the initial brainstorming sessions, we went back through each potential adaptation action and grouped actions into like categories then determined how each action fit into the RAD Framework. The RAD framework has emerged as a simple tool that captures the entire decision space for responding to resources facing the potential for rapid, irreversible change. It assists managers in making informed, purposeful choices about how to respond to the trajectory of change (Schuurman et al. 2020).

Spiral petroglyph.
NPS

Step 5: Evaluate and Select Priority Adaptation Strategies

The goal of Step 5, also completed at the in-person workshop, was for each breakout group to refine their respective brainstormed list of adaptation strategies and actions from Step 4 into a prioritized list of the top 3-5 adaptation strategies they would like to recommend. To develop their priorities, each group identified specific criteria (e.g., action effectiveness, affordability, feasibility, etc.) from which to rate their adaptation strategies and actions. Each breakout group then presented their top adaptation strategies and approaches to the full workshop group. Table 2 lists prioritized adaptation strategies and approaches generated in Step 4 and Step 5, with suggested implementation steps.

Moving Forward

The final step of the P4CC process is **Step 6: Implementation & Tracking Effectiveness**. Chaco Culture National Historical Park and Aztec Ruins National Monument now have a detailed list of potential adaptation strategies and approaches to contemplate for use in addressing potential climate driven impacts to the resources associated with the three focal case studies. It will be critical, in addition to actual implementation, that park staff also develop appropriate on-going monitoring of resources to assess whether adaptation activities achieve the desired outcomes or if additional measures are required.

The information generated during the in-person adaptation workshop represented a brainstorming exercise to familiarize the park and associated partners with the P4CC process. While the adaptation strategies and approaches identified represent plausible actions for the park to consider in the management of natural and cultural resources, the workshop ***did not*** supersede any requirements under the National Environmental Protection Act (NEPA) or actual formal consultation with Indigenous partners (when appropriate) prior to the implementation of climate change adaptation activities. Not all of the strategies and approaches will require this level of review before implementation, but an assessment of any legal or policy obligations should be considered.

Table 2. Priority adaptation strategies and approaches developed by workshop participants.

Strategy: Actively engage with Indigenous partners to understand tribal management priorities and explore co-stewardship.

Approach	Ideas for Getting Started	Responsible Staff
Consider co-stewardship with Indigenous partners. Consult with Tribes to understand what that means and how it could work.	Begin dialogue with the All-Pueblo Council Government (APCG) and non-Pueblo Tribes. Use guidelines from the DOI Departmental Manual 301-DM-7 on Integrating Indigenous Knowledge.	Park Superintendent
Establish formal agreements to establish co-stewardship (MOUs, cooperative agreements).	Stand up a formal park-tribal working group to bring park and Tribal staff together on a regular basis to share information.	Park Superintendent, Resources Program Lead, Cultural Resource Program Manager
Create opportunities to hire more Indigenous park staff—use existing programs (e.g., the Ancestral Lands Program and the Capacity Builders) to recruit Tribal interns and Tribal work crews and for descendant youth education and programming.	Participate in the APCG Working Group (Larry Samuel, Interim Tribal Preservation Officer, Pueblo of Tesuque, is currently forming this group) and work with non-Pueblo Tribes.	Resources Program Lead, Facility Management Program Lead, Cultural Resource Program Manager
Keep stories alive - honor multiple voices, ethnographic context, and diverse perspectives.	Incorporate Tribal perspectives into NPS Interpretation; hire Indigenous interpreters than can share their own stories.	Interpretation Program Lead
Go beyond just consultation, build and foster relationships with both formal and informal conversations/reciprocal visits.	Park staff endeavors to get out more to visit local Tribes; reach out more to local chapter houses.	Park Management Team
Increase potential ability to assist Tribes/Pueblos in funding Tribal Liaison positions with park.	Mesa Verde, Aztec Ruins, and Chaco Culture have a shared tribal liaison being hired under IRA funding. This position will ideally replace staff that are likely to retire within the five-year funding.	Park Superintendent and Park Management Team

Table 2. Priority adaptation strategies and approaches developed by workshop participants (*continued*).

Strategy: Revise resource management goals.

Approach	Ideas for Getting Started	Responsible Staff
Continue to focus goals on managing as found/minimal intervention/retention of information and Tribal values.	This is the overall goal of park resource management: frontcountry sites are more heavily managed to reduce risk from visitor impacts.	Park Superintendent, Resources Program Lead, Cultural Resource Program Manager
Develop specific goals about collaborating/co-stewardship with Tribes.	Consider adding explicit goals to Aztec Ruins National Monument (and later Chaco Culture National Historical Park) Vegetation and Cultural Landscape Plan. Consider adding explicit co-stewardship goals for cultural resource management in parks.	Park Superintendent, Resources Program Lead, Cultural Resource Program Manager
Prioritize which sites to preserve, which to let go.	Currently undertaking cultural resources re-survey of the park to identify, document, perform condition assessments and consider needed treatment. Have requested funding for park areas susceptible to erosion. These will form basis for prioritizing resources under a RAD framework.	Resources Program Lead, Cultural Resource Program Manager, IMR Historic Preservation Services, IMR Landscape Conservation & Climate Change Program
Resource goals need to include interpreting the sites.	Submit a TAR to CCRP to help getting started; have someone from Interpretation take the NPS Interpreting Climate Change course.	Resources Program Lead, Cultural Resource Program Manager, Interpretation Program Lead
Increase the pace of resource documentation.	Currently undertaking cultural resources re-survey of the park to identify, document, perform condition assessments and consider needed treatment. Have requested funding for park areas susceptible to erosion.	Resources Program Lead, Cultural Resource Program Manager, IMR Historic Preservation Services
Shift management goals to be more integrated between cultural and natural resources. Are there overlaps or better ways to align them?	Develop Integrated Vegetation and Cultural Landscape Plans (including Indigenous Knowledges as appropriate) for Chaco Culture National Historical Park and Aztec Ruins National Monument. Incorporate integrated goals and tribal perspective in wildlife management plans when updated.	Resources Program Lead, Cultural Resource Program Manager, Natural Resource Program Manager, IMR Historic Preservation Services
Use RAD framework to determine goals for individual sites and build justification for retention, intervention, managed loss, etc.	Currently undertaking cultural resources re-survey of the park to identify, document, perform condition assessments and consider needed treatment. Have requested funding for park areas susceptible to erosion. These will form basis for prioritizing resources under a RAD framework.	Resources Program Lead, Cultural Resource Program Manager, Natural Resource Program Manager, IMR Historic Preservation Services, IMR Landscape Conservation and Climate Change Program

Table 2. Priority adaptation strategies and approaches developed by workshop participants (*continued*).

Strategy: Begin emergency management planning and preparation.

Approach	Ideas for Getting Started	Responsible Staff
Re-visit the current Emergency Management Plan and update as needed.	Conduct a "worst-case scenario" climate risk assessment to inform the Emergency Management Plan; consider fund sources that can help produce such a plan.	Park Management Team, IMR Landscape Conservation and Climate Change Program
Prepare for increased flash flood risk in Escavada Wash that could strand employees and visitors.	Work with Navajo Nation or county, if possible, to remedy this issue (thus far such efforts have been unsuccessful). Stranded visitors and staff have worked together in the past to weather being stranded.	Park Management Team
Prepare for increased fire risk (this has already been experienced by nearby Pueblos).	Incorporate into Facilities workplan. Have requested funding for park areas susceptible to erosion. These will form basis for prioritizing resources under a RAD framework.	Facilities Manager, Cultural Resource Program Manager, IMR Historic Preservation Services, IMR Landscape Conservation and Climate Change Program
	Incorporate these ideas in the Fire Management Plan update.	Resources Program Lead, Cultural Resource Program Manager, Interpretation Program Lead
Periodically remove tumbleweed, cheatgrass, and other flashy fuels from near buildings.	Currently undertaking cultural resources re-survey of the park to identify, document, perform condition assessments and consider needed treatment. Have requested funding for park areas susceptible to erosion.	Resources Program Lead, Cultural Resource Program Manager, IMR Historic Preservation Services
Train and drill staff in emergency procedures.	Consider during annual Strategic Park Planning.	Park Management Team, Lead Ranger

Table 2. Priority adaptation strategies and approaches developed by workshop participants (*continued*).

Strategy: Implement a comprehensive monitoring and change detection program at Pueblo Bonito and other Great Houses. Identify and execute critical information (data needs); data collection related to change: pre, during, and post.

Approach	Ideas for Getting Started	Responsible Staff
Conduct a hazards assessment to identify critical data needs. Determine what a comprehensive monitoring and detection program looks like.	Develop and submit a Technical Assistance Request (TAR) to Vanishing Treasures. Submitting a project in FY24 to assess risk for the architectural bracing (test functionality; does it need to be replaced, supported? Conduct a Value Analysis—the bracing was meant to be temporary—do we still need them?). Potential funding in FY26.	Resources Program Lead, Cultural Resource Program Manager, Natural Resource Program Manager, IMR Historic Preservation Services
Geohazard analysis to address threat of rockfall—currently being conducted by Geologic Resources Division (GRD: currently working with Jack Wood).	Develop and submit a TAR to NPS-GRD. Contact Jack Wood (GRD) and Lauren Meyer IMR-(HPS) to get more assistance.	Resources Program Lead, Cultural Resource Program Manager, Natural Resource Program Manager, NPS-GRD
Architectural documentation (e.g., terrestrial LiDAR).	History of developing projects and getting them funded through park base, SCC, Museum Services etc. Initial focus is on Pueblo del Arroyo. Proposal to SC CASC to understand Chaco Wash archeological sites (led by USGS NM Water Science Program).	Resources Program Lead, Cultural Resource Program Manager, Natural Resource Program Manager, IMR Historic Preservation Services
Erosion and water: understand the micro-site water movement/erosion.	Develop and submit a Technical Assistance Request (TAR) to NPS-WRD and IMR hydrology.	Resources Program Lead, Cultural Resource Program Manager, Natural Resource Program Manager, IMR Historic Preservation Services, NPS-WRD and IMR Hydrology
Work with Indigenous partners to identify appropriate methods for data collection.	Discuss with Tribes during formal and informal discussions; could also be done through an advisory group.	Resources Program Lead, Cultural Resource Program Manager, Natural Resource Program Manager

Table 2. Priority adaptation strategies and approaches developed by workshop participants (*continued*).

Strategy: Buttress the back wall of Pueblo Bonito to prevent toppling and loss.

Approach	Ideas for Getting Started	Responsible Staff
Explore masonry or gabion solutions based on compatibility with Secretary of the Interior's Standards.	Consult with Vanishing Treasure to see where to start (part of the bracing project with VT).	Resources Program Lead, Cultural Resource Program Manager, Natural Resource Program Manager, IMR Historic Preservation Services, IMR Hydrology, CHCU Preservation Team
Potentially backfill based on compatibility with Secretary of the Interior's Standards.	Consult with Vanishing Treasure to see where to start (part of the bracing project with VT).	Resources Program Lead, IMR Historic Preservation Services, NPS-GRD, Facilities Management Program Lead, CHCU Preservation Team
Potentially a combination of masonry and backfill based on compatibility with Secretary of the Interior's Standards.	Consult with Vanishing Treasure to see where to start (part of the bracing project with VT).	Resources Program Lead, Cultural & Natural Resource Program Managers, IMR Historic Preservation Services, NPS-GRD, CHCU Preservation Team

Table 2. Priority adaptation strategies and approaches developed by workshop participants (*continued*).

Strategy: Manage water and vegetation to preserve Pueblo Bonito.

Approach	Ideas for Getting Started	Responsible Staff
Redirect water around Pueblo Bonito.	Need to assess micro, site-specific flow of water within the site. Consult with IMR Hydrology or WRD (possible TAR). [Consider how this falls out in priorities vs. water issues at Pueblo del Arroyo.]	CHCU Preservation Team, Cultural Resource Program Manager, Natural Resource Program Manager
Build small check dams where appropriate and vegetate with drought-tolerant plants.	Could be addressed during the CHCU Integrated VegetationManagement Plan process (including EA). Background work in FY24; formal process possible in FY25.	CHCU Preservation Team, Cultural Resource Program Manager, Natural Resource Program Manager, Trail Crew
Evaluate opportunities to collect water in basins. Reuse and recycle the water.	Need to assess micro, site-specific flow of water within the site. Consult with IMR Hydrology or NPS-WRD (possible TAR). [Consider how this falls out in priorities vs. water issues at Pueblo del Arroyo.]	CHCU Preservation Team, Cultural Resource Program Manager, Natural Resource Program Manager
Potentially increase capacity of existing drainage system (bigger culverts, increased catchment).	Need to assess micro, site-specific flow of water within the site. Consult with IMR Hydrology or NPS-WRD (possible TAR). [Consider how this falls out in priorities vs. water issues at Pueblo del Arroyo.]	CHCU Preservation Team, Cultural Resource Program Manager, Natural Resource Program Manager, Facilities Management Program Lead
Innovative irrigation for vegetation management.	Could be addressed during the CHCU Integrated Vegetation Management Plan process (including EA). Background work in FY24; formal process possible in FY25.	CHCU Preservation Team, Cultural Resource Program Manager, Natural Resource Program Manager, Facilities Management Program Lead

Table 2. Priority adaptation strategies and approaches developed by workshop participants (*continued*).

Strategy: Use natural preservation materials and techniques.

Approach	Ideas for Getting Started	Responsible Staff
Explore possibility of coating select walls with plaster to prevent deterioration and serve interpretive purposes.	Cross train preservation crews with other parks (e.g., MEVE is already in place). VT program used to have combined preservation training, building a community of practice. Consider using the Tribal advisory/ working group to explore this issue.	CHCU Preservation Team, Resources Program Lead, Cultural Resource Program Manager
Explore new, more resilient mortar mixes.	Cross-train preservation crews with other parks (e.g., MEVE is already in place). VT program used to have combined preservation training, building a community of practice. Could this be started up again? Consider using the Tribal advisory/working group to explore this issue.	CHCU Preservation Team, Resources Program Lead, Cultural Resource Program Manager
Potentially backfill in select locations (where walls are in danger of collapse, etc.).	Cross-train preservation crews with other parks (e.g., MEVE is already in place). VT program used to have combined preservation training, building a community of practice. Consider using the Tribal advisory/ working group to explore this issue.	CHCU Preservation Team, Resources Program Lead, Cultural Resource Program Manager, Facilities Management Program Lead

Table 2. Priority adaptation strategies and approaches developed by workshop participants (*continued*).

Strategy: Assess and control erosion issues in Chaco Wash.

Approach	Ideas for Getting Started	Responsible Staff
Review and assess existing studies and evaluations re: erosion in Chaco Wash.	Proposal to SC CASC to understand Chaco Wash hydrology (led by USGS NM Water Science Program) (see if we can add this to the scope of work). We might need to find additional funding for lit review (Scientist in Park Proposal? Include looking at what other archeological parks are doing to address erosion issue).	Cultural Resource Program Manager, Natural Resource Program Manager
Consider a landscape approach to erosion control (e.g., look above Chaco Wash on the plateau and start erosion control there; this approach has been successful on Pueblo lands).	SC project scope might include looking at the larger landscape; implementation of a landscape approach could be discussed at the post-study workshop. Discuss in the Tribal/park advisory group.	Resources Program Lead, Cultural Resource Program Manager, Natural Resource Program Manager
Assess and treat the bend in Chaco Wash above Pueblo del Arroyo.	Request assistance from IMR Hydrology. Consider a TAR to WRD. Discuss in the Tribal/park advisory group.	Resources Program Lead, Cultural Resource Program Manager, Natural Resource Program Manager
Evaluate the road bridge above Pueblo del Arroyo to understand the impacts on erosion in Chaco Wash.	Request assistance from IMR Hydrology. Consider a Technical Assistance Request to NPS-WRD.	Resources Program Lead, Cultural Resource Program Manager, Natural Resource Program Manager
Evaluate gabion function; repair as necessary.	Request assistance from IMR Hydrology. Consider a TAR to NPS-WRD.	Resources Program Lead, Cultural Resource Program Manager, Natural Resource Program Manager
Evaluate the potential for increasing risk of future floods in Chaco Wash; treat as necessary.	Proposal to SC CASC to understand Chaco Wash current and projected future hydrology (led by USGS NM Water Science Program). Workshop at the end of the study will bring park and tribal partners together to suggest implementation ideas. HPS and LC&CC are discussing potential complementary SCC proposals to link hydrological studies to flood to resource (archeological) studies.	Resources Program Lead, Cultural Resource Program Manager, Natural Resource Program Manager, IMR Landscape Conservation and Climate Change Program

Table 2. Priority adaptation strategies and approaches developed by workshop participants (*continued*).

Strategy: Complete better documentation for Roberts Great House (RGH).

Approach	Ideas for Getting Started	Responsible Staff
Engage in conversation with Tribes/ Pueblos from the beginning.	Discuss in the Tribal/park advisory group.	Superintendent, Resources Program Lead, Cultural Resource Program Manager
Perform LIDAR analyses especially for priority washes to benefit and inform scenario modeling.	Doing with park LIDAR scanner. Could be included (depends on scope) in aerial LIDAR with SC CASC hydrology project).	Cultural Resource Program Manager, IMR GIS
Prioritize needs and sequencing of sites.	Currently, remote sensing project is underway to document RGH and upwash sites (geomorphology component (with Kirk Anderson, NAU/ Museum of Northern AZ). SC CASC project might include Chaco Wash in this area. Park archeology program has used park LIDAR scanner to document issues at the on-the-ground, site level. This is a pilot project that will help park staff apply techniques to other backcountry sites.	Resources Program Lead, Cultural Resource Program Manager, IMR Historic Services Team
Liaison with Chaco Project data and external research to understand what NPA already has; available information could assist with a gap analysis.	Chaco Project has a huge amount of data, some of which isn't even available yet. CHCU archivist is working to review, scan and make digitally available to the park to use.	Resources Program Lead, Cultural Resource Program Manager
Perform LIDAR analyses especially for priority washes to benefit and inform scenario modeling.	Doing with park LIDAR scanner. Could be included (depends on scope) in aerial LIDAR with SC CASC hydrology project).	Cultural Resource Program Manager, IMR GIS
Prioritize needs and sequencing of sites.	Currently, remote sensing project is underway to document RGH and upwash sites (geomorphology component (with Kirk Anderson, NAU/ Museum of Northern AZ). SC CASC project might include Chaco Wash in this area. Park archeology program has used park LIDAR scanner to document issues at the on-the-ground, site level. This is a pilot project that will help park staff apply techniques to other backcountry sites.	Resources Program Lead, Cultural Resource Program Manager, IMR Historic Services Team
Perform a detailed ethnographic study.	Aron/Lori reached out to Theresa Pasquel to see if the park can get Navajo Nation/Chaco Heritage group report from DOI funding. Answer, no, the report was only for BLM and Tribes do not wish for that report to be distributed.	Cultural Resource Program Manager, IMR Tribal Liaison

Table 2. Priority adaptation strategies and approaches developed by workshop participants (*continued*).

Strategy: Complete better documentation for Roberts Great House (RGH), *continued*.

Approach	Ideas for Getting Started	Responsible Staff
Develop Cultural Landscape Report.	Develop SCC Funding proposal for FY27 or beyond.	Cultural Resource Program Manager
Perform a detailed ethnographic study.	Parks have received partial funding for first phase and are working with IMR cultural anthropologist to obligate funds to begin a detailed ethnographic study, starting with a literature review.	Cultural Resource Program Manager, IMR Tribal Liaison
Improve existing databases to better integrate with agency-wide database.	Parks have acquired funding (and have a contract) to create internal park databases in Microsoft Access that will track site and preservation treatment data that be compatible with Cultural Resources Inventory System (CRIS). Work with IMR GIS staff to pull data into GIS.	Cultural Resource Program Manager, IMR GIS
Re-inventory the backcountry for cultural sites and resources.	Started with project funding. Designating zones within the park to write individual project proposals. One has been funded and is underway; Two additional zones were submitted for FY26 SCC Funding. Expect this to take a decade or more. Also exploring whether archeological field schools can assist with inventory in some zones.	Resources Program Lead, Cultural Resource Program Manager
Improve resource documentation within high potential hazard areas to inform prioritization.	Zones, mentioned above, will include a risk focus (in addition to topographic and geographic). This will be used in seeking funding for inventories.	Resources Program Lead, Cultural Resource Program Manager, IMR Historic Services Team
Populate hazard information into CREVAT.	Work with VT and Historic Preservation Services to accomplish this if CREVAT is funded for further work.	Resources Program Lead, Cultural Resource Program Manager, IMR Historic Services Team
Monitor pre- and post-extreme/hazard events.	Currently, with park staff, monitor RGH and PdA after flood events and post monsoon season. GRD is monitoring rockfall (the other biggest hazard). Proposal to SC CASC to understand Chaco Wash current and projected future hydrology will help ID other priority sites at risk.	Resources Program Lead, Cultural Resource Program Manager, Natural Resource Program Manager

Table 2. Priority adaptation strategies and approaches developed by workshop participants (*continued*).

Strategy: Develop new interpretation for non-invasive preservation treatments.

Approach	Ideas for Getting Started	Responsible Staff
Engage in conversation with Tribes/ Pueblos from the beginning.	Indigenous Partner Advisory Group can be a good start to this; standard park practice is to engage Tribes with any new project.	Superintendent, Resources Program Lead, Cultural Resource Program Manager, Interpretation Program Lead
Develop transparent signs that show how sites would have looked—new age interpretation.	Track GRCA Climate Change Interpretation Strategy as a baseline for Interpretive efforts.	Interpretation Program Lead, Cultural Resource Program Manager
Use 3D-mapping (laser scanner results to show topography/architecture.	Share data with Interpretation to develop products (after input from Tribes).	Interpretation Program Lead, Cultural Resource Program Manager
Develop physical topographic models.	Is this a model of a great house that can be tactile? Check with Interpretation.	Interpretation Program Lead, Cultural Resource Program Manager
Work with CYARK—a non-profit organization that has pioneered the application of 3D recording technologies to the preservation and celebration of cultural heritage around the world.	Check with Interpretation (from Maria who has moved to NE Region).	Interpretation Program Lead, Cultural Resource Program Manager

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Sunrise on the equinox, Pueblo Bonito, Chaco Culture National Historical Park.
NPS/M. MURPHY

Appendix. List of Workshop Participants and Affiliations

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National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science