



Mesa Verde National Park

Spruce Tree House Alcove Arch Stabilization

Environmental Assessment

March 2023



Public Comment

We invite you to comment on this EA during the 30-day public review period. You may do so by providing comments through the National Park Service's (NPS) Planning, Environment, and Public Comment (PEPC) website for the park at: <https://parkplanning.nps.gov/MEVE>.

Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment—including your personal identifying information—may be made publicly available at any time. Although you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so. Comments will not be accepted by fax, by e-mail, or in any other way than those specified above. Bulk comments in any format (hard copy or electronic) submitted on behalf of others will not be accepted.

TABLE OF CONTENTS

Chapter	Page
CHAPTER 1: PURPOSE OF AND NEED FOR THE ACTION.....	1-1
1.1 Purpose of and Need for Action.....	1-1
1.2 Description of the Project Area	1-1
CHAPTER 2: ALTERNATIVES	2-1
2.1 Description of the Alternatives.....	2-1
2.1.1 Alternative A—No-Action Alternative.....	2-1
2.1.2 Alternative B—Proposed Action and Preferred Alternative	2-1
2.1.3 Alternative C—Stabilize the Arch and Do Not Open the Site for Visitation	2-11
2.1.4 Options Common to Both Action Alternatives	2-11
2.2 Project Design and Minimization Measures.....	2-11
CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES	3-1
3.1 Visitor Use and Experience.....	3-1
3.1.1 Affected Environment.....	3-1
3.1.2 Impacts of Alternative A: No-Action Alternative	3-2
3.1.3 Impacts of Alternative B: Proposed Action	3-3
3.1.4 Impacts of Alternative C: Stabilize and Do Not Open the Site for Visitation	3-4
3.2 Cultural Resources	3-5
3.2.1 Affected Environment.....	3-5
3.2.2 Impacts of Alternative A: No-Action Alternative	3-7
3.2.3 Impacts of Alternative B: Proposed Action	3-8
3.2.4 Impacts of Alternative C: Stabilize and Do Not Open the Site for Visitation	3-11
3.3 Rare Plants	3-11
3.3.1 Affected Environment.....	3-11
3.3.2 Chapin Mesa Milkvetch.....	3-11
3.3.3 Alkaline Pepperweed.....	3-12
3.3.4 Trends and Past Actions	3-13
3.3.5 Impacts of Alternative A: No-Action Alternative	3-13
3.3.6 Impacts of Alternative B: Proposed Action	3-14
3.3.7 Impacts of Alternative C: Stabilize and Do Not Open the Site for Visitation	3-14
CHAPTER 4: CONSULTATION AND COORDINATION.....	4-1
CHAPTER 5: REFERENCES	5-1

TABLES	Page
Table 3-1. Cultural Sites in the Survey Area	3-6
Table 3-2. Management Recommendations for NRHP-Eligible Sites in the Project Area	3-9
Table A-1. Concepts Considered but Dismissed from Inclusion as Alternatives or Elements of Action Alternatives	1

FIGURES	Page
Figure 1-1. Mesa Verde National Park Vicinity.....	1-3
Figure 2-1. The Sandstone Arch Face above the STH Cliff Dwelling	2-2
Figure 2-2. Williams Bar Rockbolt	2-2
Figure 2-3. Reticulated Rockbolts to Stabilize the STH Alcove Arch.....	2-3
Figure 2-4. Selected Equipment Illustrations.....	2-5
Figure 2-5. Project Location and Construction Area.....	2-6
Figure 2-6. Project Location and Off-Site Staging Area	2-8
Figure 2-7. Before and After Conditions – Sandstone Arch Face	2-9
Figure 3-1. Spruce Tree House Viewpoint.....	3-1
Figure 3-2. Spruce Tree House	3-5
Figure 3-3. Chapin Mesa Milkvetch.....	3-11

APPENDIXES

- A Alternative Concepts Considered but Dismissed from Detailed Analysis
- B Impact Topics Dismissed from Further Analysis

ACRONYMS AND ABBREVIATIONS		Full Phrase
CE		common era
dBa		A-weighted decibels
MVNP		Mesa Verde National Park
NPS	United States Department of the Interior, National Park Service	
NRHP	National Register of Historic Places	
PAC		protected activity center
SHPO	State Historic Preservation Office	
STH	Spruce Tree House	
USFWS	United States Department of the Interior, Fish and Wildlife Service	

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CHAPTER 1: PURPOSE OF AND NEED FOR THE ACTION

1.1 PURPOSE OF AND NEED FOR ACTION

The purpose of the action is to protect the Spruce Tree House (STH) cliff dwelling at Mesa Verde National Park (MVNP) from the potential collapse of the sandstone alcove arch at the entrance of the site. In adherence with the park's enabling legislation and National Park Service (NPS) management policies 5.3.5.1.1 and 5.3.5.1.2, action is needed to prevent substantial damage to the cliff dwelling and other park resources (NPS 2006, 2015a). Action is also needed to ensure staff and visitor safety, so the NPS could reopen the site to the public.

The NPS closed the STH cliff dwelling to visitors in 2015 due to increasing rock falls and concerns about overall alcove arch stability. Detailed engineering analyses have confirmed that the efforts to stabilize the arch in 1962 are at the end of their useful life. The alcove arch needs to be strengthened and stabilized if the NPS wants to preserve it from collapse and prevent substantial damage to the STH cliff dwelling.

1.2 DESCRIPTION OF THE PROJECT AREA

MVNP is in southwestern Colorado and encompasses 52,485 acres. The park's primary physical feature is a plateau called the Mesa Verde, which is surrounded by deep canyons. With a semiarid climate, the park supports several plant communities and a diversity of wildlife, including resident and migratory mammals, birds, reptiles, amphibians, fish, and invertebrates. The park includes some of the best-preserved Native American archeological sites and cliff dwellings in the Southwest. The park is bordered by state, local, and tribal lands, and federal lands under the jurisdiction of the Bureau of Land Management. The park lies entirely within Montezuma County and is near the towns of Mancos and Dolores and the city of Cortez. The park is easily accessible from U.S. Highway 160. The park entrance is 36 miles west of Durango and nine miles east of Cortez (Figure 1-1).

Congress established the park on June 29, 1906. The park's purposes, according to its enabling legislation and subsequent legislation, include protecting—unimpaired—the cultural resources and values of the park for the enjoyment, education, and inspiration of current and future generations, and the preservation of forests, wildlife, and other natural features. The park's purposes also include providing the public with opportunities to experience the park's resources and to appreciate the way of life of the Ancestral Pueblo people who occupied the area from about 550 common era (CE)¹ to 1300 CE (NPS 2015a).

The STH alcove cliff dwelling is the third-largest and one of the best-preserved cliff dwellings in MVNP. It is an Ancestral Puebloan habitation compound, built over 700 years ago, that was constructed in a naturally occurring sandstone alcove about 216 feet wide by 89 feet deep. STH is on the east side of Spruce Canyon across from the park's headquarters area on Chapin Mesa. STH is recognized as one of MVNP's fundamental resources as part of the Mesa Verde archeological landscape and the Mesa Verde Archeological District (5MT4341). It is considered essential to achieving the park's purpose and maintaining its significance, fundamental resources, and values. Fundamental resources and values are those features, systems, processes, experiences, stories, scenes, sounds, smells, or other attributes determined to warrant primary consideration during planning and management processes (NPS 2015a). The NPS recognizes and respects other

¹ CE stands for "common era or "current era" and is used in recent literature as the secular equivalent of AD (*anno Domini*), which means "in the year of the Lord" in Latin.

perspectives on the means and methods of protecting fundamental resources and honoring park values and purposes.

Project work and support areas include the construction site above the alcove, an established off-site material staging area near the four-way intersection at the Headquarters Loop, and a temporary access route of approximately 0.24 miles in length, beginning at the paved bike path along Mesa Top Loop Road and continuing to the construction site.













Mesa Verde National Park

Proposed Spruce Tree House Alcove Arch Stabilization

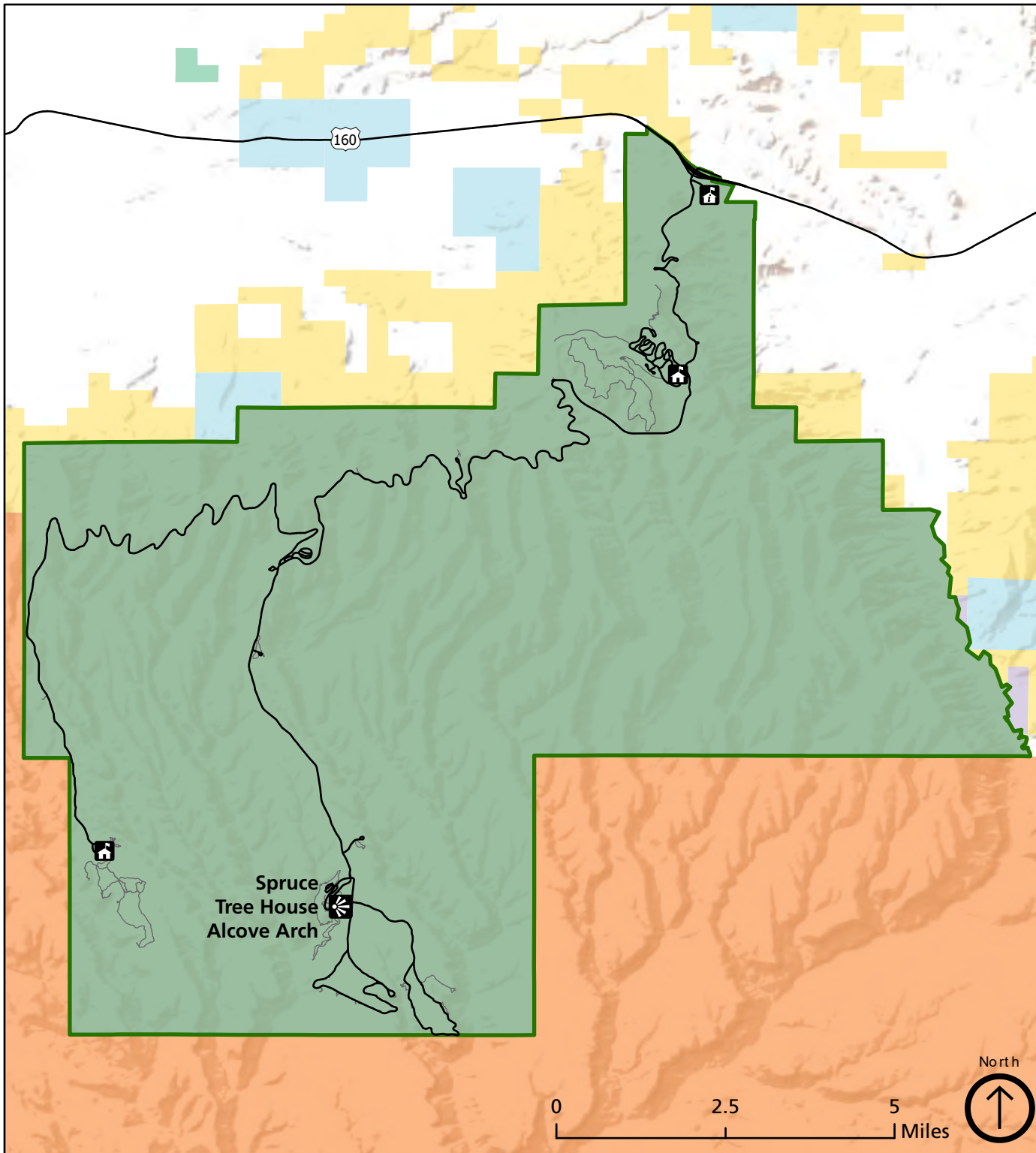


Figure 1-1

Mesa Verde National Park Vicinity

-  Spruce Tree House Alcove Arch
-  Ranger station
-  Visitor center
-  Trail
-  Road
-  Mesa Verde National Park administrative boundary
-  National Park Service
-  Bureau of Land Management
-  Indian Reservation
-  US Fish and Wildlife Service
-  State
-  Private

Source: NPS GIS 2021
 March 30, 2022
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CHAPTER 2: ALTERNATIVES

2.1 DESCRIPTION OF THE ALTERNATIVES

This chapter includes the description of three alternatives: the no-action alternative (alternative A), the proposed action of stabilizing the site and reopening it to the public (alternative B) and stabilizing the site but keeping it closed to the public (alternative C). The elements of these alternatives are described in the following sections. Appendix A of this document describes alternative elements that were considered but dismissed from detailed analysis.

2.1.1 Alternative A—No-Action Alternative

Under the no-action alternative, the NPS would not stabilize the STH alcove arch. The NPS would not attempt any new arch stabilization or make repairs to past stabilization efforts. No instrumentation would be installed to monitor the stability of the alcove arch, and the site would remain closed for safety concerns. NPS access to the site would occur only to monitor the alcove arch and standing architecture.

Surface water runoff from the top of the alcove would continue to seep between the alcove arch and the alcove itself. Groundwater within the sandstone alcove roof would continue to erode and undermine the stability of the alcove arch and impact the archeological features below. The result could be a slow deterioration of the arch and continued spalling² of sandstone or the potential for a sudden, catastrophic collapse. If the alcove arch suddenly collapses, there could be complete disintegration of the arch, vibration-induced damage to the STH structures within the alcove, and air blast loading³ that could severely damage buildings across the canyon.

The no-action alternative would incorporate the beliefs of some Native American and other commenters that nature should be allowed to take its course, and no further efforts should be made to continue to stabilize the arch and protect STH. From this perspective, everything in this world has a lifespan and resources that come from the earth should be allowed to return to the earth.

The no-action alternative does not meet the purpose and need, and it conflicts with the mission of the NPS and the park to preserve fundamental park values and resources, such as STH. However, the no-action alternative provides a baseline for comparison and consideration of impacts without the proposed stabilization.

2.1.2 Alternative B—Proposed Action and Preferred Alternative

Under alternative B, the NPS would stabilize the STH alcove arch and reopen the cliff dwelling for public visitation, similar to the access available before the 2015 closure. Proposed stabilization work would be limited to the sandstone geologic formation in which the STH cliff dwelling was constructed. The proposed work would alter and upgrade previous efforts to stabilize the sandstone arch. None of the precontact, human-made fabric of STH would be stabilized as part of this alternative, although the NPS would work with the construction contractor on temporary measures

² Rockfall of unstable rock surfaces

³ Air blast loading is the load applied to a structure from a blast wave that comes immediately after a collapse or an explosion. A high blast load can cause catastrophic damage to buildings, both internally and externally, and can be fatal to building occupants.

to protect the cultural site during construction. Stabilization activities are anticipated to occur over 180 days, from late September through mid-March.

The proposed stabilization design would remove select loose material via scaling,⁴ install rockbolts,⁵ and install several reinforced concrete supports along the face of the alcove arch (Figure 2-1). Figure 2-2 illustrates the type of rockbolt that is specified for this project.

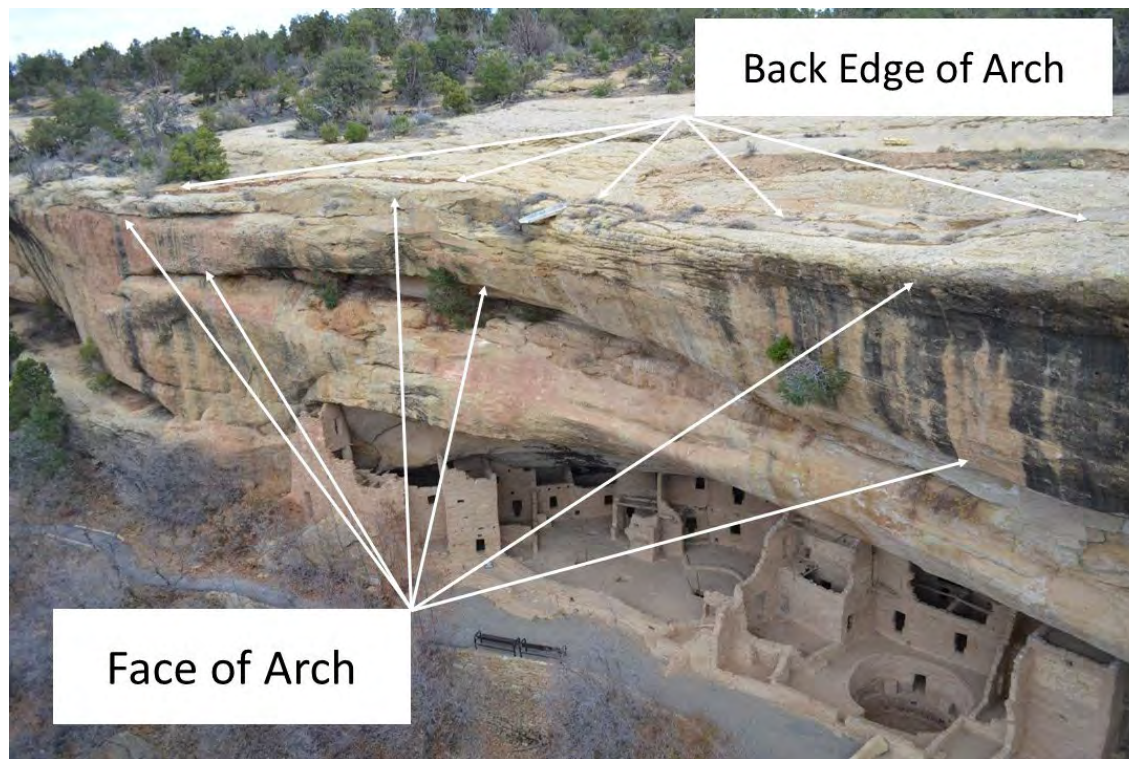


Figure 2-1. The Sandstone Arch Face above the STH Cliff Dwelling
(Photograph source: James A. Mason, PhD, PE, NPS Vanishing Treasures Program 2019)



Figure 2-2. Williams Bar Rockbolt

This is an example of the type of rockbolt that is specified for this project. It is hollow for down-hole grouting with a locking head for anchoring the down-hole end (www.williamsform.com).

⁴ Minor scaling involves the removal of loose or cracking rock from the front of the alcove arch.

⁵ Rockbolts are long, threaded bars made of corrosion-resistant steel used to stabilize rock. A hole is drilled with a non-percussive core barrel, the rockbolt is inserted into the rock, the anchor is set, and the rockbolt is tested before being grouted in place. The rockbolt is tensioned to distribute the load evenly onto the surrounding rock by clamping weaker layers together. Passive rockbolts are not tensioned; they increase the local strength of the rock mass due to arching compression and help prevent the rock mass from falling.

Specific stabilization measures would include:

- Installation of up to 75 20-foot-long tensioned rockbolts in a reticulated or net-like pattern to stabilize the overall alcove arch. Figure 2-3 shows the location of the proposed rockbolts on the face of the sandstone alcove arch and the reticulated rockbolt pattern. Reticulated rockbolts form a three-dimensional network of steel reinforcement that stitches and ties together individual preexisting rock blocks within the stabilized overall rock mass, thus forming a unified “rock block.”

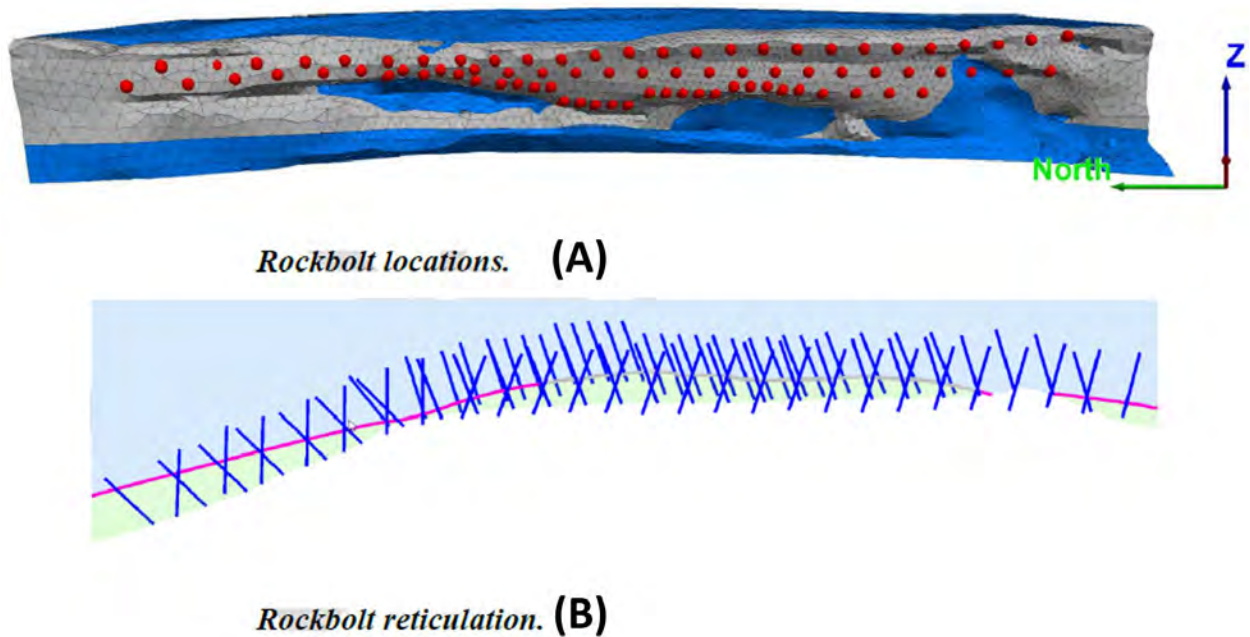


Figure 2-3. Reticulated Rockbolts to Stabilize the STH Alcove Arch. (A) = the Elevation (Front) View. (B) = the Plan (Top) View (Itasca Consulting Group 2019)

- Installation of 120 passive 6- to 8-foot rockbolts to stabilize smaller local rock features
- Encapsulation of every completed rockbolt with custom-colored mortar that would match the color and texture of the adjacent surrounding sandstone and provide corrosion protection
- Treatment of shrinkage cracks in the existing concrete plug (installed in 1963) between the sandstone at the back of the alcove arch and the outer face of the alcove roof
- Removal of loose surface rocks, detached rock slabs, and vegetation (minor scaling) using hand and power tools
- Installation of several relatively small, rectangular-shaped corbels⁶ (constructed of reinforced concrete and color matched to the local sandstone) that would be tucked up and under several hanging rock blocks that form part of the alcove’s outer surface. Their position would minimize exposure and visibility.

⁶ A corbel is a very short structural support projecting from a wall or column for the purpose of reinforcing or carrying a load.

- Installation of geotechnical instrumentation with remote data logging and transmitting capabilities (located in the park's headquarters) to constantly monitor the alcove arch's stability

Figure 2-4 illustrates examples of typical equipment that would be used in the project. The basic equipment required to complete the proposed stabilization could include a crane, generator, trailered compressor, small loader, grout plant, water-holding tank, trailered vacuum system, and rock drill. Stabilization work would be conducted by suspending workers and equipment in a movable work platform from a crane stationed on ground protection mats on the stable sandstone area above the alcove arch. The crane would be positioned at a preselected position in the southeast corner of the open area on top of the alcove that sits behind the back of the alcove proper.

A licensed surveyor, using a laser survey instrument, would identify the locations of rockbolt anchors prior to core drilling of 3-inch-diameter holes to a 20-foot depth for the rockbolts. After drilling the holes, a corrosion-resistant steel reinforcement bar would be inserted and grouted in place with nonshrink Portland cement grout. Comprehensive measures would be taken to prevent any spills or discoloration of the arch sandstone and cliff dwelling during the drilling and grouting processes.

A trailered compressor positioned near the crane would be used to power pneumatic tools (drills and wrenches). No drilling fluids, including water, would be used. Drilling dust would be captured and filtered in an all-in-one-unit vacuum system on a trailer, also positioned near the crane.

After holes are drilled, they would be cleaned with a stiff wire brush with drilling debris blown out by a pressure air nozzle. Then an associated square-bearing plate, alignment washers, and nuts would be set onto the free end of the rockbolt. The whole assembly would be set into a fitted hole just large enough to accommodate the assembly. Next, the bolt would be tightened enough to activate the locking head to seat the interior hole surface. When testing confirms the rockbolt is properly seated, the rockbolt would be tensioned to the design load. Next, the complete assembly would be filled with nonshrink Portland cement grout from the bottom of the hole up to the bearing plate via a small-diameter tube to remove all air and water from the drill hole by displacement. All cracks and voids in the anchor area would be filled with grout. If the assembly slips either at the test or lock-off load, the failed rockbolt would be grouted in place, and another rockbolt would be installed nearby and tested, as detailed above.

Measurement devices would be affixed to several of the bars to monitor whether the alcove arch moves after construction is completed. The anchors would be retested. Double nuts would be installed on the ends of the anchors, electronics would be installed, and custom architectural patches would be manually installed to mimic the color of the surrounding rock and to conceal the anchors.

Other equipment and construction materials, including a grout plant and a 500-gallon, 4-foot-wide water-holding tank, would be positioned on the top of the mesa in an existing open area covering 0.37 acres (Figure 2-5). Mats or other coverings to protect the exposed sandstone would be placed under equipment to minimize the potential damage of the rock surfaces. The grout plant would be in a secondary containment to minimize potential spills.

The mesa top and alcove arch would be accessed via a 0.24-mile temporary road constructed from Mesa Top Loop Road along an existing road and trails leading to the staging area (see Figure 2-5). At the start of the active construction period, the crane would travel west from the Mesa Top Loop Road for approximately 300 feet along a pedestrian/bicycle path to a 495-foot unmaintained access road. This road, in turn, leads to a maintained hiking trail (Petroglyph Point Trail). The proposed route would follow Petroglyph Point Trail southward about 303 feet to an old path or clearing through woodland and then head west approximately 125 feet to an expanse of exposed Cliff House Sandstone, located above the STH alcove arch. A construction area (where the crane and other

Figure 2-4. Selected Equipment Illustrations

	
<p>Crane used to access the alcove arch face. Alternative B would use a crane of similar size and in the same location.</p>	<p>Typical colloidal grout mixing plant for this size job</p>
	
<p>Photo of the crane's position taken from a suspended work platform during geotechnical investigation of the arch face</p>	<p>A rock core drill</p>
	 <p>Poly Dike Spill Containment Dike</p>
<p>Rock drilling operation</p>	<p>Containment dike</p>




Mesa Verde National Park

Proposed Spruce Tree House Alcove Arch Stabilization



Figure 2-5
Project Location and Construction Area

-  Spruce Tree House Alcove Arch
-  Museum
-  Ranger Station
-  Construction access route
-  Construction area
-  Trail
-  Mesa Verde National Park administrative boundary

Source: NPS GIS 2021
July 27, 2022
MEVESpruceEA_Intro.pdf
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equipment could be staged) would be established at this location. Once the proposed stabilization work has been completed, the crane would return along the same route back to the Mesa Top Loop Road.⁷

Some vegetation and tree limbs would be removed along the route, with native vegetation salvaged, where feasible, for reuse during restoration. The route would be graded to a width of 15 feet to allow for larger vehicles. The access route would be covered with geotextile fabric and then surfaced with aggregate. The geotextile fabric would enable the aggregate to be cleanly removed when stabilization is complete. To reduce resource impacts, the NPS would require the construction contractor to minimize the number of vehicle and all-terrain vehicle trips along the access route. The NPS also would require the construction contractor to lower the tire pressure for larger construction vehicles, except normal pickup trucks. A total of three vehicle round trips per day are anticipated for materials and personnel transport. The NPS would require vehicles to follow all traffic-control devices, speed limits, and NPS traffic-control assistance requirements.

A secondary 1.1-acre construction staging area would be in a designated job construction site northwest of the headquarters' four-way intersection in an open area that the NPS routinely uses for maintenance and staging vehicles and equipment (Figure 2-6). This area is accessed via a maintenance road and an existing road; no further modification or repair of these access roads is anticipated as part of the project. The NPS would mark the extent of the staging area prior to construction activities to ensure the contractor remains within the staging area footprint.

Figure 2-7 shows the comparison of existing visual conditions with a simulation of conditions after the proposed rock scaling, vegetation removal, and concealing of the rock anchors.

The NPS would monitor the proposed stabilization activities during construction. The contractor would not be released from the project until all activities presented in the plans and specifications are completed. Upon completing the proposed stabilization activities, the NPS would determine the alcove arch's stability. When the construction work is approved, STH would be considered safe for reopening.

The NPS plans to reopen the site for visitation in the same manner as prior to the closure in 2015. When previously open, public access was self-guided along the existing trail, with rangers present at the site. During the winter months, ranger-guided tours were conducted daily. The NPS would allow access to the roofed kiva at the site, and visitors could enter this kiva, consistent with the management prior to the 2015 emergency closure of STH.

The NPS would also reopen the upper Petroglyph Point Trail. The project area, access route, and adjacent staging areas would be restored to their original site conditions. The aggregate would be removed from the access route using a skid-steer loader, the geotextile would be picked up by hand, restoration or repairs to the trail would be made with hand tools, and repairs to the bike path would be conducted by another maintenance project.

⁷ Allan Loy, MVNP planner/project leader, email to Kevin Doyle, EMPSi project manager, on October 21, 2021, regarding clarification of the proposed stabilization project construction.



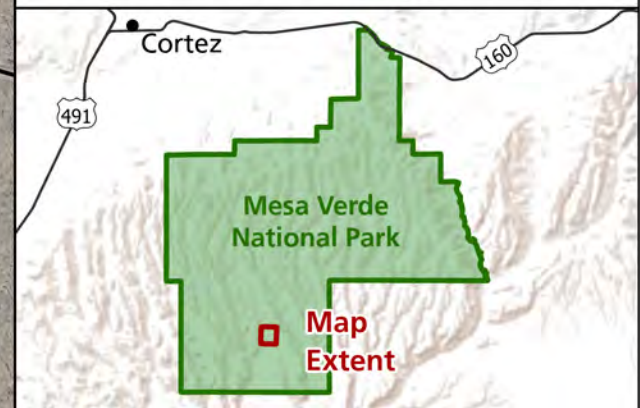
Mesa Verde National Park Proposed Spruce Tree House Alcove Arch Stabilization

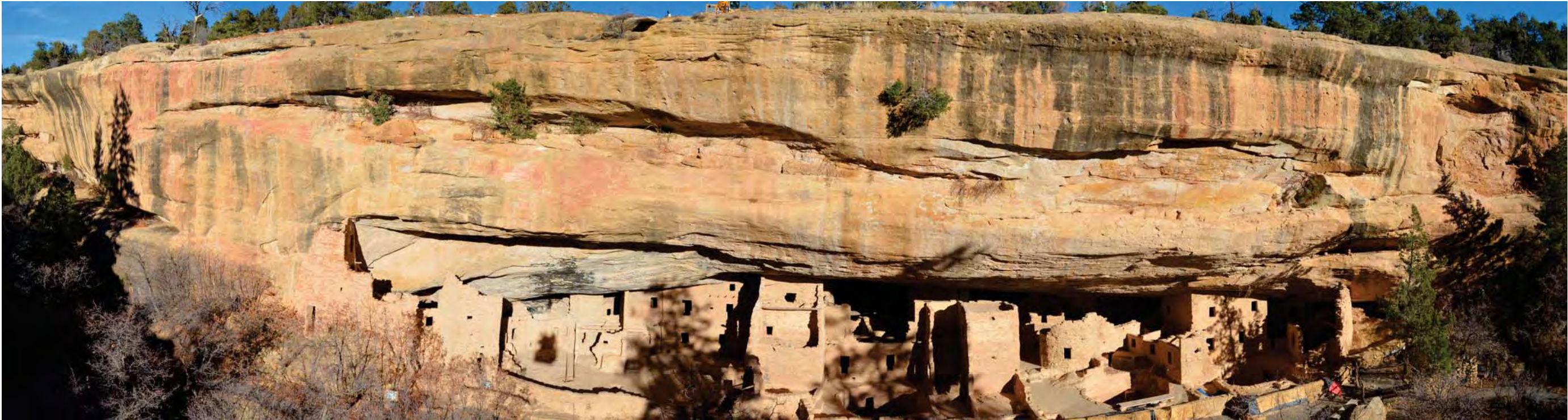


Figure 2-6
Project Location and Off-Site Staging Area

- Spruce Tree House Alcove Arch
- Museum
- Ranger Station
- Construction access route
- Construction area
- Staging area
- Trail
- Road
- Mesa Verde National Park administrative boundary

Source: NPS GIS 2021
 July 27, 2022
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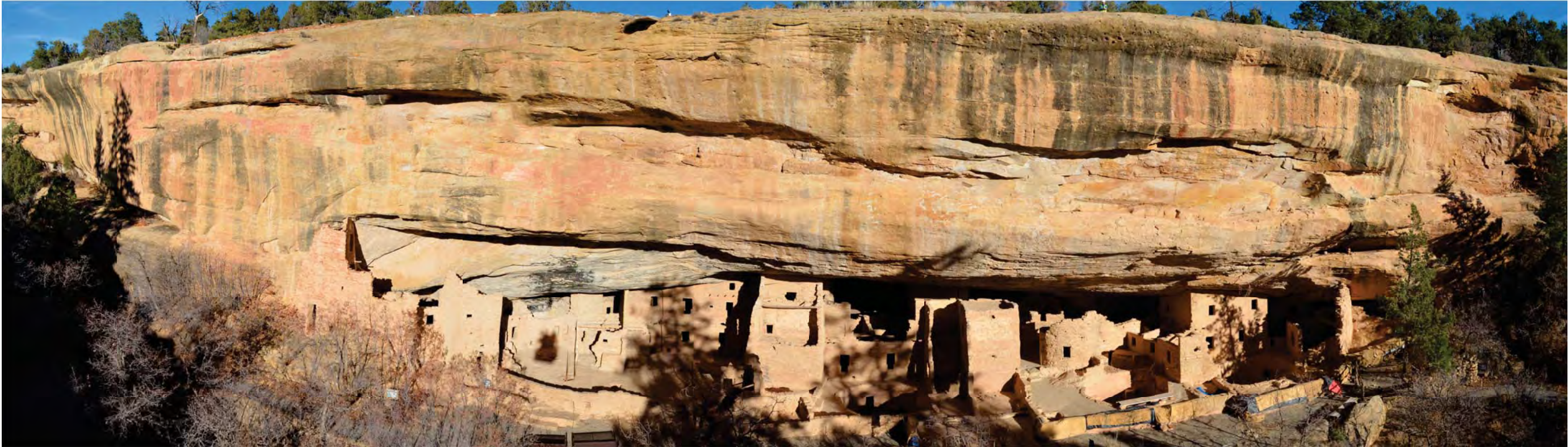




1

EXISTING CONDITIONS

1




2

CONDITIONS AFTER PROPOSED ROCK SCALING, VEGETATION REMOVAL, AND CONCEALING EXISTING ROCK ANCHORS

1

Figure 2-7. Before and After Conditions – Sandstone Arch Face

	VISUAL REPRESENTATION OF PROPOSED VEGETATION AND ROCK SCALING		TITLE OF PROJECT		DRAWING NO.
	UNITED STATES		SPRUCE TREE HOUSE ARCH STABILIZATION		307
	DEPARTMENT OF THE INTERIOR		LOCATION WITHIN PARK		133484
	NATIONAL PARK SERVICE		SPRUCE TREE HOUSE ALCOVE		PWIS/PKG. NO.
	DENVER SERVICE CENTER		MESA VERDE NATIONAL PARK		230751
	REGION	COUNTY	STATE		SHEET
	INTERMOUNTAIN	MONTEZUMA	COLORADO		1 OF 3

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2.1.3 Alternative C—Stabilize the Arch and Do Not Open the Site for Visitation

Under alternative C, the STH alcove arch would be stabilized in the same manner as described under alternative B. Staging areas and access would also remain the same as under alternative B. Upon completing the proposed stabilization activities, the NPS would not reopen the STH cliff dwelling for visitation. Visitors would be able to see the site from nearby overlooks and trails but would not be able to access the cliff dwelling itself. The site would remain closed to visitors. The NPS would conduct rulemaking under 36 CFR 1.5 to permanently close the site, since it is closed now under emergency authority. The NPS would consider public safety, visitor use and experience, natural and cultural resources, and tribal concerns.

2.1.4 Options Common to Both Action Alternatives

The following concepts and elements are common to the action alternatives:

- Safety would be an ongoing concern that would be closely monitored, with changes in the alcove arch triggering internal safety reviews.
- The NPS would maintain the existing cross-canyon viewing areas near the head of the trail and the Chief Ranger Office porch.

2.2 PROJECT DESIGN AND MINIMIZATION MEASURES

Stabilization activities for the two action alternatives would be limited to daylight work hours; no night work would be permitted. Only lighting fixtures required for equipment would be permitted. The work is anticipated to take from three to five months; however, since the work would be scheduled in the fall and winter season, a six-month (180-day) duration is used in this analysis. A total of three vehicle round trips per day are anticipated for materials and personnel transport between the Headquarters Loop staging area and the construction site.

The temporary access road would allow a heavy crane to access the construction area above the STH alcove arch. To reduce potential surface disturbance, the access route would have a restricted number of trips and would require off-road trucks with a maximum tire pressure of 20 pounds per square inch. The access route would be cleared and armored, with vegetation removal and/or limbing of trees up to a maximum of 15 feet of horizontal and vertical space to allow large equipment to pass. Armoring the route would involve the placement of a geotextile fabric and aggregate on the access route; this material would be removed at the completion of the work, and the access route would be rehabilitated and revegetated.

To reduce the likelihood of potential adverse effects on park resources, the NPS would incorporate the following minimization measures into the project design as a component of the action alternatives:

- Salvage native vegetation (as feasible) from project areas for reuse during restoration on disturbed areas.
- Install drains and treat shrinkage cracks in the concrete plug that currently functions as a dam collecting water and saturating the sandstone.

- Use a HEPA⁸ filter system during drilling of the holes for the rockbolts. Conduct all drilling without any fluid lubricant (that is, drill in the dry).
- Prohibit night work (sunset to sunrise) due to the potential presence of Mexican spotted owls and other wildlife. Coordinate any work that must occur at night with park natural resources staff and the U.S. Fish and Wildlife Service (USFWS) to maintain compliance with the Endangered Species Act.
- Clearly flag limits of disturbance to reduce potential trampling of native vegetation and soil.
- Survey the project area, buffer zone, and staging areas, and flag rare plant species.
- Conduct tree limbing in winter, to the maximum extent practicable, to avoid attracting pine beetles and to avoid the bird-nesting season in the park (April 1 to August 15).
- Wash all vehicles and equipment before entering MVNP. Clear vehicles and equipment of mud, dirt, and any vegetal material to reduce the potential introduction or spread of invasive species.
- Implement erosion control to prevent water and material intrusion.
- Restore the project area and adjacent staging areas upon the project's completion to the original site conditions, including replanting of vegetation, regrading to previous contours, restoring any biological soil crusts, and arranging soil and rock.
- Conduct nest surveys, including a 164-foot buffer. If work occurs between April 1 and August 15 that requires trees or shrubs to be removed, cut, or otherwise affected, require a bird survey. If active nests are detected in the tree or shrub or within 164 feet of the tree or shrub, monitor the nests during the nesting season and avoid disturbance. Do not trim or remove any trees or shrubs containing nests until the nest is deemed inactive.
- If Mexican spotted owls are detected within or adjacent (0.5 miles) to the project area during subsequent annual protocol-level surveys conducted by park staff, stop construction activities temporarily and reinstate consultation with the USFWS.
- In addition, consider breeding-season restrictions if noise levels are estimated to exceed a noise level of 69 A-weighted decibels (dBA; Delaney et al. 1999) consistently (more than twice per hour) or for an extended period of time (more than one hour) within 164 feet of nesting sites (if known) or within entire protected activity centers (PACs)⁹ if nesting sites are not known. This is to maintain compliance with the Endangered Species Act.
- Incorporate avoidance, minimization, and mitigation recommendations to address potential adverse effects on identified and evaluated historic properties resulting from ongoing consultations. Site-specific proposed recommendations are found in Table 3-2.
- Ensure contractors and subcontractors are informed of the penalties for illegally collecting artifacts and biological or geological specimens, or intentionally damaging paleontological materials, archeological sites, historic properties, or natural resources outside the limited disturbance. Instruct contractors and subcontractors on procedures to follow in case previously unknown paleontological or archeological resources are uncovered during construction.

⁸ Containing a filter usually designed to remove 99.97 percent of airborne particles measuring 0.3 micrometers or greater in diameter passing through it.

⁹ PACs are buffer zones around known or suspected Mexican spotted owl nesting sites.

CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the affected environment and the environmental consequences associated with the proposed stabilization of the STH alcove arch. The descriptions of the affected environment in this section serve as an account of the baseline conditions against which the potential impacts of the alternatives are compared. The chapter presents an analytic evaluation of the expected impacts from implementing the no-action alternative (alternative A), the proposed action to stabilize the arch and open the site for visitation (alternative B), and the proposal to stabilize the arch and not open the site for visitation (alternative C).

By describing how the existing condition of a resource would change, either negatively or positively, as a result of implementing the alternatives under consideration, decision-makers and the public gain an understanding of the likely environmental impacts (NPS 2015b). Potential impacts are described in terms of the type, context, duration, and intensity. Wherever possible, the potential impacts analyzed here are quantified. Where a quantitative analysis is not possible, impacts are analyzed qualitatively and with the best professional judgment. Resource topics evaluated in this document are visitor use and experience, cultural resources, and rare plants. Appendix B contains a detailed discussion of resource topics that were considered but dismissed from detailed analysis.

3.1 VISITOR USE AND EXPERIENCE

3.1.1 Affected Environment

Visitation at MVNP has averaged 537,577 recreational visits per year since 2010; nearly 70 percent of total visitation occurs between June and September (NPS 2021a). Most park visitors travel to the park to view and tour the cliff dwellings. Although the STH cliff dwelling was closed in 2015 due to safety concerns, the site was historically one of the park's most-visited locations.

The loss of close public access to the STH cliff dwelling following the 2015 safety-related closure has had a detrimental effect on visitors and their experience at the cliff dwellings for which the park is internationally known. Visitor counts prior to the closure of the site in October 2015 indicated that half of all visitors to MVNP visited STH.

The alcove containing STH is highly visible, and visitors can observe the numerous structures associated with the cliff dwelling from various vantage points along the trail leading to the site. The cliff dwelling is also visible from multiple viewpoints near the Chapin Mesa Archeological Museum (Figure 3-1, Spruce Tree House Viewpoint).

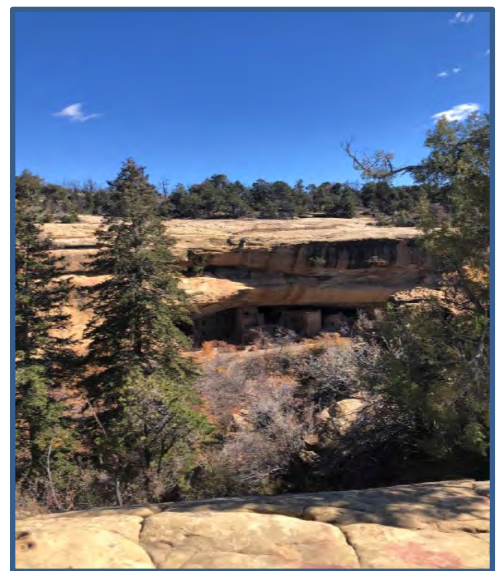


Figure 3-1. Spruce Tree House Viewpoint

The area surrounding the STH cliff dwelling is also frequented by park visitors who access the nearby 2.4-mile Petroglyph Point Trail, one of several hiking trails on Chapin Mesa. The trail is described as “a rugged and adventurous trail with steep drop offs” (NPS 2021b). The trail is a loop

that begins and ends at Chapin Mesa Archeological Museum. The trail switchbacks down Spruce Canyon to various overlooks of STH, proceeding down the canyon 1.4 miles to a petroglyph panel. Visitors then hike up the canyon wall and head back toward the museum on the mesa top. As the trail heads back to the museum, it passes the STH stabilization staging area where a segment of the trail would be used as a temporary access road before turning south toward the park headquarters and museum.

Trends and Past Actions – Visitor Use and Experience

In addition to the STH cliff dwelling closure since 2015, the Mesa Top Loop Roads paving project and the Chapin Mesa Archeological Museum closure and redesign are impacting the visitor experience within the park. Except in 2020, the annual average visitation to MVNP has remained fairly consistent (NPS 2021a). Many other NPS units have reported large increases in visitor use in recent years, and MVNP may see similar increases as sites are reopened.

The Cliff Palace Loop Road, part of the Mesa Top Loop Roads paving project, has been temporarily closed due to road construction. Until recently, there has been no access to visitor locations such as Cliff Palace, Balcony House, or other sites along the road. On Mesa Top Loop Road, Cliff Palace can still be viewed from Sun Temple and Sun Point Overlook across the canyon. Cliff Palace has recently reopened, and it continues to be subject to seasonal closure, as it was before.

The Chapin Mesa Archeological Museum has been closed for exhibit renovation since 2020. The park is also in the middle of a multiyear collaborative process to redesign the museum's exhibits ahead of the centennial of the museum's opening in 1925. The redesigned and updated museum will tell a comprehensive story about MVNP from multiple perspectives and will provide visitors with a more complete and inclusive interpretive experience. The new exhibits will highlight Indigenous perspectives, honor the historic nature of the building, provide accessible and interactive experiences, and protect irreplaceable cultural items.

Traffic congestion problems have been reported throughout the park, with circumstances depending on the time of year. In the years leading up to the 2015 STH cliff dwelling closure, the NPS observed that the Headquarters Loop had become the park's most congested area. Parking congestion remains an issue during peak summer months from late morning until mid-afternoon (NPS 2018a). There are some road construction delays and noise associated with the road projects, which include improved safety features, widened shoulders, pullouts, overlooks, shade structures, and accessibility features for park visitors. Work on the rehabilitation of the Headquarters Loop residences is planned for 2024, which will continue construction activities that may similarly affect the visitor use and experiences.

The NPS plans to work with partners to develop a virtual tour of STH, enhancing benefits for visitor use, interpretation, and experience, and creating new benefits for those who cannot physically visit the park or the STH cliff dwelling.

3.1.2 Impacts of Alternative A: No-Action Alternative

Under the no-action alternative, the experience of alcove access and on-site interpretation of the STH site would continue to be inaccessible to visitors for safety reasons. Visitors would continue to observe the site from nearby overlooks and trails but would be unable to access the cliff dwelling itself. Visitors seeking an interpretive experience at STH would obtain information about the site from rangers, kiosks, and museum installations and exhibits; however, they would not be afforded opportunities to experience the site up close.

Natural factors that currently contribute to the ongoing deterioration of the sandstone arch, such as water intrusion and the spalling of the rock face, would continue, potentially obscuring views or

directly affecting the integrity of the historic structures within the alcove. The continued loss of the arch's structural integrity over time could result in eventual catastrophic collapse. While the potential timing of any catastrophic loss of the arch's structural integrity is not known, such an event would constitute a considerable permanent adverse effect on visitor use and experience through the loss of a well-preserved and visitor-accessible cliff dwelling at the park. It would also have the potential for causing extensive damage to historic park infrastructure that currently provides visitor services across Spruce Canyon in the general vicinity of STH (Mason 2022).

STH is one of the most recognizable places at MVNP visited by the public and is one of a limited number of dwellings that have been made accessible to visitors to enhance public education and understanding of Ancestral Pueblo occupation at Mesa Verde. While there are 604 known cliff dwelling or storage sites within the park, visitors are only allowed to enter or get close to 11 cliff dwellings through ranger-guided tours. Of these 11 sites, STH is the most easily accessible site for visitors. STH is the only cliff dwelling open year-round to the public and is only one of two cliff dwellings that visitors can experience up close without paying for a tour ticket.

These highly visible, stabilized archeological sites are essential to sustaining the authenticity and integrity of the overall archeological landscape. They are linked to the park's interpretive and preservation missions. Most archeological resources in the park are preserved in place with little human intervention, visitor access, or interpretation. The potential loss or damage of STH from not stabilizing the alcove arch could result in the long-lasting and potentially irreversible loss of future opportunities for public interpretation of the site's unique cultural history.

3.1.3 Impacts of Alternative B: Proposed Action

Alternative B would have temporary adverse impacts on visitor use and experience from audible construction noise and the presence of large equipment on the mesa top. Heavy equipment (the crane, grout plant, and water storage) mobilized to the construction site above the alcove arch would remain in place for the duration of the 180-day work period. These construction-related features would detract from the area's natural surroundings and would be immediately observable by visitors from various locations near the site. Active stabilization work would be especially visible from the Chapin Mesa Archeological Museum.

Project design features would ensure that noise limits are applied during the 180-day construction period. Specifically, the NPS would adhere to the following dBA limitations:

- 70 dBA more than 12 minutes in any hour, as measured at 50 feet from the source
- 80 dBA more than three minutes in any hour, as measured at 50 feet from the source

Adhering to the measures would minimize the unnatural sounds visitors experience at MVNP. Noise impacts on visitors during winter months would be especially noticeable. Compared with summer months, when noise from visitor traffic and other high season-related sounds contribute to background levels, noise from construction activities would be more perceptible when such background sources are less present. The proposed action's visual impacts would also be evident during preconstruction staging and active stabilization work at the site.

Vegetation removal on up to 0.44 acres would be required to provide up to a maximum of 15 feet of horizontal space to accommodate the passage of large equipment along the Petroglyph Point Trail temporary access route. This would create a readily apparent visual contrast with surrounding vegetation. This effect would persist until the NPS restores the area upon completion of the project. Overall, the anticipated decrease in forest density would be noticeable only from the perspective of visitors accessing the trail once it was reopened for recreational use. Visible signs of construction-

related disturbance would diminish over time as forest vegetation is recovered; however, full restoration of the visual setting may not occur if any mature piñon-juniper trees were removed.

The required closure of public access to Petroglyph Point Trail during the 180-day work period (which is expected to last from September through March to avoid the migratory bird-nesting and breeding season) would coincide with normal seasonal trail closures that occur during winter. As a result, the impact on visitors' access to the trail would be minimal.

Traffic control needed to move equipment along park roads to and from staging areas could contribute briefly to the congestion. Traffic congestion affecting visitors would likely be minimal, except during the initial mobilization and demobilization since these activities could be expected to occur during higher visitor use periods in the fall and spring. Truck and pickup traffic from the off-site staging area to the construction site would adhere to the existing flow of traffic around the Headquarters Loop.¹⁰ If necessary, the NPS could constrain activities, such as limiting the number of daily trips to the work site, specifying when these trips occur (in the morning or late afternoon when visitor traffic is minimal), and coordinating mobilization of equipment and supplies with the contractor to minimize traffic congestion and reduce effects of congestion on roadways.

The NPS would minimize adverse effects on the visitor experience during active stabilization by allowing visitors to learn about the project through interpretive exhibits. These exhibits would enhance the museum experience and provide educational opportunities. As a result, impacts on visitor use and experience would be somewhat mitigated through educational opportunities for the public to learn about the stabilization process.

Under this alternative, the expected reopening of the archeological site following stabilization would greatly enhance the visitor use and experience. As proposed under alternative B, the visitor use and experience at the STH cliff dwelling would be similar to what they were before the 2015 site closure; no tour tickets were required, tours were self-guided, rangers were on-site, and the roofed kiva was open for visitation. Regulating the number of self-guided visitors entering the cliff dwelling site is not considered necessary because crowding within the site was infrequent and short term, typically lasting less than an hour. Likewise, allowing visitors to learn about and experience the site on their own timeline is preferable to a guided/ranger-led tour. Prior to closure, STH was one of only two self-guided cliff dwellings in the primary visitor use area in the park and the only one opened year-round. Direct engagement of the public with the site would restore a unique experience that has been a feature of MVNP for generations.

3.1.4 Impacts of Alternative C: Stabilize and Do Not Open the Site for Visitation

Under alternative C, the impacts on visitor use and experience from stabilization actions would be the same as under alternative B. Visitors seeking an interpretive experience at STH would obtain information about the site from existing installations and exhibits within the museum; however, they would not be allowed to enter STH. The NPS would continue to direct them to the park's other cliff dwellings for such opportunities. The potential closure of the archeological site following stabilization would result in a loss of interpretive opportunities, but visitors' abilities to view the site from nearby trails and overlooks would continue. Other closures negatively affecting current visitor use and experience at MVNP are temporary and would enhance visitor uses and experience when completed and reopened.

¹⁰ Allan Loy, MVNP planner/project leader, email to Kevin Doyle, EMPSi project manager, on October 21, 2021, regarding clarification of the proposed stabilization project construction.

3.2 CULTURAL RESOURCES

3.2.1 Affected Environment

MVNP was established in 1906 to preserve and protect the material culture of the ancient people who occupied the Mesa Verde cuesta.¹¹ The ancient architecture, artifacts, and landscapes that the NPS is mandated to preserve are primarily associated with Ancestral Pueblo people who occupied Mesa Verde and the wider region from 550 CE to 1300 CE.

Congress established MVNP with the stated purpose to “provide specifically for the preservation from injury or spoliation of the ruins and other works and relics of prehistoric or primitive man within said park” (NPS 2015a). These same resources were the basis for listing the Mesa Verde Archeological District (5MT4341) on the National Register of Historic Places (NRHP) in 1966. This district encompasses most of the park. In 1978, the value of the park’s archeological resources was further recognized when the park was selected as one of the seven original World Heritage Sites recognized by the United Nations.

MVNP has over 4,700 known archeological sites. The archeological sites are significant for their cultural importance to the descendants of the Ancestral Pueblo people, because they are some of the best-preserved ancient cliff dwellings in North America. They are also significant for what they can tell us about ancient settlement patterns and lifeways. The STH cliff dwelling is an Ancestral Puebloan habitation compound, built over 700 years ago in a naturally occurring sandstone alcove. STH is the third-largest cliff dwelling in the park, with 130 rooms and eight kivas. It provides a high-quality interpretive experience (Figure 3-2, Spruce Tree House).¹²

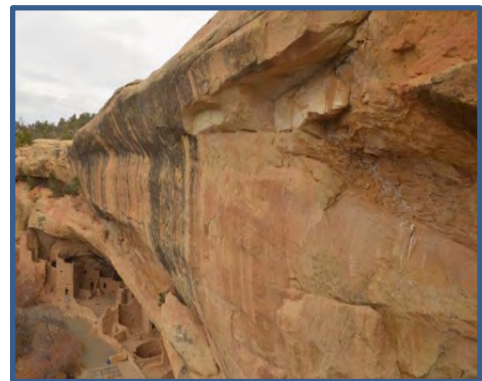


Figure 3-2. Spruce Tree House

While the park was established to preserve and protect the material culture of the people who originally occupied the area, other cultural resources include ranches and agricultural properties acquired when the park was designated; early NPS structures, roads, and trails; Depression-era structures, roads, and trails constructed by the Civilian Conservation Corps; and Mission 66 park developments.

Much of the project area is included in a cultural landscape inventory of the Headquarters Loop area (5MT23530; Shapins Associates 2012). The project area is crossed by roads that are included in the Chapin Mesa Loop Roads Historic District (5MT23457). A portion of the project area lies within the Mesa Verde Archeological District (5MT4341) designated for nearly all eligible prehistoric cultural resources in MVNP. Other districts in the immediate vicinity of the project area include the Mesa Verde Administration District - National Historic Landmark (5MT9790), the Spruce Tree Campground Historic District (5MT13629), and the Navajo Hogans Historic District (5MT13627).

During 2020–2021, archeologists with MVNP’s Cultural Resources division completed a cultural resource inventory of 6.19 acres for the proposed access route for the crane and equipment needed for the STH alcove arch stabilization, to comply with Section 106 of the National Historic Preservation Act (NPS 2022). The cultural resource inventory included an examination of 100 feet

¹¹ A cuesta, from the Spanish *cuesta* (“slope”), is a hill or ridge with a gentle slope on one side and a steep slope on the other. The geological term is more specifically applied to a ridge where harder sedimentary rock overlies a softer layer; the whole is being tilted from the horizontal.

¹² Photograph taken by James A. Mason on October 30, 2018.

on either side of the proposed access route, which connects the Mesa Top Loop Road with the construction area. The archeologists also examined the proposed construction area, encompassing much of the sandstone bedrock on the mesa top above the STH alcove arch, for cultural resources.

Seven archeological sites were located within 100 feet of the proposed access route and construction area. Of the seven sites, one site (5MV225) was previously recorded and five sites (5MV4442, 5MV4477, 5MV4478, 5MV4479, and 5MV4481) were newly recorded during the project. The historic Petroglyph Point Trail (5MT23058) had been previously partially recorded, and final documentation was completed as part of this survey (NPS 2022). MVNP staff consulted with the Colorado State Historic Preservation Office (SHPO) and received concurrence on the seven sites' NRHP eligibility (SHPO letter June 23, 2022).

Five NRHP-eligible sites have the potential to be impacted by the proposed action because they are within or directly adjacent to the proposed access route or construction area. Details of these sites are provided in the table below.

Table 3-1
Cultural Sites in the Survey Area

Site	Site Type	NRHP Eligibility	Relationship to Project Component
5MT23058 - Petroglyph Point Trail	Historical hiking trail	Eligible	The proposed access route coincides for approximately 303 feet.
5MV225	Prehistoric habitation	Eligible	The proposed access route goes through the site for approximately 160 feet.
5MV4442 - Pack and Saddle Site	Historic horse concession headquarters and early camping	Eligible	The proposed access route goes through the site for approximately 655 feet.
5MV4477	Prehistoric habitation	Eligible	The site is 45 feet east of the proposed access route.
5MV4478	Prehistoric checkdams	Eligible	The proposed access route goes through the site for approximately 61 feet.
5MV4479	Historical activity locale	Not Eligible	The site is approximately 19 feet east of the work area.
5MV4481 - Ruins Loop Shortcut Road	Historical road	Eligible	The proposed access route coincides for approximately 300 feet.

Source: MVNP 2022

Trends and Past Actions – Cultural Resources

The park's cultural resources (archeological sites, cultural landscapes, precontact and historic districts, structures, objects, and buildings) are subject to a variety of disturbances, including erosion, natural deterioration of structures, landslides and rockfalls, wildfire, animal activity, and other natural processes. Most archeological sites at MVNP are preserved in place, with minimal human intervention. Cultural resources in the park and surrounding areas have also been adversely impacted to varying degrees from past and ongoing management and projects, construction-related disturbance, visitor use and support facilities, and unauthorized collecting and vandalism.

Recent, ongoing, or upcoming actions near the STH alcove arch project include the Mesa Top Loop Roads paving project, rehabilitation of the Headquarters Loop residences, the Chapin Mesa Archeological Museum closure and exhibit redesign, actions related to the fire management plan, and demolition and restoration of the old MVNP helibase site. These ongoing and future activities may result in adverse effects on historic properties through ground disturbance, inadvertent damage, or incompatible alterations to the setting.

Construction and maintenance of park facilities are undertakings subject to cultural resource protection laws. Adverse effects on historic properties are minimized or mitigated through consultation with the SHPO and Tribal Historic Preservation Officers as part of the National Historic Preservation Act Section 106 process. The Colorado SHPO has concurred that the Mesa Top Loop Roads paving project would result in an adverse effect because it diminishes the integrity of the setting and feeling by widening the road and removing mature piñon-juniper forest. Section 106 consultation is in process for the projects to rehabilitate the Headquarters Loop residences and the Chapin Mesa Archeological Museum closure and redesign. Both of these projects are designed to follow the Secretary of the Interior's Standards for Rehabilitation and are not expected to result in an adverse effect. Implementation of the fire management plan also is not expected to result in an adverse effect because of the minimization and avoidance measures that the NPS will follow.

Climate trends are affecting cultural resources throughout the park. Climate change patterns and drought are leading to hotter temperatures, drier conditions, and more intense storm events. Flash flooding displaces surface artifacts and destroys cultural deposits and structures. Structures and protective rock features are subject to erosion, weathering, and rockfalls. Warming temperatures and drought result in more intense wildfires, which have more serious impacts on cultural resources. Updated fire management planning would include measures to ensure that impacts on cultural resources would be avoided or minimized, consistent with park policy and direction on preserving these resources.

3.2.2 Impacts of Alternative A: No-Action Alternative

None of the cultural sites identified within the recently surveyed area of Chapin Mesa would be affected under the no-action alternative; however, the no-action alternative could result in adverse impacts on cultural resources at MVNP from the continued deterioration of the STH cliff dwelling. Natural factors that contribute to ongoing deterioration of the sandstone arch, including water intrusion and spalling of the alcove arch, would continue. Such factors would accelerate the loss of structural integrity. As conditions of the arch deteriorate over time and are further exacerbated, the subsequent loss of structural integrity could result in eventual collapse. While the potential timing of the catastrophic loss of the arch's structural integrity is not known, such an event would constitute a considerable permanent adverse effect on cultural resources within the alcove at STH.

These effects would be potentially severe and would result in the long-lasting and potentially irreversible loss of important cultural resources. In addition, this would reduce future opportunities for public interpretation of the site's unique cultural history.

Since the closure, no stabilization has occurred on the STH cliff dwelling, and the limited park activities since the closure have focused on analyzing arch stability and documenting rock falls and any resulting damage to the site. Given the existing safety concerns, stabilization of the STH cliff dwelling would not occur prior to the potential collapse of the arch. If the arch were to collapse today, the park would document this event and perform the stabilization needed to prevent further deterioration of what remains of STH. It is likely the concussive force of the arch collapse would obliterate most of the site's standing architecture, potentially knock portions of the trail in front of

the site down slope into Spruce Canyon, and potentially result in structural damage to the historic buildings on the west rim of Spruce Canyon (Mason 2022).

MVNP staff maintains government-to-government relationships with 26 federally recognized tribes that have interests in the park's cultural resources. From some, but not all, tribal perspectives, physically protecting the cultural resources within the alcove by stabilizing the sandstone arch is not considered as appropriate as letting nature take its course. From this perspective, everything in this world has a lifespan; resources that come from the earth, in time, return to the earth. The site has served its purpose. An eventual collapse of the alcove arch and destruction of STH would be considered a natural and acceptable outcome.

However, the no-action alternative is in conflict with the mission of the NPS and the park to preserve the fundamental park values and resources. If fundamental resources and values are allowed to deteriorate, the park's purpose or significance, or both, could be jeopardized. Specifically, the no-action alternative would affect the fundamental value of archeological preservation and investigation and the fundamental resource of STH, an important part of the Mesa Verde archeological landscape (NPS 2015a).

3.2.3 Impacts of Alternative B: Proposed Action

Stabilization activities proposed under alternative B, which would involve securing individual arch rock blocks and installing geotechnical instrumentation to monitor the arch's stability, would result in increased protections for cultural resources contained within the alcove at STH. Structural improvements of the geologic formation would prevent or delay the collapse of the arch or rockfalls. An estimate of the useful life of the improvements is over 100 years (Post-Tensioning Institute 2004; FHWA 1999; Advanced Terra Testing 2020). Stabilization activities would also mitigate the potential for damage to the cliff dwelling from natural factors that currently contribute to the ongoing deterioration of the sandstone arch.

The proposed stabilization would result in beneficial impacts on cultural resources by providing for the preservation of the alcove arch above the site, consistent with the mission of the NPS and the park to preserve the fundamental park values and resources. As described above, the NPS recognizes and respects tribal perspectives on the means and methods of protecting fundamental resources and honoring park values and purposes.

There is the potential for rock falls to occur during stabilization work on the sandstone arch. Given that such events would have the potential to impact the structures at STH, a protection system designed by the contractor and approved by the NPS would be in place once the project is approved. This protection plan would serve to prevent damage to the cultural site within the alcove during stabilization work.

Alternative B would have localized impacts on cultural resources as a result of the vegetation removal required to provide up to a maximum of 15 feet of horizontal space to accommodate the passage of large equipment. These effects would be confined to the access route; portions of the route coincide with the Petroglyph Point Trail. The cultural resources survey conducted for the project identified five NRHP-eligible sites that would potentially be impacted by the proposed action because they are within or directly adjacent to the proposed route or construction area. Details of these sites are provided below.

Table 3-2
Management Recommendations for NRHP-Eligible Sites in the Project Area

Site	Site Type	NRHP Eligibility	Relationship to Project Component	Management Recommendation
5MT23058 - Petroglyph Point Trail	Historical hiking trail	Eligible	The proposed access route coincides for approximately 303 feet.	An archeologist should monitor the equipment traffic through the site.
5MV225	Prehistoric habitation	Eligible	The proposed access route goes through the site for approximately 160 feet.	An archeologist should monitor the equipment traffic through the site.
5MV4442 - Pack and Saddle Site	Historic horse concession headquarters and early camping	Eligible	The proposed access route goes through the site for approximately 655 feet.	Equipment travel should be restricted to the designated route (the old access road and Petroglyph Point Trail) and should be monitored by an archeologist to ensure cultural deposits are not impacted. Barrier fencing should be placed in areas where cultural deposits are most likely to be impacted, such as along the margins at the intersection of the access road and the Petroglyph Point Trail. An archeologist should monitor the vegetation removal and tree limbing. Trees with evidence of historical modification should be documented prior to limb removal. After project completion, erosion controls should be implemented along the access road to prevent water channeling and potential impacts on cultural deposits and features along the road.
5MV4478	Prehistoric checkdams	Eligible	The proposed access route goes through the site for approximately 61 feet.	An archeologist should monitor the equipment traffic through the site.

Site	Site Type	NRHP Eligibility	Relationship to Project Component	Management Recommendation
5MV4481 - Ruins Loop Shortcut Road	Historical road	Eligible	The proposed access route coincides for approximately 300 feet.	An archeologist should monitor the vegetation removal and tree limbing. Trees with evidence of historical modification should be documented prior to limb removal. Equipment traffic through the site should be monitored by an archeologist and should be confined to the center of the existing roadbed and pedestrian/bicycle path to avoid disturbance of roadside features.

Source: MVNP 2022

The current condition of the historical road, recreational trail, and area of prior use as a horse concession indicates that further use of these areas to provide for access to the construction site would not affect the park's fundamental resources and values. Additional ground disturbance within the designated route would not result in the loss of the historical artifacts that are lightly scattered in the area of the former horse concession. Prior use of the existing access corridor that runs along the road and trail, and through the former pack and saddle site, has occurred for past stabilization activities. No adverse effects are anticipated from the additional use of the route (NPS 2022).

The NPS is complying with Section 106 of the NHPA and its implementing regulations (36 CFR 800) concurrently with the NEPA process. The NPS used the procedure for public involvement under NEPA in lieu of public involvement requirements under the NHPA. The proposed action is not expected to result in an adverse effect as defined by 36 CFR 800.5 and MVNP will be requesting the SHPO's concurrence on a finding of No Adverse Effect.

3.2.4 Impacts of Alternative C: Stabilize and Do Not Open the Site for Visitation

Impacts on cultural resources under alternative C would be the same as those described under alternative B.

3.3 RARE PLANTS

3.3.1 Affected Environment

3.3.2 Chapin Mesa Milkvetch

Chapin Mesa milkvetch (*Astragalus schmolliae*) is a flowering herb endemic to a small part of the Mesa Verde cuesta in southwest Colorado (Figure 3-3, Chapin Mesa Milkvetch). Specifically, it is found in MVNP and the Ute Mountain Ute Tribal Park. It grows primarily in red loess soil on Chapin Mesa, in old-growth piñon-juniper woodlands between 5,800 and 7,500 feet in elevation (Porter 2014).



Figure 3-3. Chapin Mesa Milkvetch

Chapin Mesa milkvetch's habitat occurs in aeolian mesa topsoil of piñon-juniper woodlands on Chapin Mesa; a few are on Park Mesa and the adjoining canyon edges. Chapin Mesa milkvetch's range is suspected to be about 4,000 acres, mostly on Chapin Mesa, with about half of its habitat (2,012 acres) within MVNP. The Chapin Mesa milkvetch's preferred habitat is the partially shaded understory of intact old-growth piñon-juniper woodland canopy with deep, loess soils on Chapin Mesa (NPS 2020; Rondeau et al. 2016).

A 2021 survey conducted for the site of the access route and portions of the associated trails (NPS 2021c) discovered a total of 403 Chapin Mesa milkvetch plants in the area surveyed; seven of these were seedlings, and 396 were adults. The survey of additional areas included the entire paved bike path (not just the crane access path), which is wider than the area that would be impacted by the crane and pickups traveling between the work site and staging area. The most recent total population estimate for the species was 500,000 plants in 2001.

Chapin Mesa milkvetch grows to approximately 12 to 24 inches tall with ash-colored compound leaves and creamy white flowers. The plant develops a deep taproot that grows 16 inches or more

(USFWS 2015). Chapin Mesa milkvetch plants emerge in early spring and flower between late April/early May and early to mid-June. Most plants release their seeds by late June. The seeds are hardy and long lived in the soil. Only a small percentage of seeds germinate each year (USFWS 2015). The structure of the flowers requires a strong insect for pollination, as the insect must force itself between the petals of the butterfly-shaped flowers. Ground-nesting bees, bumblebees, and bee flies are known pollinators (USFWS 2015).

In MVNP, Chapin Mesa milkvetch is threatened by drought, fire, noxious weed invasion, development, and browsing by large herbivores, including feral livestock (USFWS 2010). This perennial species reproduces by seed but can resprout after wildfire. The species' occupied habitat has been intensively surveyed and mapped for several decades, using long-term demographic plots and belt transects, most recently by the Colorado Natural Heritage Program.

The 2018 Conservation Plan for Chapin Mesa Milkvetch (NPS 2018b) includes the following conservation actions to support a viable, stable population of Chapin Mesa milkvetch within intact habitat at MVNP within its known range:

- Surveys and avoidance—The NPS will survey proposed development and disturbance sites for Chapin Mesa milkvetch plants and work to relocate development to a site that will impact fewer or no plants.
- Buffers—Where ground-disturbing activities, including trampling, digging, or other effects, are within 100 feet of plants in suitable habitat, the NPS will minimize or mitigate the impacts through:
 - Restoring piñon-juniper in burned areas
 - Placing ground protection mats over the ground to prevent heavy equipment from disturbing soil
 - Working during fall and early winter when plants are subsurface and dormant
 - Working during periods when soils are dry to prevent rutting and crown damage to underground root crowns of Chapin Mesa milkvetch
 - Replanting disturbed areas with Chapin Mesa milkvetch and its associates
 - Introducing Chapin Mesa milkvetch into suitable but unoccupied habitat within its range

Potentially suitable habitat for Chapin Mesa milkvetch extends beyond the boundaries of its documented occupied habitat; it includes most of Park Mesa and West Chapin Spur and more than half of Chapin Mesa. In MVNP, recruitment is highly episodic and correlated to a wet spring, which is abundant some years and absent in others (Anderson 2004). Both emergence and population have been affected by wildfires and competition with nonnative, invasive plants. The population status across the boundary on tribal land is unknown to the federal government.

In February 2022, the USFWS withdrew a proposed rule to list Chapin Mesa milkvetch as a threatened species under the Endangered Species Act. This decision was based on a conclusion that the conservation plan and associated implementation plan for Chapin Mesa milkvetch at MVNP, in addition to new standard operating procedures for fire management at MVNP, reduce threats to the species so that it no longer meets the Endangered Species Act's definition of an "endangered" or "threatened" species (USFWS 2022).

3.3.3 Alkaline Pepperweed

The alkaline pepperweed (*Lepidium crenatum*) is a perennial plant currently categorized as imperiled. The alkaline pepperweed grows in piñon-juniper woodland openings and may be

associated with Mancos Shale. It is also found on arroyo banks and greasewood flats. While the total occupied acreage for the species is not known, the species has been recorded on 354 acres within the park and is known from 15 collections in six Colorado counties. The species may also be present in New Mexico and Utah. While potential habitat for the alkaline pepperweed exists within the project area, surveys did not find any individuals present (NPS 2018c; NPS GIS 2022).

3.3.4 Trends and Past Actions

Past, ongoing, and future projects involving ground disturbance throughout the park can contribute to the direct loss of rare plant species, such as Chapin Mesa milkvetch and the alkaline pepperweed. Recent, ongoing, past, and future actions include construction projects, such as the Mesa Top Loop Roads paving project, rehabilitation of the Headquarters Loop residences and Chapin Museum, and demolition of obsolete structures and restoration of Chapin Mesa milkvetch habitat at the old MVNP helibase. The amount of development in Chapin Mesa milkvetch and alkaline pepperweed habitat is low but scattered, thus fragmenting the habitats. Areas of development may no longer have the potential to support the species. The effects of development, such as the extent of invasive, nonnative species and increased erosion, can extend beyond the project footprints.

In addition to fragmentation, habitat loss and degradation from development; wildfires; invasive, nonnative plants; restricted range; and climate change interact to constitute the largest-trending threat to Chapin Mesa milkvetch, alkaline pepperweed, and their habitat. Climate change has increased the risk of frequent, large, stand-replacing wildfires, which has created the need for fuels management to protect people and park infrastructure. In turn, both wildfire and fuels management exacerbate the invasion and expansion of nonnative species, especially cheatgrass. Cheatgrass competes with native species for winter and spring moisture, directly competing with Chapin Mesa milkvetch and alkaline pepperweed. Additionally, cheatgrass facilitates more frequent fire, which further degrades and prevents the recovery of habitat.

Post-burned areas host a greater abundance of herbivores, such as pocket gophers, which are considered the primary source of adult mortality of Chapin Mesa milkvetch. Post-burned areas are also more exposed to hotter and drier conditions, resulting in reduced reproductive effort and seedling recruitment (NPS 2018b). Drought conditions caused by climate change can suppress the species' emergence in the spring, also leading to reduced reproduction and recruitment and increased mortality. The restricted range of these species makes the entire population vulnerable to widespread disturbance events such as drought and wildfires.

Conservation plans for Chapin Mesa milkvetch have been implemented by MVNP staff and the Ute Mountain Ute Tribe (NPS 2018b). Changes in fire management with regard to consideration of rare plants are in place, and a revised fire management plan is in progress. The USFWS has withdrawn a proposed rule to list Chapin Mesa milkvetch as a threatened species and designate critical habitat for the species. This withdrawal is based on the USFWS's conclusion that the conservation plan for Chapin Mesa milkvetch at MVNP and its associated implementation plan, in addition to new standard operating procedures for fire management at MVNP, reduce the threats to the species.

3.3.5 Impacts of Alternative A: No-Action Alternative

There would be no potential for adverse impacts on rare plant species under the no-action alternative.

3.3.6 Impacts of Alternative B: Proposed Action

Some existing locations of Chapin Mesa milkvetch (*Astragalus schmollii*) could be affected during construction activities under alternative B. Plants located along the approximately 1,264-foot access route would be subject to trampling by equipment, such as the heavy crane that would access a construction area above the STH alcove arch. No known occurrences of the alkaline pepperweed (*Lepidium crenatum*) have been recorded in the access route or other portions of the project area.

Localized, short-term effects on Chapin Mesa milkvetch would occur from the use of this heavy equipment during construction staging operations on Chapin Mesa and during active site stabilization work, which could involve additional trampling of vegetation in the local area. Preparing the access route and use of the staging area at the mesa could impact Chapin Mesa milkvetch by trampling and degrading habitat, potentially reducing the extent or vigor of populations. This could affect the viability of certain Chapin Mesa milkvetch populations and degrade potentially suitable habitat for both alkaline pepperweed and Chapin Mesa milkvetch. The NPS would minimize potential impacts on both species by identifying plants via preconstruction surveys, flagging, and avoidance to the maximum extent practicable.

Preparing the access route to allow for the passage of large equipment would cause the removal of approximately 0.44 acres of piñon-juniper woodland. This would occur through removal and limbing of trees to provide up to a maximum of 15 feet of horizontal and vertical clear space. The current forest cover in this area is relatively dense and has been previously disturbed.¹³ The extent of anticipated disturbance (0.44 acres) would amount to less than 0.1 percent of the total estimated habitat of Chapin Mesa milkvetch present in the park (2,012 acres).

The NPS would mitigate the effects on this species using the following strategies, per guidance contained in the 2018 Conservation Plan for Chapin Mesa Milkvetch (NPS 2018b). This plan includes conservation actions to support a viable, stable population of Chapin Mesa milkvetch within intact habitat at MVNP within its known range:

- Surveys and avoidance—The NPS will survey proposed development and disturbance sites for Chapin Mesa milkvetch plants and work to relocate development to a site that will impact fewer or no plants.
- Buffers—Where ground-disturbing activities, including trampling, digging, or other effects, are within 100 feet of plants in suitable habitat, park staff will minimize or mitigate the impacts, as described under alternative B.

3.3.7 Impacts of Alternative C: Stabilize and Do Not Open the Site for Visitation

Impacts on rare plants under alternative C would be the same as those described under alternative B.

¹³ Past thinning projects have reduced the density and spacing of piñon and juniper trees in the project area. The dominant plant species include *Pinus edulis*, *Juniperus osteosperma*, *Achnatherum hymenoides*, *Heterotheca villosa*, *Poa fendleriana*, *Yucca baccata*, *Machaeranthera bigelovii*, *Astragalus schmollii*, and other forbs (NPS GIS 2022).

CHAPTER 4: CONSULTATION AND COORDINATION

The following agencies, organizations, and American Indian tribes were contacted and invited to participate in the planning process. Consultation with the Colorado SHPO is in progress. The proposed action is not expected to result in an adverse effect as defined by 36 CFR 800.5 and MVNP will be requesting the SHPO's concurrence on a finding of No Adverse Effect.

MVNP consults with 26 affiliated and associated Tribes and Pueblos. The Spruce Tree Arch Stabilization project was presented and discussed at MVNP's annual tribal consultation meetings held on April 6, 2016; April 5, 2017; April 4, 2018, and May 5, 2022. The project was not discussed at the 2019 annual consultation meeting and no meetings were held in 2020 or 2021 because of safety concerns related to Covid-19.

In a correspondence dated November 19, 2021, the 26 Tribes and Pueblos were invited to participate in civic engagement as part of the NEPA process. The park received responses from the Hopi Tribe, Pueblo of Acoma, Navajo Nation, Pueblo of Santa Clara Pueblo, and Ysleta del Sur Pueblo. MVNP will continue to consult with Tribes and Pueblos throughout implementation of the activities covered by the EA.

- Bureau of Land Management – Tres Rios Field Office
- Bureau of Indian Affairs – Ute Mountain Ute Agency
- Natural Resources Conservation Service – Colorado Field Office
- U.S. Environmental Protection Agency – Region 8
- USFWS
- U.S. Forest Service – San Juan National Forest
- Colorado History, Colorado SHPO
- Colorado Parks and Wildlife
- Montezuma County
- Colorado State Land Board, Southwest District
- Colorado Department of Transportation – Region 5
- City of Durango, Colorado
- Town of Dolores, Colorado
- Cortez Area Chamber of Commerce
- Durango Chamber of Commerce
- Mancos Valley Chamber of Commerce
- Mesa Verde Foundation
- Crow Canyon Archaeological Center
- Colorado Natural Heritage Program

The following are the 26 federally recognized tribes that MVNP and Yucca House National Monument staffs consult with:

- Hopi Tribe of Arizona
- Jicarilla Apache Tribe
- Kewa Pueblo

- Mescalero Apache Tribe
- Navajo Nation
- Ohkay Owingeh
- Pueblo of Cochiti
- Pueblo of Nambe
- Pueblo of Picuris
- Pueblo of Sandia
- Pueblo of Taos
- Pueblo of Acoma
- Pueblo of Isleta
- Pueblo of Jemez
- Pueblo of Laguna
- Pueblo of Pojoaque
- Pueblo of San Felipe
- Pueblo of San Ildefonso
- Pueblo of Santa Ana
- Pueblo of Santa Clara
- Pueblo of Tesuque
- Pueblo of Zia
- Pueblo of Zuni
- Southern Ute Indian Tribe
- Ute Mountain Ute Tribe
- Ysleta del Sur Pueblo

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Appendix A

Alternative Concepts Considered but Dismissed
from Detailed Analysis

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APPENDIX A. ALTERNATIVE CONCEPTS CONSIDERED BUT DISMISSED FROM DETAILED ANALYSIS

ALTERNATIVE ELEMENTS CONSIDERED BUT DISMISSED

Based on internal scoping and the civil engagement process, the NPS considered several elements and concepts as separate alternatives or as elements of the action alternatives. These elements are summarized below, along with the rationale for their dismissal from inclusion as full alternatives.

The purpose and need and proposed action are primarily focused on the proposed stabilization construction project to preserve STH and secondarily on reinstating the pre-2015 access and visitor experience. The range of alternatives, including the no-action alternative (alternative A), stabilizing and reopening the site to the public (alternative B), and stabilizing the site with continued closure to the public (alternative C), are sufficient for a focused environmental assessment study on stabilization construction. The no-action alternative does not meet the purpose and need, but it provides a baseline for comparison and a discussion of likely impacts without the proposed stabilization.

Table A-1
Concepts Considered but Dismissed from Inclusion as Alternatives or Elements of Action
Alternatives

Concepts	Reason for Dismissal
Do not stabilize the arch and reroute the existing access trail outside the rockfall zone to allow visitors to view STH from the trail.	Not stabilizing the alcove arch and rerouting the existing access trail would not meet the primary purpose of and need for action and would not adhere to the park's enabling legislation or NPS management policies. There is limited flat topography in the canyon that would allow this kind of construction without substantial land disturbance and alteration of the setting. Construction of a new section of trail would potentially impact sensitive cultural and natural resources that are likely present. Also, visitors can already view STH from the existing trail.
Do not stabilize the alcove arch and open STH for visitation.	Not stabilizing the alcove arch and resuming visitation would not meet the primary purpose of and need for action. This would not adhere to the park's enabling legislation or NPS management policies. Public safety concerns would continue.
Do not stabilize the alcove arch and build a new observation platform outside the rockfall zone with visitation confined to viewing from the platform.	Not stabilizing the alcove arch and rerouting the existing access trail would not meet the primary purpose of and need for action and would not adhere to the park's enabling legislation or NPS management policies. Construction of an observation platform would potentially impact sensitive cultural and natural resources that are likely present in the canyon. There is limited flat topography in the canyon that would allow this kind of construction without substantial land disturbance and alteration of the setting. In addition, observation areas to view STH without entering the site already exist.

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Appendix B

Impact Topics Dismissed from Further Analysis

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APPENDIX B. IMPACT TOPICS DISMISSED FROM FURTHER ANALYSIS

Much of the activity during the project would be centered in the immediate construction area located on the mesa top and cliff face above the STH alcove arch. Any potential resource issues or impacts would be highly localized, of limited duration (less than 180 days), and, if present, minimized by design features that are incorporated as part of the proposed stabilization project. Based on an internal NPS environmental screening process with park resource specialists, there was no potential or only negligible potential for impacts on most resources screened. Some resources would be absent from the project area. The resource topics described below are those that are formally dismissed. The discussions also include the reason(s) that further analysis was not warranted.

Air Quality

The 1963 Clean Air Act, as amended (42 United States Code 7401 et seq.) requires federal land managers to protect air quality and to meet all federal, state, and local air pollution standards. MVNP is subject to federal, state, and local air pollution standards. The U.S. Environmental Protection Agency has established national ambient air quality standards. Current standards are set for sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, particulate matter equal to or less than 10 microns in size, fine particulate matter equal to or less than 2.5 microns in size, and lead. Montezuma County, Colorado, is currently in attainment for all criteria air pollutants (CDPHE 2022).

National parks are designated as Clean Air Act Class I areas and are afforded the highest level of protection from air quality impacts. In addition to the health-based national ambient air quality standards that protect ambient air quality, the Clean Air Act provides Class 1 areas with special protection for air quality and air quality related values, including visibility. The park is affected by air pollution from the coal-fired power plants in the Four Corners region, nearby mining, and urban and industrial pollutants from the southwestern United States, California, and Mexico. Air pollutants blown into the park can harm natural and scenic resources, such as soils, surface waters, plants, wildlife, and visibility (NPS 2018d).

The proposed action could have a negligible effect on air quality from vehicle and heavy equipment operation during construction activities. The use of construction equipment would result in a small increase of greenhouse gas emissions in the project area, including an increase in vehicle exhaust emissions, and fugitive dust during the construction period. It is expected that the heavy equipment (the crane, grout plant, water storage, etc.) would be mobilized to the work site above the alcove at the same or similar time and remain in place for the duration of the work (less than 180 days). Three vehicle round trips per day are anticipated between the off-site staging area and the work site. Armoring the access route with a geotextile and aggregate would reduce the effect of dust from access to the work site. Likewise, during the proposed stabilization work, a HEPA filtering dust-capture system would be used during drilling operations to reduce particulates from “drilling-in-the-dry” processes.

The use of various types of equipment during the construction period would produce emissions that would be very small relative to those produced from visitors’ travel throughout the park. The use of the equipment would make an inconsequential contribution to the park’s overall emissions profile. Any increase in greenhouse gas emissions would cease once construction is complete; therefore, no lasting effects are expected. For the reasons outlined above, this topic has been dismissed from further analysis.

Geology

The broader landscape at MVNP is characteristic of the south-sloping Mesa Verde cuesta geologic setting within which the park is located. Four geologic formations within the cuesta comprise the Mesa Verde Group, which lies above the Mancos Shale deposits characteristic of the region and includes the Cliff House Sandstone Formation. The Cliff House Sandstone Formation is the uppermost element in the geologic stratigraphy in MVNP; it is the highest in elevation and closest to the top of the numerous mesas within which Ancestral Pueblo people built their homes (NPS 2021d). The formation is characterized by a tan sandstone that has eroded in particular locations to form alcoves and overhangs.

The project area is defined by these geologic features and natural water sources present at STH. These features contribute to the site's cultural history and have played an essential role in providing for early human habitation.

A unique, freestanding natural sandstone arch is poised above the STH cliff dwelling. The arch's shape when viewed from above resembles a boomerang, with the midpoint of the arch pointing, leaning inward toward the main alcove roof. It measures roughly 216 feet in length and 89 feet deep. There used to be another alcove immediately south of STH that acted as an abutment for the STH alcove arch. That alcove collapsed hundreds of years ago, thus making the STH arch's stability that much more precarious.

The presence of heavy equipment on the mesa top, as well as temporary modifications to surface flows at the site required under the implementation of the storm water pollution prevention plan, would result in temporary adverse and localized impacts on the geological formation. However, these adverse impacts would be small in scale (contained to the mesa top staging area and specific portions of the rock face) and limited in duration (lasting under 180 days).

No adverse effects on existing geologic surfaces would occur. The arch's natural geology has been previously modified through prior stabilization efforts. Proposed modifications would address factors that currently contribute to the ongoing deterioration of the sandstone arch, such as continued water intrusion and spalling of the rock face. These factors are accelerating the already well-documented loss of the arch's structural integrity. As conditions at the site worsen over time and are further exacerbated, the subsequent loss of structural integrity at the site could result in eventual collapse. For the reasons outlined above, this topic has been dismissed from further analysis.

Water Resources

Springs and seeps are common in locations where the Cliff House Sandstone and Mancos Shale deposits meet, as the shale acts as a barrier to water infiltration. These seep springs provided a continuous source of water for the Ancestral Pueblo people for hundreds of years and active seep springs are still located along the trail to the STH cliff dwelling (NPS 2021d). An ephemeral drainage also occurs at the base of the site, which is part of a larger network of riverine intermittent streambeds that drain to the Mancos River (NWI 2021). The natural sandstone alcove shelters the historic dwellings. Natural water features occur at the site and vicinity in the form of seep springs, which can be found where the water emerges from the cliff face, directly above the shale layer.

The arch's structural stability would be improved through installation of drains and treatment of shrinkage cracks in the concrete plug that currently functions as a dam collecting water and saturating the sandstone. The proposed arch stabilization would improve protection of the Ancient Puebloan structures within the alcove by tightly clamping the existing concrete plug between the

sandstone arch and alcove roof via the installed rockbolts. This would inhibit, if not completely stop, the intrusion of water from getting into the alcove through the existing thin gaps alongside the concrete dam at the top of the alcove roof. This improvement via arch stabilization, with installed drainage tubes in the underside of the existing concrete dam, along with existing water diversion structures (curbs and gutters that redirect rainwater from getting into the alcove) justify the dismissal of this issue from further analysis.

Vegetation

Piñon-juniper woodland vegetation is a dominant vegetation cover in MVNP and within the project area. It covers a total area of 20,918 acres in the park (NPS GIS 2022). Piñon-juniper woodland occupies the mesa tops and upper canyon slopes lying at or below 7,800 feet in elevation (NPS 2021e). These woodlands occur primarily on gently sloping terrain evenly distributed throughout the lower elevations in the park's southern and western reaches. They also occur on rocky canyon slopes. Piñon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) dominate the piñon-juniper woodland. The *Juniperus* genus dominates the lower-elevation and xeric sites, and piñon pine dominates at higher-elevation and mesic¹⁴ sites.

Preparing the access route to allow for the passage of large equipment would result in the partial removal of approximately 0.44 acres of piñon-juniper woodland. This would occur through removing or limbing of trees to provide up to a maximum of 15 feet of horizontal and vertical clear space. The current forest cover in this area is relatively dense and has been previously disturbed.¹⁵ The extent of anticipated disturbance (0.44 acres) would amount to less than 0.01 percent of the total woodland vegetation present in the park (20,918 acres). Thus, the anticipated decrease in forest density would not be noticeable. No vegetation would be disturbed beyond the aforementioned limits of required removal and vegetation would recover following disturbance.

Following stabilization, the NPS would implement invasive species monitoring and controls to help prevent the recurrence of invasive plants along the trail and to minimize the potential spread into adjacent, undisturbed forest. Additionally, incorporation of the following minimization measures would further reduce the proposed action's effects on vegetation:

- Restore the project area and adjacent staging areas upon the project's completion to the original site conditions, including replanting of vegetation, arranging the soil and rock, and restoring any affected biological soil crusts.
- Clearly flag limits of disturbance to reduce potential trampling of native vegetation and soil.

By incorporating the above-listed mitigation strategies to avoid and minimize the proposed action's effects, there would be no permanent adverse impacts on vegetation. Additional beneficial impacts on native vegetation may occur through removal of any invasive plants along the proposed access corridor. For the reasons outlined above, this topic has been dismissed from further analysis.

Wildlife

MVNP, including the area around the project site, is home to abundant wildlife. Species occurring in the vicinity of the site include many mammals, birds, and reptiles (NPS 2021f). Migratory birds and

¹⁴ Relating to or requiring a moderate amount of moisture

¹⁵ Past thinning projects have reduced the density and spacing of piñon and juniper trees in the project area. The dominant plant species include *Pinus edulis*, *Juniperus osteosperma*, *Achnatherum hymenoides*, *Heterotheca villosa*, *Poa fendleriana*, *Yucca baccata*, *Machaeranthera bigelovii*, *Astragalus schmollii*, and other forbs (NPS GIS 2022).

eagles may also occur in the vicinity. The park's geographic isolation and its location in a geographic transition zone help provide niches for this wide variety of animal species.

The presence of human-caused noise and vibration from the use of heavy equipment during staging operations and active stabilization work on Chapin Mesa would affect wildlife that inhabit areas immediately adjacent to the site. Wildlife that inhabit these areas are likely habituated to vehicular noise and other human activity; however, the increased noise and activity related to the proposed construction would, nonetheless, cause wildlife to avoid the project area during the daylight hours when construction is actively taking place. Such displacement would occur daily throughout the approximately 180-day construction period. However, displaced wildlife would be able to occupy other portions of their home ranges until construction activities cease.

There would also be a temporary loss of 0.44 acres of piñon-juniper woodland habitat along the access route to the mesa top staging area; however, approximately 20,918 acres of this kind of habitat would continue to be available park-wide for use by displaced wildlife. To comply with the Migratory Bird Treaty Act, vegetation removal would occur outside the migratory bird-nesting season (April 1 through August 15) to avoid impacts on nesting birds. If construction activities cannot occur outside the bird-nesting season, a qualified biologist would conduct surveys prior to scheduled activity to determine whether active nests are present within 164 feet of the construction area. Any nesting locations found during surveys would be barricaded (for example, plastic fencing) to eliminate construction impacts on nests. The NPS would not remove vegetation containing nests until the nest is deemed inactive.

The above impacts could adversely affect individual wildlife and migratory birds but would not affect species at the population level. While displacement of birds and small mammal species is expected to occur, the effects would be of similar duration and intensity to other localized construction activities occurring in the site vicinity, such as roadway improvements associated with park infrastructure maintenance and improvement. These effects would occur over the short-term duration of stabilization activities (approximately 180 days) and would not persist beyond the completion of the arch stabilization work. For the reasons outlined above, this topic has been dismissed from further analysis.

Mexican Spotted Owl

In 1993, the USFWS listed the Mexican spotted owl (*Strix occidentalis lucida*) as threatened under the Endangered Species Act. Critical habitat for the Mexican spotted owl was designated in 2004, comprising approximately 8.6 million acres on federal lands in Arizona, Colorado, New Mexico, and Utah (69 *Federal Register* 53182; USFWS 2012). Intensive surveys conducted at MVNP found a small but successfully breeding population of Mexican spotted owl during the 1990s (Johnson 1997). Follow-up surveys in 2004 and 2005 found several birds but no breeding activity, even though most of the prime habitat for this species was intact (Johnson 2006). Additional call surveys by park biologists in suitable habitat have continued annually for many years, but the last time a response was heard was in 2009. Since then, spring-season call surveys in MVNP have continued intermittently without any detections. Surveys have been conducted using USFWS protocols specified in the Mexican spotted owl recovery plan (USFWS 2012).

NPS guidance considers a species extirpated from a park only after it has been demonstrated that it has been absent from the area for more than 10 years. In addition, during the previous decade, several hundred acres in the southern canyons of MVNP were being proposed for designation as two Mexican spotted owl PACs. The nomination process ended because no breeding activity was being detected and no owls were detected after 2009. The limits of these Mexican spotted owl PACs extend to the area surrounding and including STH.

There would be no direct impacts on Mexican spotted owl nesting or foraging habitat. There would be a loss of approximately 0.44 acres of piñon-juniper woodland habitat located along the proposed access route. Although Mexican spotted owls spend some time foraging on mesa tops, they typically spend the majority of their time below the canyon rim (Willey and van Riper III 2007); therefore, impacts on Mexican spotted owl foraging habitat would be minimal, as this is not the species' preferred foraging location. Moreover, the proposed action's potential effects on populations of Mexican spotted owls would be mitigated through the following strategies:

- If Mexican spotted owls are detected within or adjacent (0.5 miles) to the project area during subsequent annual protocol-level surveys conducted by park staff, construction activities would stop temporarily and consultation with the USFWS would be reinitiated.
- Due to the potential presence of Mexican spotted owl and other wildlife within the limits of disturbance or down canyon, work would not occur at night. In addition, the NPS would consider breeding-season restrictions if noise levels are estimated to exceed 69 dBA noise level (Delaney et al. 1999) consistently (more than twice per hour) or for an extended period of time (more than one hour) within 164 feet of nesting sites (if known) or within entire PACs (if nesting sites are not known). This is to maintain compliance with the Endangered Species Act.

For the reasons outlined above, this topic has been dismissed from further analysis.

Human Health and Safety

There would be no visitor health and safety impacts during construction because visitors would not be allowed to access the STH cliff dwelling site, and the upper portion of Petroglyph Point Trail would be closed. Worker safety would be addressed by project design and work rules. If the STH cliff dwelling is reopened to visitors after completion of the proposed stabilization project, the project would greatly reduce the visitor safety risks associated with rockfall. Therefore, human health and safety have been dismissed from detailed analysis as a stand-alone topic.

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