Improvement of Visitor Facilities at the Cottonwood Area Draft Environmental Assessment

Joshua Tree National Park, California

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EXECUTIVE SUMMARY

The United States Department of the Interior, National Park Service (NPS), has prepared this planning document and environmental assessment to address proposed facility development and improvements to visitor use management at Joshua Tree National Park. The project is situated in the Cottonwood area in the southeast portion of the park. The plan addresses immediate and long-term issues concerning resource protection, visitor use, and administration of the Cottonwood Springs visitor center area and associated trails. The plan was developed in accordance with the park's enabling legislation; management plans; NPS policies; and applicable federal, state, and local laws and regulations.

PLAN PURPOSE AND NEED

The purpose of this plan is to improve the park's Cottonwood area visitor facilities near Highway 10 to accommodate growing visitation and crowding in the visitor access areas of the district. The project would provide better space for interpretation, law enforcement, and fee collection to serve the public. The visitor center would be rehabilitated to address growing visitation and to provide improved interpretation of the park's unique ecosystem within a more sustainable, comfortable, and energy-efficient building.

The plan is needed to

- expand the visitor center parking area to accommodate increasing numbers of visitor vehicles;
- provide new spaces both within and outside the visitor center to provide adequate space to conduct interpretive programs and services;
- improve the ranger contact station and restore it to reflect the NPS Mission 66 period of park design and development; and
- replace the current modular, temporary visitor center unit with a building more appropriately designed for increasing numbers of visitors, better suited for the site and desert climate, and architecturally compatible with the site's Mission 66 period of development.

ALTERNATIVES

The plan presents two alternative approaches to managing the Cottonwood visitor center area and associated visitor facilities. These are the "no-action" alternative (alternative A), which describes a continuation of current management and the proposed action / NPS preferred alternative (alternative B). The alternatives were developed by soliciting input from park staff, stakeholders, other government agencies, and the public on key issues and desired resource conditions and visitor experiences. The alternatives consider different approaches to managing visitor use, directing development, providing access, and avoiding potential conflicts that may arise in the Cottonwood area.

Alternative A (No-Action Alternative)

There would be no changes to the existing double-wide trailer that serves as the visitor center. The existing Mission 66 historic contact station would continue to serve as a ranger contact station. Existing facilities would continue to have limited space for interpretive exhibits and provide limited opportunities to orient visitors to the backcountry. Space for outside interpretive and educational programs would remain small with inadequate shade for larger groups. There would continue to be a staffed information desk in the visitor center. No improvements, beyond current maintenance operations, would be made to the parking area, ranger contact station, or the restroom building. A small, shaded area with picnic table, information panels, and a short interpretive trail would be available for visitors. No change would occur in wayfinding throughout the district or in the management of trailheads or interpretive exhibits, and visitors would continue to have difficulty navigating crowded developed areas in the Cottonwood area.

Alternative B (NPS Preferred / Proposed Action)

The existing modular visitor center would be removed and replaced with a new building constructed within the immediate area. The new building would be designed specifically for the climate and site, and would match the architectural character of the Mission 66 district. The visitor center would have space for sales and visitor contact information, new exhibits, a classroom/meeting room, and an indoor restroom facility. It would also have office space for park staff (including law enforcement, fee collection, and interpretation), and storage. The existing Mission 66-era visitor contact station would be retained and its exterior restored to its historical appearance. New facilities would be accessible to all visitors, fully meeting NPS accessibility requirements. A new, shaded patio space would be provided that could serve as an outdoor classroom and accommodate interpretive programs.

The following improvements would be made to the existing visitor facilities, all within the existing developed area of the visitor center:

- The existing restroom building would be removed and restroom functions relocated to the interior of the new visitor center.
- The existing shaded picnic area would be expanded to a size that can incorporate six shaded picnic tables and accommodate 40 visitors.
- The short nature interpretive trail would be improved and connected to the new visitor center.
- An amphitheater and outdoor classroom with shade structure would be developed.
- The existing parking area would be expanded in size to increase visitor capacity and accessibility requirements.
- The existing photovoltaic array at the maintenance area would be expanded.
- The visitor center would be designed with water conservation infrastructure to minimize impacts on groundwater supply.
- A new well would be established along the route of the existing supply line to the visitor center to serve as monitoring station for groundwater levels and as a backup to the existing well.
- Other improvements would be made to improve visitor orientation and connections between the visitor center and the campground.

Impact Topics. The topics retained for impact analysis by actions proposed in this plan and environmental assessment are historic districts (the NPS Mission 66 buildings and structures of the Cottonwood area); prehistoric archeological resources; groundwater; and visitor use and experience.

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Purpose and Need

INTRODUCTION

Cottonwood is one of the three primary entrances to the park and is the primary way visitors enter Joshua Tree National Park (JOTR) from the south (figure 1). The existing visitor center, which is about 5 miles north of Interstate 10, is part of the Cottonwood area. The district is the focal point for visitor and park support facilities for the eastern portion of the park and also is the primary area for experiencing the Colorado Desert. The Cottonwood Mountains rise west of the visitor center, and the Pinto Basin plateau extends to the north.

PURPOSE AND NEED FOR THE PLAN

The National Park Service (NPS) is proposing to remove the temporary structure serving as a visitor center in the Cottonwood area and build a permanent visitor center, as well as address associated visitor facilities issues in the southeast portion of the park. The purpose of the effort is to improve the visitor facilities by accommodating growing visitation and addressing perceived crowding in the visitor access areas of the district. The project would provide better space for serving the public as well as provide improved space for visitor services, law enforcement, and fee collection within a sustainable, comfortable, and energy-efficient building.

The park has been in need of a new visitor center in the Cottonwood area for some time. The existing structure was never intended to be permanent and has reached end of its useful life. It is also undersized for adequately managing current visitation to the Cottonwood area, both in terms of space for educational and interpretive programs and waysides, as well as parking. In addition, the park recently completed a Determination of Eligibility to the National Register of Historic Places for the mid-20th-century modern architecture and landscape design of the original Mission 66 layout of Cottonwood's developed areas (Hennebery Eddy Architects 2016). The district's central feature is the visitor contact station in the Cottonwood visitor area, which is in a condition that allows for its restoration to period appearance. The existing temporary visitor center and modern restroom building detract from the district's significance, however.

This plan is needed to address both immediate and long-term issues concerning resource protection, visitor use, and administration of the Cottonwood Springs visitor center area and associated trails. The existing temporary, double-wide trailer, does not provide sufficient space for staff, does not adequately support the current and projected number of visitors in this part of

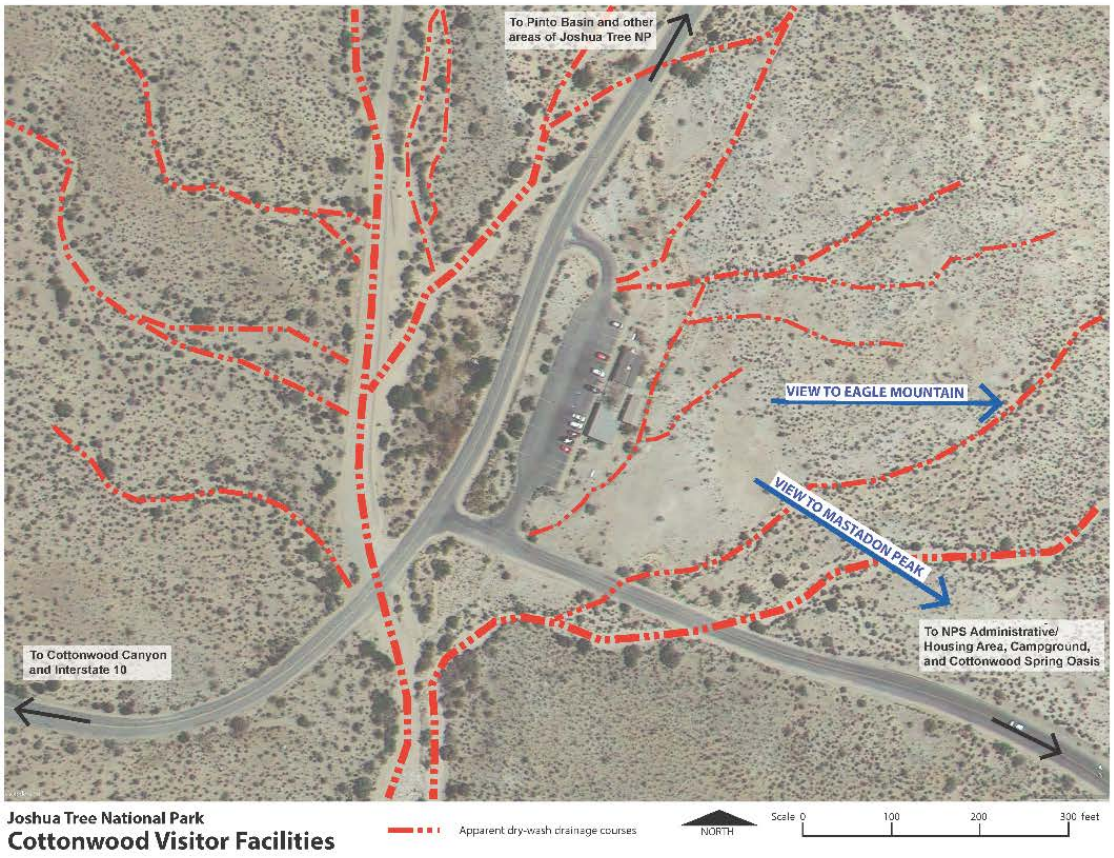

FIGURE 1. LOCATION OF THE COTTONWOOD AREA

the park, and is poorly engineered for the environment. In 2016, Joshua Tree National Park set a record for annual visitation with more than 2.5 million visitors. Visitation for the month of March 2016 alone was 327,072, and visitor numbers for the same month in 2017 increased to 404,545, which is the largest monthly visitation in the park's history. Visitor safety issues and the quality of the visitor experience also need to be addressed. A plan is needed to evaluate opportunities for rehabilitation, relocation, or replacement of existing facilities, including the visitor center, parking area, trails and trail parking, and office space, and to address necessary infrastructure upgrades. Visitor access, including improved accessibility, also needs to be evaluated as part of the plan.

This environmental assessment was prepared in compliance with the National Environmental Policy Act (NEPA) of 1969 and implementing regulations, 40 CFR Parts 1500-1508 and NPS Director's Order 12 and the NPS *NEPA Handbook* (NPS 2015a).

PLANNING BACKGROUND

The 1995 General Management Plan / Development Concept Plans recognized issues with the Cottonwood area and called for actions, including:

- providing a pullout near the entrance;
- building an approximately 3,000-square-foot visitor center that would include space for information and orientation, administrative offices, and restrooms;
- providing an approximately 800-square-foot sheltered outdoor space for informal talks, exhibits, and information boards; and
- expanding the parking area.

PURPOSE, SIGNIFICANCE, AND SELECTED FUNDAMENTAL RESOURCES AND VALUES

The park's purpose, significance, and fundamental resources and values, as well as statutory mandates and NPS management policies, all shape and constrain what this plan proposes. The purpose of Joshua Tree National Park is to:

> *"Preserve and protect the scenic, natural, and cultural resources representative of the Colorado and Mojave deserts' rich biological and geological diversity, cultural history, wilderness, recreational values, and outstanding opportunities for education and scientific study."*

The park is significant for many reasons, including its Joshua trees; landscapes; cultural, ecological and geologic resources; research opportunities; and location adjacent to urban populations.

Six of the park's fundamental resources and values are pertinent to the Cottonwood visitor center area and may be affected by this plan, including:

- prehistoric sites and ethnographic resources relating to American Indian inhabitants,
- biological diversity and healthy ecosystem function,
- recreational opportunities and values,
- hydrological resources,
- night sky, and
- viewsheds.

For more details on the park's significance and fundamental resources and values, see the park's foundation document (NPS 2015b).

DESIRED CONDITIONS

The Cottonwood Area would continue to be a gateway to the Colorado Desert, featuring a wide range of visitor opportunities and access to remote and challenging wilderness areas. The area would continue to be a location where high visitor use will be encountered, especially adjacent to exhibit plazas and visitor center facilities, trailheads and campsites, and become dispersed

and more unconfined with distance. Visitors would have opportunities to participate in hiking, photography and other artistic endeavors, astronomy, backpacking, and wildlife viewing.

Additional desired conditions include the following:

- The Cottonwood area would continue to
  - provide outstanding example of prehistoric archeological sites, 19th-century pioneering, and mid-century approaches to the modest development of a remote NPS outpost;
  - be a place where visitors can explore undisturbed Colorado Desert habitat featuring rare native fan palm oases, and have opportunities for viewing the desert tortoise and bighorn sheep as well as expansive views of surrounding mountain ranges and the Salton Sea; and
  - exemplify the best in NPS sustainable practices, where facilities maximize energy and water efficiency and interpret an impressive example of "off the grid" function to the visiting public.
- The plant and wildlife communities of Cottonwood would continue to thrive and adapt to changing environmental conditions; where natural processes dominate, ecosystem function is resilient, and biodiversity is high.
- Visitors to Cottonwood consistently have the opportunity to enjoy natural night skies and soundscapes; light pollution is minimized and environmental sounds dominate the developed area.
- Contemporary exhibits and visitor services would educate and inform more than one million annual visitors to the area with interpretive facilities and staff that emphasize park themes and resource messages.
- A dedicated education area would continue to provide opportunities to engage students as well as a space for special events and gatherings.
- A residential community meeting room exists and is maintained to build community in this lesser used, sparsely populated area.

THE PLANNING PROCESS

The process employed in creating this plan / environmental assessment is sequential, and the presentation of the plan / environmental assessment follows the stages in this process. It began with collecting, reviewing, and defining key information about the Cottonwood area, which included public opinions of the area and of the proposed action. The above information was used to identify issues that the proposed action needed to address. In the subsequent and central stage of the process, the interdisciplinary team developed potential resulting actions. Information was sought from other agencies on the area's resources, including the California State Historic Preservation Office and US Fish and Wildlife Service (USFWS), and input from the public during public scoping was requested. The next steps, after the conclusion of the public comment period, are described at the end of this chapter.

Issues

As defined by the 2015 NEPA handbook (NPS 2015a), "issues" or "environmental issues" are problems, concerns, conflicts, obstacles, or benefits that would result if the proposed action or alternatives, including the no-action alternative, were implemented. The National Park Service, other agencies, tribal governments, or the public may raise issues.

Over the course of the planning efforts, several issues related to the proposed actions in the Cottonwood area were revealed. These included visitor safety; viewshed concerns; protecting habitat, wildlife, and cultural resources; and improving visitor experience.

Visitor Safety. There is a visitor and staff safety concern at the current visitor center area. Exterior drinking fountains associated with the restroom building attract bees in the desert environment. These bees pose a safety issue to visitors and staff using the fountains.

Viewshed. Maintaining the views of Eagle Mountain and the desert landscape from the visitor center area was identified as a concern, particularly when considering construction of new facilities and modifications of visitor circulation in the visitor center area. In addition, views of the visitor center area and its designed historic landscape were also identified as a resource and experience that should be protected.

Habitat and Wildlife. Endangered species, including the desert tortoise and several state-listed plants, live in and around the Cottonwood area. Protecting them from disturbance during any proposed work, or as a result of new visitor access, was identified as an issue. Park biologists would monitor the construction associated with the Cottonwood visitor center to ensure that desert tortoises are not harmed or affected by the project. Park staff would also further enhance or expand the existing education and interpretation displays about the desert tortoise in and around the visitor center to help improve public awareness of this sensitive species and its protection needs.

Cultural Resources. A national register-eligible historic district associated with Mission 66 landscape design and architecture has recently been documented in the Cottonwood area. It includes the existing contact station in the visitor center area as well as its associated landscape features and parking lot. The visitor center area is a contributing feature of the historic district that includes most of the other development in the Cottonwood area. Highlighting and protecting the mid-century modern architectural and design styles as well as the remaining historic fabric of the Cottonwood area were identified as issues for the project. In addition, prehistoric archeological sites, some of which are individually eligible to the National Register of Historic Places and all of which contribute to a potential prehistoric landscape designation, are present in the Cottonwood area. Protecting prehistoric archeological sites from disturbance during any proposed work, or because of new visitor access, was identified as an issue.

Visitor Experience. Reported annual increases in visitation to the Cottonwood area is an existing and growing issue for Joshua Tree National Park. Crowding at the visitor contact station and at the entrance to the park is expected to increase in the foreseeable future. Maximizing the ability of the Cottonwood area to accommodate visitors in the developed portions of the park, while still protecting the historic and natural resources in the areas, was identified as a central issue to this project.

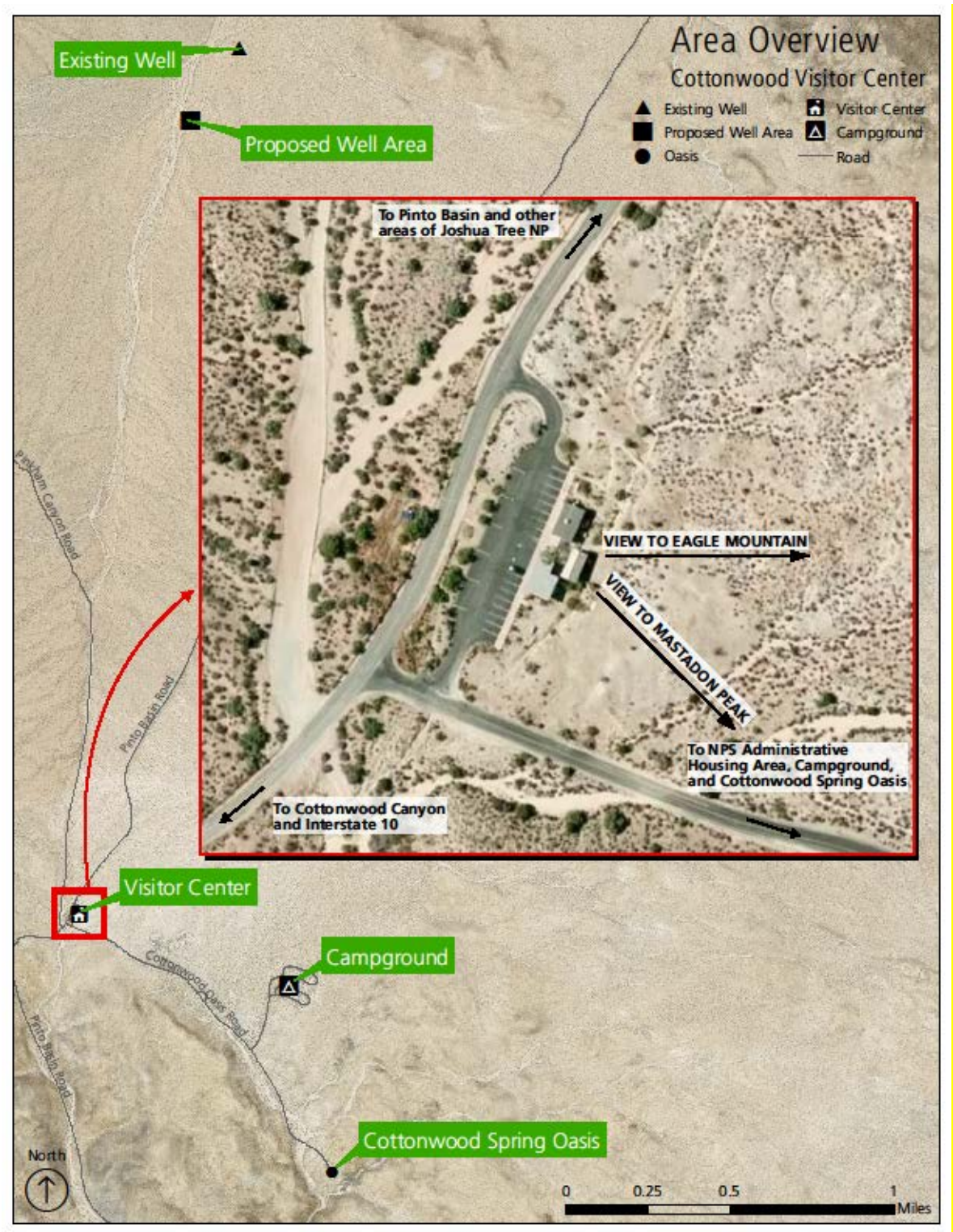

FIGURE 2. PROJECT AREA

Scope

Figure 2 shows the project area, which includes the visitor center area, the route of a proposed visitor center-to-campground connector trail, location of the Oasis trailhead parking area, and the location of the Cottonwood area's existing well and associated water line. The project area does not include the other developed facilities in Cottonwood area such as the campground, maintenance facility, and employee housing area.

IMPACT TOPICS RETAINED FOR FURTHER ANALYSIS

An important part of effective planning is understanding the consequences of making one decision over another. Environmental assessments, such as this document, identify the anticipated impacts of possible actions on resources and on park visitors and neighbors. The following section summarizes the key environmental issues and impact topics identified through scoping, which are discussed in "Chapter 3: Affected Environment" and analyzed in "Chapter 4: Environmental Consequences."

The analysis focuses on significant issues (meaning pivotal issues or issues of critical importance). During scoping for this plan, the interdisciplinary team identified a number of management issues for the Cottonwood area. The issues were retained for more detailed analysis of this plan if

- the environmental impacts associated with the issue are central to the proposal or of critical importance;
- a detailed analysis of environmental impacts related to the issue is necessary to make a reasoned choice between alternatives;
- the environmental impacts associated with the issue are a big point of contention among the public or other agencies; or
- if there are potentially significant impacts to resources associated with the issue.

Various impacts are analyzed for each of the retained environmental issues. Impacts are organized by topic, such as impacts on visitor experience or impacts on vegetation. Impact topics focus the environmental analysis and ensure the relevance of impact evaluation. These topics were identified based on federal laws and other legal requirements, Council on Environmental Quality guidelines, NPS management policies, staff subject-matter expertise, and issues and concerns expressed by the public and other agencies early in the planning process. The alternatives in this plan have the potential to affect these topics.

The following are the issues and impact topics that are addressed in this environmental assessment. They are not listed in any order of priority.

Cultural Resources

Establishing or modifying new facilities in the Cottonwood area would disturb the ground and have the potential to affect the area's archeological resources, which include individual archeological sites determined eligible for the National Register of Historic Places and a potentially eligible prehistoric landscape district. In addition, the Cottonwood area includes historic architecture and designed landscapes associated with the Mission 66 program of the

National Park Service. The eligible features of the Mission 66 design in the Cottonwood area include the visitor contact station at the visitor center area as well as the design (including the parking layout) of the visitor center area. Changes to the Mission 66 contact station and to the design of the parking lot around it would be of concern and could represent significant impacts to cultural resources associated with this action.

Impact topics: Prehistoric archeological resources (inclusive of individual archeological sites and a prehistoric landscape), Mission 66 Historic District (inclusive of historic structures and a designed historic landscape).

Groundwater

All of the facilities in the Cottonwood area depend on groundwater for their water supply. New developments could increase visitor use in this area, which in turn would increase groundwater withdrawals. Further analysis of the aquifer and the water budget is necessary to ensure the groundwater resource is not overdrawn under any alternative.

Impact topic: Groundwater.

Visitor Use and Experience

The primary reason for this proposed action is to improve the quality of the visitor experience at Cottonwood. Different actions could be proposed in the Cottonwood area to address the concerns of perceived crowding and increasing visitation numbers, and visitor use in the area—different options exist for rehabilitating and/or relocating the Cottonwood visitor center and building associated visitor facilities. These options would affect visitors in different ways, which will be of key importance to decision makers.

Impact topics: Visitor information and circulation, diversity of visitor experience, and opportunities.

IMPACT TOPICS DISMISSED FROM FURTHER ANALYSIS

Some impact topics have been eliminated from further analysis because the resources do not occur within the project area, the topics are not an issue for this project, or because the anticipated impacts would have no effect or an inconsequential effect on the topic. The following impact topics were considered but then dismissed from further analysis for the reasons outlined below.

Native Vegetation, Including Rare Plants

The project area lies along the southern edge of the Pinto Basin at an elevation of roughly 3,000 feet, which is an area dominated by desert scrub vegetation. The park's vegetation map identifies two associations in this area, the Mojave yucca—blackbrush association, and the creosote bush—white bursage association. Based on recent plant surveys, plant species common in this area include creosote bush (*Larrea tridentata*), blackbrush (*Coleogyne ramosissima*), white bursage (*Ambrosia dumosa*), cheesebush (*Ambrosia salsola*), silver cholla (*Cylindropuntia echinocarpa*), Mojave yucca (*Yucca schidigera*), catclaw acacia (*Senegalia greggii*), brittlebush (*Encelia farinosa*), bladder sage (*Scutellaria mexicana*), and lotebush (*Ziziphus obtusifolia*). Two

plant species identified by the State of California as rare are found in the area: Hall's tetracoccus (*Tetracoccus halli*) and thorny milkwort (*Polygala acanthoclada*). No federally listed plant species are present. Several nonnative, invasive plant species also occupy previously disturbed areas along roads, trails, and other ground disturbances in this area of the park, including red brome (*Bromus madritensis*), Mediterranean grass (*Schismus* sp.), and Saharan mustard (*Brassica tournefortii*).

The proposed action would expand the area of direct ground disturbances for the new visitor center, parking area, leachfield, connector trail along campground along road, and the water supply infrastructure that would tie a proposed second well to the exiting waterline north of the visitor center. In addition, anticipated increases in visitor use of this area would likely increase the prevalence of social trails. These impacts would potentially have a negative effect on native plant distributions and plant community condition, and introduce new ground disturbance zones that are prone to the spread of nonnative species. In accordance with the park's Vegetation Management Program, operating under the park's resource stewardship strategy goals and objectives to conserve biodiversity, a wide array of routine and ongoing vegetation best management practices and mitigation measures would continue along with the proposed action. These measures include the salvage of succulents prior to construction and replanting, active revegetation of disturbed areas, ensuring weed-free construction equipment, and weed control measures, among others. While areas of individual native plants would be removed as part of the action, with proper mitigation measures, the species' populations and native plant community composition would remain intact, and threats from nonnative infestations would be relatively minimal. Thus, this topic has been dismissed from further analysis in this environmental assessment.

Federally Listed Species – Desert Tortoise (*Gopherus agassizii*; Mojave population)

The desert tortoise is a federally listed species known to occur within the project area (listed as threatened as of 1990). Via the Endangered Species Act, critical habitat for the tortoise was designated within the park in 1994, parts of which lie roughly 1 to 2 miles southwest of the project area.

A final recovery plan for the tortoise was initially completed by the US Fish and Wildlife Service in 1994, and a revised recovery plan was released in 2011 (USFWS 2011). The National Park Service has adopted the management recommendations of the initial and updated recovery plans for the tortoise and has applied them at Joshua Tree National Park. However, given the tortoise's potential presence in the project area, the National Park Service has initiated informal consultation with the US Fish and Wildlife Service regarding the proposed action's potential effects on the desert tortoise or its habitat (see chapter 5 for consultation summary). The park will continue ongoing consultation with the US Fish and Wildlife Service to obtain concurrence on their section 7 determination. This information is publicly available the on the park's planning website at http://parkplanning.nps.gov/jotr.

The desert tortoise is most commonly found in association with the creosote bush scrub plant community, the predominant plant community of the project area. In preparation for this project, a site survey for the tortoise was conducted on February 8, 2017 by NPS staff. This

initial survey focused on the area in and around the existing (and proposed) visitor center. No tortoises or burrows were identified on this survey.

While tortoise habitat exists in the project area, this topic has been dismissed from further analysis in this environmental assessment for multiple reasons that aim to avoid or mitigate impacts to the tortoise or its habitat. These include: (a) the National Park Service is engaged in consultation with the US Fish and Wildlife Service and would implement agreed upon recovery measures and management actions identified in the consultation process prior to construction; (b) the National Park Service will continue to follow the tortoise management guidance outlined in the 2011 US Fish and Wildlife Service tortoise recovery plan; (c) the National Park Service will further enhance or expand the existing education and interpretation programming and displays about the desert tortoise to help improve public awareness of this sensitive species and its protection needs; and (d) the National Park Service would conduct additional site-specific tortoise surveys prior to construction, monitor for tortoise during construction, and continue surveying the area for tortoise after the facilities are developed and in full use. Following the above approach, it is not expected that there will be any measurable impacts to tortoise habitat or populations.

Dark Night Skies

The dark night skies in this area of the park are an important, unique resource to both visitor experience (e.g., stargazing) and the behavior of some desert wildlife species, particularly in less developed and less visited areas of the park that have very dark night skies relative to some other areas farther west. Given the natural darkness of this area, exposed artificial light can easily alter the quality of dark night skies. The most conspicuous artificial light impacting the dark night sky quality in the Cottonwood area relates to regional urban development on multiple horizons; headlights on the highway and adjacent roads; and artificial lighting in and around the visitor center, staff housing/facilities area, and campground. However, the adverse effects on dark night skies from artificial lighting associated with this proposed action would be negligible. Through compliance with the park's Lighting Guidelines (2016), proper structural design of the visitor center and the use of down-lighting fixtures to the extent possible, these impacts would be sufficiently mitigated. Via design and mitigation measures on the proposed visitor center, it may be possible to reduce existing lighting impacts relative to the existing visitor center. However, increases in anthropogenic light from a potential increase in visitor vehicles in the area could occur, but these effects should be relatively negligible. Therefore, this topic has been dismissed from further analysis in this environmental assessment.

Surface Hydrology and Floodplains

The project site lies atop an extensive shallow alluvial deposit that formed from surface runoff draining to the south/southwest into Cottonwood Canyon over the millennia. The terrain ranges from relatively flat to gradually sloping. While some snowmelt and rain drain southward in a sheetflow manner, most surface runoff collects into the many braided tributary ravines and washes that run through the project area and eventually outfall into Cottonwood Canyon. Given the very arid local climate, precipitation is infrequent and often comes in heavy downpours. Because of the terrain variability and sparse desert vegetation groundcover, heavy precipitation events result in high runoff rates and limited infiltration into the ground. In cases of heavy

precipitation and flash flooding, the majority of runoff volume and velocity is concentrated in the otherwise-dry ravines and washes that pass through the project area. This nature of surface hydrology is inherent to the desert landscape and must be factored into all site development and visitor use management considerations. Flood events in the area's washes and ravines are inevitable. Therefore, to maintain visitor safety and protect structures and facilities under these circumstances, this project would include mitigation measures that would be incorporated into the design of the visitor center structure, parking lot, connector trail to the campground, and all site grading associated with any of these project elements. With proper site layout, grading, and facility design, alterations to the surface hydrology (and subsequent flood event threats) would be minimal. As a result, this topic has been dismissed from further analysis in this environmental assessment.

NEXT STEPS IN THE PLANNING PROCESS

Finalizing the Visitor Center Area Plan

Separate from this document, consultations will occur on a parallel track with the US Fish and Wildlife Service, as well as the California state historic preservation office, and the tribal historic preservation offices of Joshua Tree National Park's consulting tribes. These consultations will address National Historic Preservation Act section 106 issues and endangered species issues under section 7 of the Endangered Species Act.

Following public review and assessment of public comments, either a finding of no significant impact or a notice of intent to prepare an environmental impact statement would be prepared.

If a finding of no significant impact is prepared, it would document the NPS selection of an alternative for implementation, include any necessary errata sheet(s) for factual changes required in the document, and include responses to substantive comments by agencies, organizations, and the general public. Before the finding of no significant impact is signed, consultations associated with compliance with section 106 of the National Historic Preservation act would be completed with the state historic preservation office and affiliated tribes, and a memorandum of agreement on the treatment of historic properties in the project area would be finalized. Also before signature, the park would complete consultation with the US Fish and Wildlife Service, as required by section 7 of the Endangered Species Act, and incorporate any mitigations necessary to protect endangered species during (and after) the project. The finding of no significant impact would be made available to the public once it is signed by the NPS Pacific West regional director. Implementation of the selected action would occur as resources and funding allow.

Implementation of the Plan

The approval of this plan does not guarantee that funding and staffing needed to implement the plan will be forthcoming. The implementation of the approved plan will depend on future funding and could also be affected by factors such as changes in NPS staffing, visitor use patterns, and unanticipated environmental changes. Full implementation could be many years in the future.

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Chapter 2
Alternatives

INTRODUCTION

This chapter presents two alternative approaches to managing the Cottonwood visitor center area and associated visitor facilities in Joshua Tree National Park. These approaches are the "no-action" alternative (alternative A), which describes a continuation of current management, and the proposed action / NPS preferred alternative (alternative B). The alternatives were developed by soliciting input from park staff, stakeholders, other government agencies, and the public on key issues and desired resource conditions and visitor experiences.

The alternatives in this plan are intended to enable managers and the public to consider different approaches to managing visitor use, directing development, providing access, and avoiding potential conflicts that may arise in the Cottonwood area.

Chapter 2 describes the vision, goals, and desired conditions that were used in formulating the alternatives. Each alternative is then described and shown graphically. Each alternative includes a summary or concept statement, followed by management actions that would be taken under that alternative. Management actions under each alternative are grouped under the *Visitor Center Area*, and under *Other Visitor Opportunities*. Alternative B, as the preferred and proposed action (and only action alternative), also discusses indicators, thresholds, and visitor capacity concepts for the Cottonwood area. The chapter then describes the mitigation measures that would be taken to reduce the intensity of impacts under the action alternative. Lastly, the chapter describes alternatives and actions that were considered but dropped from further analysis.

ALTERNATIVE A (NO ACTION)

Visitor Center Area

There would be no changes to the existing visitor center. The existing double-wide trailer would continue to serve as the visitor center. The existing Mission 66 historic contact station would continue to serve as a ranger contact station. It would continue to have a historically compromised façade and would remain structurally at risk to withstand seismic events (Langenheim et al. 2016). The existing facilities would continue to have limited space for interpretive exhibits, limited opportunities for visitors to be oriented to the backcountry, and a small gift shop. Existing space for outside interpretive and educational programs would remain

small and provide inadequate shade for larger groups. There would continue to be a staffed information desk with NPS entry fee collection registers and Natural History Association sales.

No improvements, beyond current maintenance operations, would be made to the parking area, ranger contact station, or the restroom building. Occasional negative visitor interactions with bees attracted to exterior water sources at the restroom would continue and would be managed through warning signs. A small, shaded area with one picnic table, information panels, and a short interpretive trail would continue to be available for visitors.

Other Visitor Opportunities

No change would occur in wayfinding throughout the district or in the management of trailheads or interpretive exhibits. Visitors would continue to have difficulty navigating crowded developed areas in the Cottonwood area, obtaining a campsite during busy seasons, and making timely contact with NPS rangers. Visitors would still expect to experience solitude and places to enjoy natural processes in the Cottonwood backcountry, but trails connecting to the backcountry would involve encounters with increased congestion.

ALTERNATIVE B (NPS PREFERRED / PROPOSED ACTION)

Under alternative B, the National Park Service would improve visitor facilities in the Cottonwood area, including the replacement of the visitor center building and restrooms, expansion of the visitor center parking area, improvement of an existing trail, and the creation of a new trail. Under the action alternative, the primary goal would involve improving and expanding the visitor experience in the Cottonwood area. This goal would be accomplished by

- providing new and enhanced infrastructure for educational and interpretive programs/experiences;
- reducing wait times for initial visitor contact and fee collection,
- reducing incidences of potentially hazardous encounter between visitors and bees (bees attracted to outdoor water fountains);
- expanding capacity for parking at the visitor center and Oasis trailhead; and
- improving outdoor visitor experiences (by improving the existing nature trail and providing connectivity to the campground area).

Visitor Center Area

The existing modular visitor center would be removed and replaced with a new 3,500 to 4,000-square-foot building constructed within the immediate area of the existing visitor center grounds. The new building would be designed specifically for the climate and site. It would be designed to match the architectural character and massing of the Mission 66 district and to blend in with the landscape (figure 2). The visitor center would have space for sales and visitor contact information, new exhibits, a classroom/meeting room, and an indoor restroom facility. The new facility would also have office space for park staff (including law enforcement, fee collection, and interpretation), and storage. The existing Mission 66-era visitor contact station would be retained, with its exterior restored to the appearance of its period of significance. It would likely retain its function as a contact station for fee collection (or could be adaptively

repurposed for other uses), while other traditional visitor center activities would occur in the newly constructed space. The new facilities would be accessible to all visitors, fully meeting NPS accessibility requirements.

A new, shaded patio space with an area of about 1,300 square feet (54 feet x 24 feet) would be provided that could serve as an outdoor classroom for school programs and for interpretive programs for visitors. This space would be developed using materials, styles, and massing complementing the Mission 66 design of the visitor center area.

The following improvements would be made to the existing visitor facilities, all within the existing developed area of the visitor center area:

- The existing restroom building would be removed with these services relocated to the inside of the new visitor center.
- The existing shaded picnic area would be expanded to a size that can incorporate six shaded picnic tables and accommodate 40 visitors.
- The short nature interpretive trail would be improved and connectivity to the new visitor center established. The proposed accessible trail would be a 595-linear-foot loop trail, 6 feet wide with two 15-foot boardwalks connecting the trail over the wash from the visitor center. The treatment is stabilized compacted aggregate, either native soil aggregate, or imported aggregate which corresponds with the surrounding soils in terms of color. A 30 foot x 30 foot vista point (concrete slab with sitting walls) would be placed on the north side of the trail and a 20 foot x 20 foot vista point (same construction) on the south side of the trail.
- An amphitheater with a capacity of 84 people, as well as an outdoor classroom with shade structure, would be developed.

The existing parking area would be expanded in size to increase visitor capacity at the visitor center area. The lot would be expanded to accommodate approximately 58 vehicle stalls, 6 oversized stalls, and at least two spaces that meet Architecture Barriers Act requirements. The new lot would represent a capacity increase of approximately 25 percent. The redesign of the parking lot would be sympathetic to the original design of the Mission 66 landscape.

Although the visitor center would not have a photovoltaic (PV) array, the project includes expansion of the existing ground-mounted PV array at the maintenance area. The visitor center would also be designed with water conservation infrastructure to minimize impacts on groundwater supply. In addition, a new well would be established along the route of the existing supply line to the visitor center area in a location without significant archeological resources. The new well will serve as a monitoring station for groundwater levels and as a backup to the existing well should water quality or quantity decline (figure 1). A new septic system / leach field would be built in an area without significant archeological resources. In accordance with the NPS Green Parks Plan (NPS 2012) and the DOI Sustainable Buildings Implementation Plan (DOI 2008), the National Park Service would incorporate green building approaches into site choice, design, construction, and maintenance/sustainability features of new structures. This project would use green construction materials as much as possible, optimize energy performance, minimize resource damage, and minimize construction and maintenance costs.

Although the park would not seek Leadership in Energy and Environmental Design (LEED) certification, LEED design principals would be used in the design of the facility.

Other Visitor Opportunities

Under alternative B, other improvements within the Cottonwood area would be developed to enhance the visitor experience in the district, reduce the potential for damage to the significant natural and cultural resources of the area, and speed visitor access to the natural areas of the park (by speeding the fee collection and the rate of initial visitor contacts, and increasing parking availability). Wayfinding signage along the highway in advance of the entrance to the Cottonwood area would be established with information that would speed visitor interactions with fee collection and result in higher initial fee compliance. A trail would be established between the visitor center and campground to provide connectivity allowing campers to access the visitor center without occupying a parking spot needed for recent arrivals and day-use visitors. In addition, improved wayfinding within the campground would encourage overnight visitors to remain parked in the campground and access the popular (and frequently over-parked) Oasis trailhead via the existing connector trail. At the Oasis trailhead, an area used as informal overflow parking would be formalized and hardened, expanding parking capacity by 15 vehicles.

BEST MANAGEMENT PRACTICES—MITIGATIONS

Resource protection measures and best management practices to protect natural resources, cultural resources, and other values would be implemented under the action alternative. The following best management practices would be implemented to minimize the degree and/or severity of adverse effects.

General Measures

- Construction limits would be clearly marked with stakes prior to beginning ground-disturbing activities. No disturbance would occur beyond these limits.
- All contractor employees and subcontractors would attend an orientation session(s) regarding park regulations focused on minimizing impacts on resources, human health, and safety. Sessions would include specific education on the status and protection of desert tortoises and laws regarding archeological resources.
- All tools, equipment, barricades, signs, surplus materials, and rubbish would be removed from the project area work limits upon project completion. Construction debris would be hauled from the park to an appropriate disposal location.

Groundwater

- Park staff would collect and record groundwater withdrawal measurements and groundwater level data at the existing water supply well and the proposed well, respectively. These data, along with monthly visitation data, would be used to inform management of water supply withdrawals so as to comply with state water quality standards in the sub-basin.

Wildlife and Species of Concern

- Construction personnel would be instructed on appropriate behavior in the presence of wildlife and on proper storage and handling of food, garbage, and other attractants.
- The following additional conservation measures would be taken to protect the desert tortoise:
    - Preconstruction surveys for tortoise burrows would be conducted within ¼ mile of the project area prior to construction activities.
    - Tortoise exclusion fences would be installed around all active work areas.
    - The park would continue all appropriate recovery plan actions per consultation and agreement with the US Fish and Wildlife Service.

Vegetation

- Disturbance to vegetation would be avoided as much as possible and contained to as small a footprint as possible while meeting project objectives.
- All equipment, tools, and vehicles would be cleaned before entering the park to minimize the transportation of exotic seeds to the site. All equipment entering the park would be inspected and may be required to be pressure washed to remove foreign soil, vegetation, and other materials that may contain nonnative seeds or vegetation.
- Revegetation and recontouring of disturbed areas would take place following construction and would be designed to minimize visual intrusions. Revegetation efforts would use native species to strive to reconstruct the natural spacing, abundance, and diversity of native plant species. All disturbed areas would be restored as closely as possible to preconstruction conditions shortly after construction activities are completed.
- Nonnative invasive plant infestations near disturbed areas would be treated on a yearly basis for a minimum of three years following project completion.
    - Soil, duff, and litter from work areas would be salvaged prior to disturbance.
    - These materials would be stored in a pile under a tarp in the shade and reapplied as soon as work is completed.
    - Introduced seed or plant materials (even named native species) from commercial sources would not be used. The landscape planting plan includes specific plant species and locations. The park plant nursery will grow plants as specified in plans from local genetic material, as native (unassisted) revegetation will not be sufficient for areas around the visitor center and along the nature trail. If the park biologist determines additional plant material is needed, it would be collected from local native seed and salvaged plant material.

- Rare plant species including Hall's tetracoccus (*Tetracoccus hallii*) and thorny milkwort (*Polygala acanthoclada*) located in the project area would be flagged and avoided.
- Succulents including yuccas and cacti that must be disturbed by construction activities would be salvaged and transplanted in an appropriate location.

Soils

- Disturbance to soils would be contained to as small a footprint as possible while meeting project objectives. Any soils severely compacted during construction will be restored by ripping or imprinting at project conclusion.
- Topsoil would be salvaged, stored under cover, and used to restore temporarily disturbed areas following construction. Topsoil salvage would be limited to the upper 5-10 centimeters of soil and would not be diluted with deeper subsoil.
- Topsoil would be stored for as short a period as possible before restoration.
- Any topsoil temporarily disturbed during construction would be aerated and replanted with native vegetation to reduce compaction and prevent erosion.

Cultural Resources

- No ground disturbance would occur in areas not previously evaluated for the presence of archeological resources. The California State Historic Preservation Office and Tribal Historic Preservation Offices would be consulted before, during, and after archeological investigations. If new surveys conducted for the purposes of this plan revealed historically significant archeological resources, efforts would be taken to avoid adverse impacts to them, and appropriate consultations under Section 106 of the National Historic Preservation Act would be carried out.
- Known historic sites and isolated occurrences would be flagged and avoided during construction, and a NPS archeologist would be on-site during ground-disturbing activities associated with well installation and along new trail construction.
- Should construction unearth previously undiscovered cultural resources, work would be stopped in the area of any discovery and the park superintendent would consult with the State Historic Preservation Office, consulting tribes, and others as necessary, according to §36 CFR 800.13, *Post Review Discoveries*. In the unlikely event that human remains are discovered during construction, provisions outlined in the Native American Graves Protection and Repatriation Act (1990) would be followed.
- Park staff would ensure that all contractors and subcontractors are informed of the penalties for illegally collecting artifacts or intentionally damaging paleontological materials, archeological sites, or historic properties. Contractors and subcontractors would also be instructed on procedures to follow in case previously unknown paleontological or archeological resources are revealed during construction.

Visitor Use and Experience

- Signs, press releases, and other communication methods would be used to inform visitors about construction, trail access, and traffic delays.
- A temporary facility (limited in size but including portable restrooms and alternative parking locations) would be established within the visitor center area adjacent to construction activities while work is proceeding on the new visitor center. Alternatively, construction could be phased so that existing facilities could be used as new ones are constructed.
- Construction activities would be scheduled to coordinate with lowest months of visitation in the park.

Air Quality and Soundscapes

- All construction motor vehicles and equipment would have mufflers conforming to original manufacturer specifications that are in good working order to prevent excessive or unusual noise, fumes, or smoke.
- To reduce noise and emissions, construction equipment would not be permitted to idle for longer than 5 minutes when not in use.

Public Health, Safety, and Park Operations

- Appropriate barriers and barricades would be used to clearly delineate work areas and provide for safe visitor travel through construction areas.
- Construction workers would wear appropriate attire such as hard hats, gloves, and goggles to protect themselves from natural hazards. Visitors would not be allowed into construction zones. Park staff would also be required to wear protective gear when they are in the construction zone.
- Trucks hauling debris and other loose materials would be covered to maintain adequate freeboard to prevent spillage to paved surfaces.
- Emergency response protocols would be developed for implementation during construction. Construction activities would be conducted in accordance with established safety protocols.
- Employees and construction crews would be required to park their vehicles in designated locations.
- Construction workers and supervisors would be informed about the special sensitivity of park values, regulations, and appropriate housekeeping.

VISITOR USE MANAGEMENT

Introduction

Visitor use management is the proactive and adaptive process of planning for and managing characteristics of visitor use and its physical and social setting, using a variety of strategies and tools to sustain desired resource conditions and visitor experiences. Visitor use management is important because NPS managers strive to maximize benefits for visitors while achieving and

maintaining desired conditions for resources and visitor experiences in a particular area. Managing visitor access and use for visitor enjoyment and resource protection is inherently complex. It requires that managers analyze not only the number of visitors but also where they go, what they do, their impacts on resources and visitor experiences, and the underlying causes of those impacts. Managers must acknowledge the dynamic nature of visitor use, the vulnerabilities of natural and cultural resources, and the need to be responsive to changing conditions.

Proactively planning for visitor use maximizes the ability of agencies to encourage access and protect resources and values. Visitor use goes beyond the types of activities that people engage in at parks. In this framework, visitor use refers to human presence in an area for recreational purposes, including education, interpretation, inspiration, and physical and mental health. Visitor use also includes the amount, timing, and distribution of visitor activities and behaviors. The visitor use management framework provides a process within which visitor capacity should be addressed when necessary. Visitor capacity, a component of visitor use management, is the maximum amount and type of visitor use that an area can accommodate while achieving and maintaining desired resource conditions and visitor experiences consistent with the purposes for which the area was established. Visitor capacities will vary from site to site depending on the desired conditions and issues of the specific area. The monitoring component of this visitor use management framework would test the effectiveness of management actions and provide a basis for informed adaptive management of visitor use.

The Planning Process

This plan uses the visitor use management framework to develop a long-term strategy for managing visitor use within the Cottonwood area of Joshua Tree National Park. The general process for the development of the Cottonwood visitor use plan followed a series of planning process steps. These included:

- Determining how the park's purpose/significance and the fundamental resources and values found within the district, along with guidance from previous park plans, outline desired resource conditions, visitor experience opportunities, and general levels of development in the Cottonwood area.
- Determining what goals and objectives for visitor use management should exist within the district by assessing existing knowledge about current and expected visitor use (e.g., patterns of use, timing of use, types of use, impacts on resources and visitor experiences caused by visitors, and monitoring that is already being conducted).
- Identifying the critical elements of desired visitor experiences and resource conditions that may serve as visitor use indicators. Prioritizing the range of potential indicators and determining the most feasible and important for inclusion in the plan. See below for more information on the development of indicators.
- Developing thresholds for each priority indicator. See below for more information on the establishment of thresholds.
- Identifying a tool kit of management strategies that could be applied for each priority indicator to manage visitor use and achieve desired conditions over time. See below for more information on management strategies associated with indicators. An analysis of

the impacts of proposed actions and management strategies are also discussed in "Chapter 4: Environmental Consequences," in the "Visitor Use and Experiences" section.

- Identifying management strategies that necessitate visitor capacities. Understanding the processes through which visitor capacities will be determined for those strategies. See below for more information on management strategies associated with visitor capacities. An analysis of the impacts of proposed actions and management strategies are also discussed in chapter 4, in the "Visitor Use and Experience" section.

Indicators and Thresholds

Indicators translate goals and objectives into measurable attributes (e.g., lineal extent of visitor-created trails) that, when tracked over time, evaluate change in resource or experiential conditions. These are critical components of monitoring the success of the trail plan and are considered common to all action alternatives. The interdisciplinary planning team considered the central issues and developed related indicators that would help identify when the level of impact becomes cause for concern and management action may be needed. Those described below were considered the most critical, given the importance and vulnerability of the resource or visitor experience affected by types of visitor use. The planning team also reviewed the experiences of other park units with similar issues to identify meaningful indicators.

Thresholds represent the minimum acceptable condition for each indicator and were established by considering qualitative descriptions of the goals and objectives, data on existing conditions, relevant research studies, professional judgement of staff from management experience, and scoping on public preferences. Although defined as "minimally acceptable," thresholds still represent acceptable conditions. Establishing thresholds does not imply that no action would be taken prior to reaching the threshold. Thresholds identify when conditions approach unacceptable levels and serve as mechanisms to alert managers and the public that corrective action must be taken to keep conditions acceptable. Ultimately, indicators and thresholds furnish managers with good monitoring protocols to allow goals and objectives to be met and tracked over time.

Indicators, thresholds, monitoring protocols, management strategies, and mitigation measures would be implemented as a result of this planning effort and are described below (tables 1-5). Indicators would be applied to actions described within this plan. The planning team concluded the following indicator topics would translate the desired conditions into measurable attributes that could be tracked over time:

- Visitor-created trails
- Damage to cultural resources
- Visitor center congestion
- Parking lot congestion
- Visitor complaints

Table 1. Indicators and Thresholds for Visitor-Created Trails

Visitor-Created Trails
Indicator
Number of visitor-created trails.
Threshold
No more than five visitor-created trails in the Cottonwood area.
Rationale for Indicator and Threshold
The indicators help to determine the frequency of the visitor-created trails use and whether some are more widely used than are others. The thresholds are based on sensitivity of resource, amount of use, and tolerance of impact. There would be a range of acceptance depending upon site, area, or zone.
Monitoring
Park staff will establish baseline data and protocol for evaluating the number of visitors leaving designated trails (measured every mile). Park staff will also establish criteria for identifying visitor-created trails such as the following categories: over 2 m, 1.5-2 m, .5-1.5 m width of visitor-created trails; length depends on the location.
Management Strategies and Mitigation Measures
➢ Restrict off-trail travel in key areas. ➢ Evaluate and identify access locations for visitor-created trails to climbing sites. ➢ Restore and rehabilitate areas with visitor-created trails. ➢ Minimize the number of current culturally and ecologically harmful visitor-created trails. ➢ Educate visitors regarding sensitive resources and staying on trails. ➢ Improve trail identification and signage. ➢ Nontraditional use of wayside exhibit plan to redistribute visitors throughout the park. ➢ Evaluate visitor-created trails to determine appropriate management action. ➢ Formalize visitor-created trails as designated trails, if appropriate. ➢ Use site management / design such as constructing boardwalks, adding view scopes, rails, borders, and pavement to improve delineation of designated trails, as appropriate. ➢ Consider potential area closures. ➢ Improve communication with visitors about trail stewardship. ➢ Improve maintenance and trail markings. ➢ Expand trail watch volunteers including trail stewardship programs.

Table 2. Indicators and Thresholds for Damage to Cultural Resources

Damage to Cultural Resources
Indicator
Changes in condition assessments of cultural / archeological sites using regularly-scheduled condition assessments.
Threshold
No more than five annual condition assessments drop below fair documented incidents of changes in condition at key sites in a year.
Rationale for Indicator and Threshold
Damage to cultural and archeological sites can occur through both intentional and unintentional means. Both can cause impacts that influence the integrity of these resources. Continued and increased visitor use and the resulting deterioration of trail conditions coupled with increased erosion could cause negative impacts to archeological sites and historic ruins. The indicator selected would be sensitive to capture activity in the Cottonwood area where hiking and access occurs. The historic and prehistoric properties to be monitored are nonrenewable resources; as a result, thresholds are set low.
Monitoring
Continue to record incidences of vandalism or theft. Review incident reports on a yearly basis. Strongly advertise that visitors report and help monitor any harmful activities, theft, or damage to archaeological sites. Continue monitoring sites in the Cottonwood area on a two- to three-year cycle. Report from cultural groups on interrupted activity.
Management Strategies and Mitigation Measures
➢ Prioritize documentation of sites in high visitor use areas and sites found to be impacted by visitor use. ➢ Increase ranger presence or patrol. ➢ Increase trail watch activities. ➢ Establish site stewards (volunteers, partners, staff, and tribal members) to monitor sites and interact with visitors during high visitation times. ➢ Increase monitoring schedule. ➢ Reroute trails and examine potential temporary closures. ➢ Increase educational efforts and outreach to visitors and the community on the sensitivity of resources and the need to protect historical sites, including signage. ➢ Target education to groups that are accessing areas with historical sites. ➢ Establish more regular communication mechanisms to understand traditional cultural resource locations and activities. ➢ Create physical barriers closing access to sensitive or targeted resources. ➢ Consider area closures only after a range of management strategies have been implemented and are not effective. ➢ Consider data recovery of resources in high visitor use areas. ➢ Work with interpretation to check daily during tours; use volunteers to monitor. ➢ Documented reports will trigger a condition assessment.

Table 3. Indicators and Thresholds for Visitor Center Congestion

Visitor Center Congestion
Indicator
Wait times at the visitor center, especially during peak months of visitation.
Threshold
80% of people wait to pay a fee no longer than 20 minutes during peak season and no more than 10 minutes on average or no more than 20 people are in line at one time.
Rationale for Indicator and Threshold
To date, there have been few studies conducted to assess visitor-based thresholds for acceptable vehicle wait times at entrance stations. Recommendations from a 2008 study in Yosemite National Park included a potential threshold for wait times at park entrance stations that specified 80% of visitors wait no longer than 15 minutes to enter the park (White and Aquino 2008).
Monitoring
Record wait times at park entrance stations via direct observation, self-report surveys, and/or time-lapse photography.
Management Strategies and Mitigation Measures
➢ Sell passes online or at local businesses, so visitors can purchase them before entering the park. ➢ Install an automated fee station near the Cottonwood entrance for visitors to purchase/validate passes. ➢ Station rangers outside contacting visitors who are waiting to pay entrance fees. ➢ Hold ranger patio talks. ➢ Improve signage and information available for visitors entering the park. Example: "All golden age pass holders or other pass holders do not need to pay an entrance fee. Please proceed directly into the park."

Table 4. Indicators and Thresholds for Parking Lot Congestion

Parking Lot Congestion
Indicator
Number of Vehicles at One Time (VAOT).
Threshold
Visitor center and parking lot: VAOT does not exceed the design capacity of parking lots at the visitor center more than 20% of the time per peak season. Cottonwood Oasis Trailhead parking lot: VAOT does not exceed the design capacity of parking lots at the trailhead more than 50% of the time per peak season from 9 a.m. – 5 p.m.
Rationale for Indicator and Threshold
Monitoring and managing visitor use according to this indicator will help ensure that visitors have safe and stress-free access to popular visitor destinations at key areas by reducing vehicle congestion and conflicts in parking lots. VAOT is a measure often used by park managers and researchers to quantify vehicle congestion in parking lots (Lawson and Kiser 2013; Manning, et al. 2014). VAOT provides an important

Parking Lot Congestion
measure of parking lot conditions in relation to visitor access to popular destinations as well as potential park resource impacts because of parked vehicles in unauthorized areas when lots are full. Parking lot capacities provide an ideal threshold upon which to base monitoring efforts for VAOT. Instances in which parking lot capacities are exceeded are indicative of vehicle congestion, potential safety concerns, and possible park resource impacts stemming from vehicles parking in unauthorized areas (Lawson, Newman, and Monz in press).
Monitoring
Establish statistical and/or mathematical relationships among automated vehicle traffic recorder (ATR) data and VAOT as a basis for long-term monitoring of VAOT using ATR data. Periodically conduct an observational study of VAOT in parking lots and adjacent overflow areas to establish and update statistical relationships between ATR data and VAOT counts. Compare observed and/or estimated VAOT to the design capacity of parking lots.
Management Strategies and Mitigation Measures
➢ Enforce parking and access restrictions, as well as site-management (signage, curbing, paving, revegetation, and blockades) to resolve over-parking and visitor-created parking. ➢ Deploy intelligent transportation systems to provide visitors with information on status of parking lots (i.e., Lost Palm Oasis Trail parking lot is full—park elsewhere). This information would be conveyed to visitors prior to and/or upon entry to the corridor to facilitate seeking alternative experiences including those outside the corridor. ➢ Increase enforcement of endorsed parking only. ➢ Encourage visitors to walk from the campground and use the nature trail to access the Lost Palms Oasis Trail. ➢ Explore overflow-parking solutions. Example: Pinkham Wash Road (west of the visitor center area) has potential to be widened to accommodate overflow parking for cars. Add crosswalk. ➢ Increase website messaging about full parking lots and crowding. ➢ Explore potential for an automatic monitor (video camera) of parking, signs that say Full, or an auto gate. ➢ Develop signage similar to parking garages in urban areas.

Table 5. Indicators and Thresholds for Visitor Complaints

Visitor Complaints
Indicator
Number of reasonable visitor complaints.
Threshold
No more than 20 reasonable complaints related to wait times at Cottonwood's parking lots, visitor center, trail signage and information, and restroom facilities per year through letters or visitor comment cards.
Rationale for Indicator and Threshold
The rationale for these indicators and thresholds is that together they represent the overall quality of the visitor experience.
Monitoring

Visitor Complaints
Develop mechanisms for logging complaints, implement a logbook at Cottonwood Visitor Center and monitor visitor letters and e-mails. Develop criteria for identifying reasonable complaints.
Management Strategies and Mitigation Measures
➢ Establish/re-establish a complaint log that will be integrated with an internal work order system. ➢ Maintain structures regularly. ➢ Communicate and coordinate with adjacent landowners and neighborhood communities the construction status and impacts to visitor opportunities. ➢ Respond to visitor comments by providing feedback. ➢ Address issues as appropriate.

VISITOR CAPACITY

Visitor capacity is a component of visitor use management defined as the maximum amount and type of visitor use that an area can accommodate while sustaining desired resource conditions (i.e., goals and objectives for this plan) and visitor experiences consistent with the purpose for which the area was established. By establishing and implementing visitor capacities, the National Park Service can help ensure resources are protected and visitors have the opportunity for a range of high-quality experiences. Joshua Tree National Park has no prior identification of visitor capacity. Through this planning effort, the park has an important opportunity to proactively safeguard the highly valued experiences and resources throughout the park unit. The following section outlines the considerations and process used to identify visitor capacity.

General Process for Identifying Visitor Capacities

Visitor capacities were identified using best practices and examples from other plans and projects across the National Park Service. The approach for identifying visitor capacities is based on the Interagency Visitor Use Management Council's Visitor Use Management Framework (https://visitorusemanagement.nps.gov/) and associated publications.

The Analysis Area: Cottonwood Visitor Center Area

To determine the analysis area, park staff and the planning team considered the most meaningful geographic areas to understand the relationship between existing and potential visitor use patterns as well as desired conditions. Key areas were selected as destinations where high levels of use are currently or projected to cause impacts to natural, cultural resources, and visitor experiences and are directly related to desired conditions. For the purposes of the current planning effort, the geographic areas were determined to include the Cottonwood visitor center area and the Oasis area.

Existing Direction and Knowledge

The planning team reviewed plan goals and objectives, indicators, and thresholds, with particular attention paid to conditions and values that must be protected and are most related to visitor use levels. In addition, the action alternative was assessed for the primary differences related to the amounts, timing, distribution, and types of use. The visitor capacity was identified

by considering the actions in the alternatives and the desired conditions established for the visitor center environmental assessment based on the park's fundamental resources and values specific to the cultural and natural resources.

Park managers at Joshua Tree National Park have three primary goals for visitor use in the Cottonwood area that drive desired experience and resource conditions. First, the aim to improve the visitor experience is central and includes the vision for the Cottonwood area to continue to be an aesthetically modest yet remote, desert outpost, while still meeting the needs of the visitors. Second, park managers desire to increase visitor information and education to reach visitors who arrive in the Cottonwood area through a more comprehensive educational outreach strategy. Third, there is a focus on cultural and natural resource preservation with attention to the Oasis area, desert tortoise conservation and recovery, interpretation of the cultural history of mining, and communicating stories of the historic and prehistoric history of the area. The amount, timing, and distribution of visitor use in the Cottonwood area influence both resource and experiential conditions. Currently, there is high demand for a typical visitor center experience; recreation opportunities, including camping and hiking; as well as moderate to high levels of use within the park, particularly during spring and fall. Visitation typically peaks during the confluence of comfortable temperatures in the spring and fall and is heightened in the spring during wildflower season.

The levels and patterns of visitor use are causing adverse impacts to visitor experiences and more evident adverse impacts to natural resources. Specifically, during high use times, the visitor center area becomes crowded with visitors seeking to pay entrance fees and find information about things to do in the area. The crowding results in long lines and inadequate parking for oversized vehicles such as RVs. In the Oasis area, while there is no evidence of crowding on the trails, the parking lot can be congested. Impacts to natural and cultural resources are also more likely to occur on these busy days. See chapter 3 (affected environment) for more information on amounts and types of visitor use in the Cottonwood area.

Current use levels reported by the Public Use Statistics Office report about 108,449 visitors to the Cottonwood Area Visitor Center annually. During peak season, the visitor center had more than 17,000 visitors through its doors during the month of March 2016. Off-season and more typical visitation is between 5,000-6,000 people per month. Park managers report that during peak season, special events, and the super bloom, the current visitation levels supersede the ability of the visitor center to manage use levels. However, outside of peak season, the current visitor center might be able to receive increased visitor use.

Capacity Metrics: Joshua Tree National Park collects limited monitoring data for the locations where it is deemed necessary to identify visitor capacity and would establish baseline conditions upon implementation of this plan. Visitor capacity in most cases is based on daily visitation numbers and is represented as people per day. In the Oasis area, the visitor capacity is based on the number of people at one time (PAOT) in an area. Monitoring can be done in a variety of ways but would serve to approximate the total number of people present as best as possible.

The Limiting Attribute

Overall, for the Cottonwood area, park staff identified the sensitive natural and cultural resources and visitor experiences as the primary limiting attributes to constraining visitor use levels. While there are limited developed trails in the Cottonwood visitor center area, the trails in the Oasis area lead to sensitive resources (the Oasis itself) and pass through desert tortoise habitat and archaeological sites. Visitor experiences in the Cottonwood visitor center area are also unique and provide for night sky viewing and opportunities for solitude, hiking, and camping in a remote desert environment. Given these unique resources and experiences, visitor capacity will be constrained based on desired conditions to preserve high-quality visitor experiences and maintain the preservation of sensitive natural and cultural resources.

Strategies to Implement Visitor Capacity in the Visitor Center Area

Park staff would employ a variety of management options to implement visitor capacity in the Cottonwood visitor center area. These strategies include:

- Separate fee and visitor assistance such as a pass purchases only options
  - Develop partnerships, collaboration, public involvement, and outreach to solve some of the congestion challenges at the visitor center.
  - Install an automated fee station near the Cottonwood entrance for visitors to purchase/validate passes or at Chiriaco Summit.
- Additional visitor contact opportunities.
- Rangers outside contacting visitors who are waiting to pay entrance fees.
- Ranger patio talks.
- Improve signage and information available for visitors entering the park. Example: "All golden age pass holders or other pass holders do not need to pay an entrance fee. Please proceed directly into the park."
- Use media/social media/mobile device apps.
- Employ dynamic/variable message sign.

Visitor Capacity Identification.

Alternative A (no action). If alternative A is selected, the park staff identified the need to maintain current use levels at no more than 560 persons per day (PPD) in the Cottonwood visitor center area.

Alternative B (preferred). Park staff identified that the Cottonwood visitor center area can accommodate additional use and achieve desired resource and experiential conditions given the actions under alternative B. Several actions under preferred alternative B would contribute to the area's ability to accommodate additional visitor use. The addition of six shaded picnic tables would accommodate 40 visitors. Expansion of the visitor center parking area would accommodate approximately 58 vehicle stalls, 6 oversized stalls, and at least two spaces that meet Architecture Barriers Act requirements and would increase visitor capacity at the visitor center area. This expansion represents a facility increase that could accommodate approximately 50 percent more visitor use, which would allow for visitors currently parking along the roadside to park in a designated parking spot. The 50 percent increase is not attributed

to adding more visitors, but rather accommodating current visitor use levels. The parking lot turnover rate at the visitor center area is about 40 minutes, which means that during any eight-hour day the parking lot would turnover about 12 times. There are 58 parking lot stalls in the new parking design, and when Joshua Tree National Park's persons per vehicle is applied, that provides the opportunity for 135 visitors at one time, assuming 100% parking lot utilization. Given the desire to provide high-quality visitor experiences, the park staff identified a visitor capacity under preferred alternative B of 135 PAOT for the visitor center area. This also would equate to a 1,700 PPD visitor capacity.

Monitoring. The most relevant indicators for capacity in the visitor center area are visitor center congestion and parking lot congestion. Monitoring related to visitor center congestion will ensure that wait times at the visitor center, especially during peak months of visitation, are minimized. Similarly, monitoring for parking lot congestion will ensure that visitors have safe and stress-free access to popular visitor destinations by reducing vehicle congestion and conflicts in the parking area.

Visitor Capacity and Implementation Strategies—Oasis Area

Park staff would employ a variety of management options to implement visitor capacity in the Oasis area. These strategies include:

- Enforce parking and access restrictions, as well as site-management (signage, curbing, paving, revegetation, and blockades) to resolve over-parking and visitor-created parking.
- Deploy intelligent transportation systems to provide visitors with information on status of parking lots (i.e., Lost Palm Oasis Trail parking lot is full—park elsewhere). This information would be conveyed to visitors prior to and/or upon entry to the corridor to facilitate seeking alternative experiences, including those outside the corridor.
- Increase enforcement of endorsed parking only.
- Encourage visitors to walk from the campground and use the nature trail to access the Lost Palms Oasis Trail.
- Employ electronic systems to warn visitors of busy times.
- Create limits on parking time to increase turnover.

Visitor Capacity Identification.

Alterative A (no action)—If alternative A is selected, the park staff identified the need to maintain current use levels at no more than 100 PAOT derived from the 34 designated parking spaces and the 2.7 persons-per-vehicle (PPV) multiplier.

Alternative B (preferred)—Park staff identified that the Oasis area can accommodate a very small number of additional visitor use to maintain and achieve desired resource and experiential conditions given the desire to provide high-quality visitor experiences. While there exists congestion associated with trailhead access because of parking and congestion, formalizing 15 spaces where cars are currently illegally parking will formalize the use in the area. The action alternative will relieve some of that congestion and access issues by providing additional parking to improve the experiential conditions. Adding 15 parking spaces will bring the total number of

parking spaces to 49 at the Oasis Trailhead parking area. The visitor capacity for the area will be 140 PAOT (49 parking spaces with approximately 2.7 PPV and additional capacity for walk-in visitors).

Monitoring. The most relevant indicators for capacity in the Oasis area are visitor-created trails and parking lot congestion. Monitoring the number of visitor-created trails helps to determine the frequency of the visitor-created trail use and ensures the sensitivity of resources, amount of use, and tolerance of impact are protected in the Oasis area. Similarly, monitoring for parking lot congestion will ensure that visitors have safe and stress-free access to popular visitor destinations by reducing vehicle congestion and conflicts in the parking area.

ALTERNATIVES CONSIDERED AND DISMISSED

Given the condition and safety of the current visitor center, alternatives that included replacement of the modular visitor center with a similar structure were deemed inadequate to support the increased visitation and incompatible with the conditions of the historic site. In addition, alternatives that considered replacing the visitor center within a different area, i.e., relocation of the facilities, were considered to pose an unacceptable amount of damage to existing natural communities and viewsheds.

Chapter 3
Affected Environment

INTRODUCTION

This chapter describes the affected environment (existing setting or baseline conditions) and a description of the resources potentially affected by the alternatives. It is organized by impact topics derived from internal National Park Service and external public scoping. This section describes only those environmental resources that are relevant to the decision being made and does not describe the entire existing environment. In addition, only those environmental resources that could be affected by the alternatives, if they were implemented, are discussed. This section, in conjunction with the description of the "no-action" alternative, forms baseline conditions for determining the environmental impacts of the proposed action. Those associated impacts are further analyzed in the Environmental Consequences Section (chapter 4)

HISTORIC DISTRICT

The Cottonwood Spring historic district consists of buildings and facilities constructed as part of the NPS Mission 66 initiative that primarily spanned the decade between 1955 and 1966. The district includes the ranger contact station, a maintenance building and yard, residential area, and campground and picnic areas. This collection of resources was developed between 1961 and 1968 in accordance with the park's 1961 master plan. The plan identified the area for further development to address issues resulting from the establishment of campground facilities in the Cottonwood Spring Oasis during the 1950s and to provide much needed visitor services and supervision in the southern portion of the park. The Cottonwood Spring historic district was determined eligible for the National Register of Historic Places at the local level of significance. Further contributing to the district's significance are its pattern of organization/sequence, views and vistas, designed landscape features, and circulation systems of roads and trails. Noncontributing resources include contemporary buildings constructed after 1968 and the comfort stations and amphitheater that have been substantially altered. The Cottonwood Spring district remains the only development in the southern portion of the park and the only representative area associated with Joshua Tree National Park's primary period of development. It retains substantial integrity with regard to its modern-style features and continuity as a planned district and reflects the goals of the Mission 66 program (Hennebery Eddy Architects 2016).

The Cottonwood Spring district is comprised of five contributing buildings (the ranger contact station, maintenance building, and residences 203, 204, and 205), a collection of contributing ramada picnic area structures, and three sites including the planned landscape of the district, the campground, and the picnic area. The district's associated cultural landscape includes attributes such as views and vistas; siting/sequencing; circulation systems; small-scale, man-made features; and structures such as roads, driveways, and planting islands. Most of the alterations to the district's contributing buildings are minor and reversible. However, the two campground comfort stations, one picnic area comfort station, and the amphitheater have lost historic integrity and are, therefore, considered noncontributing properties. The maintenance office in the Cottonwood maintenance yard was constructed in 1980, the law enforcement office was constructed in 1994, the duplex in 1985, and yards originally fenced sometime in the 1970s. Additionally, the temporary visitor center building and contemporary restroom building next to the ranger contact station, and two buildings in the maintenance yard were added to the district after 1997 to support park operations and visitation growth. These building are also considered noncontributing to the district's period of significance (Hennebery Eddy Architects 2016).

Located near the south park entrance along the main north-south road through the park, the district was designed and planned with four primary use areas organized around curved roads. Although newer buildings were constructed in the ranger contact station, maintenance, and residential areas, the overall layout and spatial relationships of the areas have been maintained. The Cottonwood Spring district also retains its setting at the base of the Eagle and Cottonwood Mountains, surrounded by the low Pinto Basin desert in proximity to the Cottonwood Spring Oasis. Although the ranger contact station and the residences had intentionally designed landscaping that has been significantly altered or allowed to revert to natural vegetation, the overall natural setting continues to predominate. Period buildings are primarily of concrete block wall construction, with windows and ceiling/floor materials connecting indoor spaces to the outdoors. Although windows, roofing, and interior finishes have been changed in many of the buildings, the district retains original construction and finish materials. Stucco applied to the concrete block surface of the ranger contact station is a reversible treatment allowing for restoration of the original material. The district retains qualities of workmanship and feeling and reflects NPS efforts to modernize national park units while retaining naturalistic design principles. Design and planning philosophies of the time, along with modern construction materials, were incorporated into building and site planning to provide appropriate visitor use areas and comfortable living accommodations for employees in the remote southern portion of the park without dominating or greatly altering the natural landscape (Hennebery Eddy Architects 2016).

Although weathering of historic building fabric from the desert environment, and potential deterioration of historic roads, trails, and other properties from visitor/park use would continue, NPS staff would preserve and maintain character-defining features of the district's historic buildings and cultural landscape to the extent possible in accordance with the Secretary of the Interior's Standards. Consequently, while the district's contributing buildings and cultural landscape features would not be adversely impacted by proposed project undertakings, limited adverse impacts would likely continue to result from natural deterioration and visitor/park use.

Long-term, beneficial impacts would result from NPS efforts to preserve and maintain historic buildings and cultural landscape features contributing to the Mission 66 character of the historic district.

The district's association with the Mission 66 era is reflected in the application of modern design elements that connect the property to the Modern Movement Style by such means as low-profile massing, spatial relationships, proportion, and materials. The area was planned as a cohesive development providing visitor contact and other services, maintenance facilities, and employee housing. Architectural design of the various structures included both the modern design features unique to the ranger contact station and maintenance building, as well as integration of standardized NPS designs for employee residences and comfort stations (Hennebery Eddy Architects 2016).

PREHISTORIC ARCHEOLOGICAL RESOURCES

Abundant evidence of American Indian presence in the area now encompassing Joshua Tree National Park has been documented in the archeological record. Among the earliest identified sites are those associated with the Pinto Culture, a nomadic hunter-gatherer people who seasonally frequented the California desert some 7,000–10,000 years ago during a period of wetter climatic conditions. Pinyon nuts, mesquite beans, acorns, and cactus fruit were among the food items harvested for sustenance. Evidence of their food processing is found in bedrock mortars—holes ground into solid rock that were used along with stone pestles for pulverizing seeds. More recent occupation by the Cahuilla, Serrano, Chemehuevi, and Mojave Indians has also been archeologically documented. Among the artifacts associated with their occupation are rock art, shelters, pottery sherds, and flaked stone from tool making (NPS 2015b; https://www.nps.gov/jotr/learn/historyculture/pintoculture.htm).

A late prehistoric archeological site—CA-RIV-2054 (JOTR 78A-17)—was recorded in the area of the Cottonwood Spring campground. The site was first recorded in 1978 representing a large artifact scatter consisting of ceramic sherds, flakes, manos, hammerstones, a projectile point, a bifacial knife, core tools, and milling stones. Three primary areas of artifact concentration were identified. Test excavations and shovel test pits were carried out although most of the recovered artifacts were found on the surface. Investigators concluded that the site was in poor condition and that the establishment of the campground, collection of artifacts by visitors, erosion, and other disturbances had adversely impacted the site. Nevertheless, the site was recommended eligible for the National Register of Historic Places (RECON Environmental, Inc. 2016).

The site area was again surveyed in 1998 as part of a cultural resources survey carried out in support of the park's Cottonwood Development Plan. The boundaries of site CA-RIV-2054 were expanded, and, along with a 10-meter buffer, the dimensions of the site were increased to 500 meters east/west by 371 meters north/south. Five areas of artifact concentration were identified. More than 280 surface artifacts were identified and the majority were collected, consisting primarily of pottery sherds, lithic tool reduction flakes, bone fragments, and a large milling slab (not collected). In 2011, an extreme rain event severely impacted the site, and only one of the artifact concentrations (Locus 1) was determined to remain. Further archeological investigations were conducted in the spring of 2016 that included the surface collection of artifacts, shovel test pit excavations, surface scrapes, and the excavation of 1 x 1 meter units.

Special studies included paleo-ethnobotanical analyses, lithic sourcing, and protein residue analyses. Analysis supported the conclusion that plant use or processing was not an intensive activity at the site. Information gathered by surface collection and excavation units indicated (in agreement with earlier investigations) that most of the cultural material exists on the surface (RECON Environmental, Inc. 2016).

Site CA-RIV-2054 is recommended eligible for the National Register of Historic Places under Criterion D, representing a Late Prehistoric Period location exhibiting patterns of use as an expedient tool production and limited tool maintenance site. Prehistoric peoples are thought to have traveled across the site area and tested the area's lithic materials for tool production. Based on the number of surface artifacts and the shallow depth of the cultural deposit in the eastern portion of the site, the site has a moderate potential to address research questions regarding site formation processes, chronology and dating, settlement and site function, subsistence, and trade and exchange systems. Portions of the site (campground area) lack integrity, although sufficient integrity has been maintained overall. Artifact density in the campsite area and along the Mastodon Peak/Lost Palms Oasis/Cottonwood Springs Trail leading southwest is sparse. Despite past water runoff and sheet washing events, the overall periphery of the site (within the expanded site boundary area) retains substantial integrity where the cultural deposit remains relatively intact. The artifact density is higher in the expanded area, particularly in the eastern portion. It is possible that modern visitors did not explore much past the campsites, helping to explain why surface artifacts were still present at the time of the survey. Overall, the site is in good condition (RECON Environmental, Inc. 2016).

GROUNDWATER

The groundwater aquifer that lies just to the north the Cottonwood Visitor Center, park housing, and facility maintenance area would continue to be the primary water supply source for all development and visitor use associated with the proposed action. The well and pump that tap this aquifer lie roughly three miles north of the Cottonwood area and are connected to the site by a buried water conduit. This aquifer source is a 22,000-acre headwater sub-basin of the much larger 407,000-acre Pinto Basin aquifer, the park's largest groundwater aquifer system. The groundwater storage in the Cottonwood sub-basin aquifer is estimated to range from 56,000 to 84,000 acre-feet, depending on the technical assumptions built into the estimates (NPS 2018). In addition, at the time of this publication, the dynamics of the subsurface connectivity between the small Cottonwood sub-basin and the larger Pinto Basin aquifer is not yet fully understood and will be researched further by the National Park Service. In particular, the effect of subsurface geologic strata and fault lines in groundwater movement will be assessed.

Groundwater aquifers in the park are generally fed by precipitation within the surface watershed. However, this arid valley receives only about 4.5 inches of precipitation per year, on average. In addition, because of surface runoff and evaporation rates, only a small portion of precipitation percolates down to recharge the groundwater. Groundwater in the Cottonwood sub-basin aquifer generally flows northward as it percolates through the sub-basin's shallow alluvial ground surface of sand and gravel material. Most of the groundwater is stored in the older, deeper alluvial deposits of clay, sand, and boulders, and in fractures of the underlying igneous and metamorphic rock strata.

As mentioned, the water demands associated with the park facilities and uses in the Cottonwood area are dependent on this sub-basin aquifer. National Park Service hydrologists assessed the implications of the existing groundwater withdrawals on the Cottonwood sub-basin as part of this environmental assessment process. This included an analysis of hydrogeological data and water budget estimates (inflow and outflow). The water budget estimates involve groundwater inflow from precipitation infiltration and septic system return flows and groundwater outflow from evapotranspiration, subsurface outflow, and groundwater withdrawal for Cottonwood uses. Per the analysis, it is estimated that even with the small, sporadic natural groundwater recharge that occurs in this arid sub-basin, the existing groundwater withdrawal does not appear to substantially impact the amount of water storage in the aquifer (NPS 2018). Under current conditions of groundwater use at the existing visitor center, park housing, and campground, the estimated potential worst case net loss in annual groundwater storage because of groundwater pumping and potential subsurface outflow (2.3 acre-feet per year) would be a very small fraction of the aquifer volume range of 56,000 to 84,000 acre-feet. Please refer to the NPS memo in the appendix for the water budget analysis.

The sub-basin analysis also considered data from the park that suggests the groundwater level at the existing well site dropped approximately 49 feet over the past few decades (from 170 feet below surface to 219 feet below the surface). However, given the above-noted water budget estimates and the other attributes that directly affect aquifer condition (e.g., climate conditions, and hydrogeologic changes from shifts in subsurface faults and fractures, etc.), it is quite possible that changes in groundwater levels in the sub-basin are more closely correlated to these other natural processes/events and climatic shifts than to groundwater withdrawal. It is also quite possible that the noted drop in groundwater level at the existing well site may also relate to a clogged well screen and localized impermeability in localized subsurface soils (NPS 2018).

VISITOR USE AND EXPERIENCE

This section describes elements of visitor use and experience in the Cottonwood area of Joshua Tree National Park that may be affected by the management alternatives. The description of these elements is based on the best professional judgment of NPS staff and public scoping for this plan. The following visitor use and experience elements will be discussed:

- Visitor information and circulation
- Diversity of visitor experience and opportunities

The Cottonwood area is one of three entrances used to access the park, located in the south near Interstate 10. Of the three entrance stations, the Cottonwood entrance is the only one without a fee collection booth. The vast majority of visitors to Joshua Tree National Park come via private passenger vehicles, and visitation is concentrated in about 10% of the park along Park Boulevard adjacent to JOTR forests and boulder fields in the northern part of the park, leaving fewer visitors in the Cottonwood area.

Currently, population increases in communities neighboring the Cottonwood area and overcrowding in other, more traditionally visited portions of Joshua Tree National Park is driving rapidly increasing visitation numbers to the district. As these numbers rise, the park

finds itself unable to adequately serve visitor needs on busy days. The number of days per year with inadequate service is expected to steadily rise in the future.

In 2016, Joshua Tree National Park set a record for annual visitation of more than 2.5 million visitors. Visitation for the month of March 2016 alone was 327,072 and visitor numbers for the same month in 2017 increased to 404,545, which is the largest monthly visitation in the park's history. Total park visitation since the first of the year is up 27% from 2016. Fair weather and the abundance of wildflowers this year significantly contributed to the increase in visitor numbers. (Joshua Tree News Release, May 17, 2017).

Visitation to the Cottonwood area, following the rest of the parks' visitation patterns, has been increasing over the last five years. See figure 3 to view the recreation visits collected by the traffic counter and multiplied by the parks' person per vehicle average.

Visitor Information and Circulation

The visitor center is one of the primary contact areas where visitors stop in the Cottonwood area. It contains very limited facilities, including outdoor water, flush toilets, an onsite bookstore, and a nearby picnic area. The visitor center offers little by way of information to visitors for experiences in the surrounding area, mostly because of the lack of space available for the dissemination of information. Visitor safety is currently compromised because bees are attracted to the outdoor drinking fountains at the restroom.

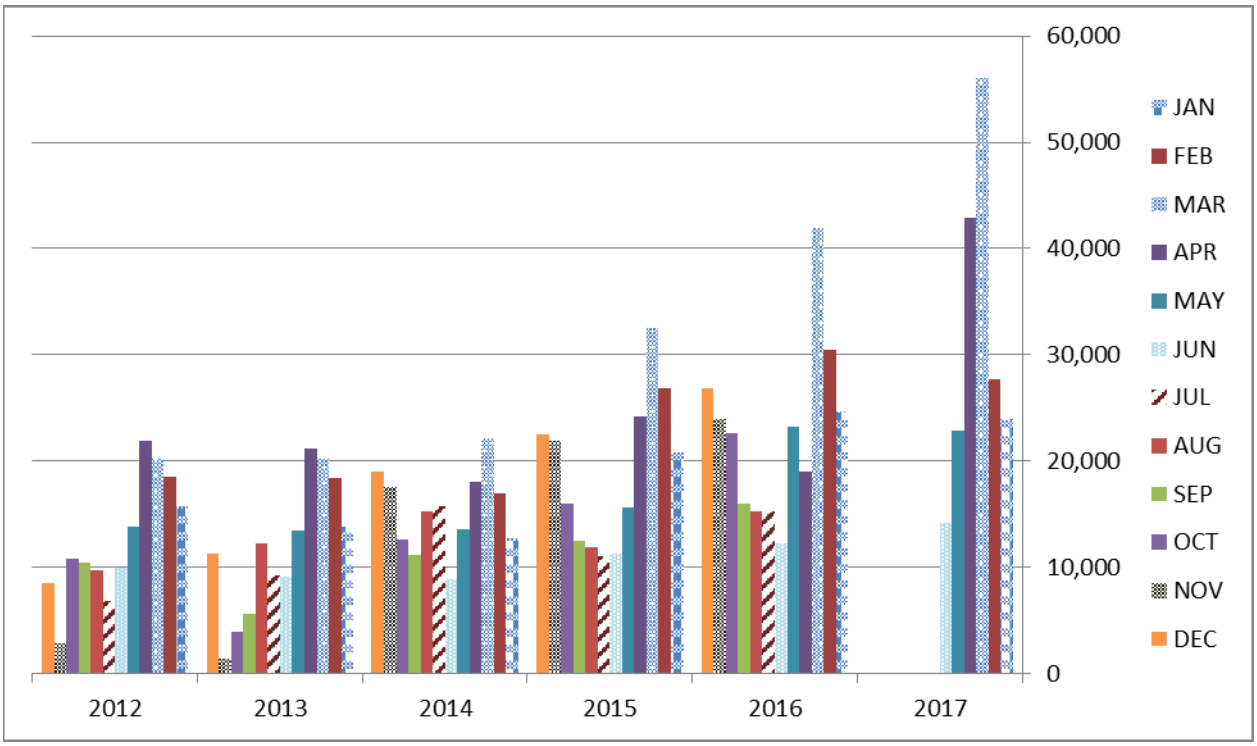

FIGURE 3. COTTONWOOD AREA VISITATION

Visitor safety is stressed through the park's online messaging about bringing the "10 Essentials" while viewing wildflowers or hiking through the Joshua trees. The 10 Essentials include water, food, layers of clothing, sun protection, first aid kit, sturdy shoes, navigation (map and compass), pocket knife/multitool, flashlight/headlamp, and emergency shelter.

Challenges for visitors in the Cottonwood area include a need for increased stewardship and visitor education that result in additional messaging and information. Given the limited cell coverage and small facilities, visitors can have difficulty navigating. During busy seasons in the Cottonwood area, the wait line at the visitor center can sometimes be quite long.

Diversity of Visitor Experience and Opportunities

Hiking. Several hiking trails exist in the Cottonwood area. The Bajada Trail offers visitors the opportunity to walk on a bajada and discover plants of the Colorado Desert on an easy .25 mile, wheelchair-accessible path.

Another hiking trail, the Cottonwood Springs Oasis trail, is touted as one of the best-kept secrets in Joshua Tree National Park. It is a result of earthquake activity and was used historically by Cahuilla Indians. Consequently, the area has bedrock mortars and clay pots.

A number of hikes begin at Cottonwood Spring. A short, easy walk down Cottonwood Wash leads past a second oasis to a dry falls. In wet years, the falls can become a scene of rushing water and red-spotted toads. Bighorn sheep often come up the wash for water in the early hours of the day. An old teamster road drops down past the falls to the lower wash. A short hike leads through palo verde and desert willow trees to the remains of Moorten's Mill.

The three-mile loop trail to Mastodon Peak offers spectacular views, interesting geology, the Mastodon Mine, and the Winona Mill Site. Longer hikes are also available; the Lost Palms Oasis trail is an eight-mile round trip option featuring the largest stand of fan palms in the park.

While there is limited crowding occurring on hiking trails in the Cottonwood area, the parking lot is often congested since it serves as the primary access point for three major trails varying in length and difficulty. Other challenges in this area include human waste and insufficient law enforcement to monitor the area. Occasional search and rescue missions do occur on these trails and include treating individuals for minor accidents such as twisted ankles or heat-related incidents, as well as locating lost individuals.

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Chapter 4
Environmental Consequences

INTRODUCTION

This section contains the environmental impacts, including direct, indirect, and cumulative effects for each alternative. The analysis is based on the assumption that the mitigation measures and best management practices described in the Alternatives section of this environmental assessment would be implemented for the preferred alternative. Overall, the National Park Service based these impact analyses and conclusions on the review of existing literature and studies, information provided by experts within the park and other agencies, the professional judgment and of park staff and their insights, and public input. Direct, indirect, and cumulative effects are analyzed for each resource topic carried forward. Impact analysis requires considerations of impact type, context, and duration.

Cumulative impacts were determined by combining the impacts of the actions included in the alternatives with other past, present, and reasonably foreseeable future actions. Therefore, it is necessary to identify other past, present, or reasonably foreseeable future projects at the park that could result in cumulative impacts. Because the scope of this project is relatively small, the geographic and temporal scope of the cumulative analysis is similarly small. The geographic scope for this analysis includes actions within the park's boundaries, while the temporal scope includes projects within a range of approximately 10 years. The past and future projects described in the following sections were identified for the purpose of conducting the cumulative effects analysis.

Cumulative Actions and Effects

Steady increases in visitor use of the Cottonwood area over the last two decades brought about the construction of the current modular visitor center and restroom facilities in 1997. These modern features were installed before the historic district obtained its Determination of Eligibility. Similarly, the comfort stations in the two existing campground loops, originally constructed between 1961 and 1967 as part of the Mission 66 design, have been modified over the years to the point that they no longer retain their historic character. To accommodate staffing, the Cottonwood maintenance office in the maintenance yard was constructed in 1980; the law enforcement office was constructed in 1994; the duplex in 1985; and the yards were fenced sometime in the 1970s. Other non-historic structures in the area include the bathroom and visitor center (1997), the 1998 solar array, modern maintenance yard buildings, duplex, and

residential yard fencing. In 2015, the campground comfort station was modified with stucco and altered roof/tile. Periodic repaving of the roads, parking lots, and campground loops have occurred, but the Mission 66 design and layout has been retained.

Future Actions

In addition to the actions described in the preferred alternative of this plan, the park is planning future interior improvements to two additional facilities, which are also contributors to the Mission 66 historic district. The park expects to assess their suitability and to retain their historic character in future developments. Other projects proposed for the Cottonwood area include:

- resurfacing and repairs to the Mission 66-era roads (within best practices treatments for the historic features);
- improvements and expansions of parking lots at trailheads;
- restoring native plantings within campgrounds to improve natural conditions and screening for visitor enjoyment;
- stabilizing the Cottonwood Spring archeological site (to allow visitor access without negative impacts to the archeological integrity of the site); and
- retrofitting the solar electrical system of wells that provide drinking water.

The current conditions of the Cottonwood area resources resulting from past actions as well as the anticipated impacts associated with future plans were taken into consideration when describing the overall environmental consequences associated with each alternative described in this environmental assessment. The following section details the results of that evaluation for the impact topics carried forward.

HISTORIC DISTRICT

Environmental Consequences as a Result of Alternative A (No Action)

Under alternative A, no new construction or design modifications would occur in the near future that could adversely affect historic Mission 66 buildings (the ranger contact station, maintenance building and yard, residential area, and campground and picnic areas) contributing to the significance of the Cottonwood Spring historic district. Other features contributing to the district's associated cultural landscape would be avoided by construction disturbance or modification such as views and vistas; the circulation system of roads and trails; and small-scale, man-made features. Although noncontributing buildings placed or constructed after the period of significance would remain within the district, the continued presence of these buildings would not further diminish the historic setting or the overall national register eligibility of the district.

Cumulative Impacts. The addition of facilities constructed after the period of significance for the Cottonwood Spring historic district (e.g., modular visitor center and restroom near the ranger contact station) intrude on the district's designed cultural landscape although without substantially diminishing the district's national register eligibility. Other structures such as the amphitheater and campground restroom have been modified resulting in lost historical

integrity. These primarily past actions have resulted in limited adverse impacts on the overall integrity of the historic district. Among proposed projects are resurfacing and repairs to the Mission 66-era roads, improvement and expansion of trailhead parking lots, and planting of native vegetation. Other proposed future actions include improvements to the NPS housing and maintenance facilities in the historic district. These future actions would be designed and implemented to retain the historic character of the historic district. Consequently, long-term beneficial impacts are anticipated from future facility improvements on contributing historic buildings and cultural landscape features.

The impacts associated with implementation of alternative A would have primarily long-term beneficial impacts and only limited adverse impacts on historic structures and cultural landscape features contributing to the significance of the Cottonwood Spring historic district. Other primarily past actions have resulted in limited adverse impacts to the integrity of the historic district, while proposed future undertakings to improve the district's facilities would be carried out in accordance with the Secretary of the Interior's Standards to avoid or minimize disturbance of the district's historic character resulting in long-term beneficial impacts. Consequently, the limited adverse impacts of the other actions described above, in combination with the impacts of alternative A, would cumulatively result in long-term limited adverse impacts on historic structures and cultural landscape features. The impacts associated with the no-action alternative would represent a small component of the adverse cumulative impact.

Conclusion. Under alternative A (no action) no new construction or design modifications would occur that could adversely impact Mission 66 buildings and cultural landscape features contributing to the national register significance of the Cottonwood Spring historic district. Long-term limited adverse impacts would likely continue to result from natural weathering and the presence of noncontributing buildings and features constructed after the district's period of significance that detract from the district's integrity. However, the overall integrity of the district would not be substantially diminished. Long-term limited adverse cumulative impacts on historic buildings and cultural landscape features would also result from primarily past actions. Although the new construction would introduce new visual elements to the historic district, the new structures are not incompatible or out of character with the surrounding area and the aesthetics or character of adjacent structures and historic district, and the integrity of the historic district would be minimally diminished. Potential future actions to improve facilities in conformance with the Secretary of the Interior's Standards are anticipated to have long-term beneficial impacts.

Environmental Consequences as a Result of Alternative B (NPS Preferred)

Under alternative B, the National Park Service would improve visitor facilities in the Cottonwood Spring historic district. The existing modular visitor center would be removed and replaced with a new building designed to blend with the cultural landscape and be compatible with the designed architectural character and massing of district's Mission 66 buildings and other constructed elements. The new visitor center would have space for visitor contact information, exhibits, a classroom/meeting room, office space, and an indoor restroom facility. The existing Mission 66-era ranger contact station would be retained to serve as a visitor contact station or repurposed for other uses, and its exterior would be restored to its historical appearance. Noncontributing restrooms would be removed. Other proposed actions to improve

the visitor experience would include expansion of the visitor center parking area, construction of a new shaded patio space, improvement of an existing nature trail, and the creation of a new trail connecting visitor center and campground areas.

All of the proposed actions identified above would be carried out in conformance with Secretary of the Interior's Standards to ensure that new development is sensitively designed to protect the character-defining features of the Mission 66-era historic district. New construction would incorporate materials, scale, massing, landscape design (particularly regarding the parking lot expansion), and other architectural details that harmoniously complement existing contributing buildings, structures, and cultural landscape features. Proposed new construction and improvements would result primarily in long-term beneficial impacts by helping ensure that the district retains its historic character, and only limited adverse impacts would occur from the introduction of newly constructed buildings and features (e.g., visitor center, expanded parking area, and patio) that were not included in the original Mission 66 site design. However, compatible architectural designs would help to mitigate the potential adverse visual impacts associated with new construction.

Cumulative Impacts. The addition of facilities constructed after the period of significance for the Cottonwood Spring historic district (e.g., modular visitor center and restroom near the ranger contact station) intrude on the district's designed cultural landscape although without substantially diminishing the district's national register eligibility. Other structures such as the amphitheater and campground restroom have been modified resulting in lost historical integrity. These primarily past actions have resulted in limited adverse impacts on the overall integrity of the historic district. Among future proposed projects are resurfacing and repairs to the Mission 66-era roads, improvement and expansion of trailhead parking lots, and planting of native vegetation. Other proposed future actions include improvements to the NPS housing and maintenance facilities in the historic district. These future actions would be sensitively designed and implemented to retain the historic character of the historic district, and consequently long-term beneficial impacts are anticipated from future facility improvements on contributing historic buildings and cultural landscape features.

The impacts associated with implementation of alternative B would have primarily long-term beneficial impacts and only limited adverse impacts on historic structures and cultural landscape features contributing to the significance of the Cottonwood Spring historic district. Other primarily past actions have resulted in limited adverse impacts to the integrity of the historic district, while proposed future undertakings to improve the district's facilities would be carried out in accordance with the Secretary of the Interior's Standards to avoid or minimize disturbance of the district's historic character resulting in long-term beneficial impacts. Consequently, the limited adverse impacts of the other actions described above, in combination with the impacts of alternative B, would cumulatively result in long-term limited adverse impacts on historic structures and cultural landscape features. The impacts associated with the no-action alternative would represent a small component of the adverse cumulative impact.

Conclusion. Under alternative B, all new construction and improvements to existing facilities would be carried out in a manner that protects character-defining features of the Cottonwood Spring historic district. New construction for the visitor center, expanded parking area, covered patio area, and new trails would be compatible with the district's Mission 66 character and in

conformance with the Secretary of the Interior's Standards. Noncontributing restroom buildings would be removed. These measures would result in long-term beneficial impacts on the integrity of the historic district and its contributing historic buildings and cultural landscape features. Although limited adverse impacts would occur from the introduction of new constructed buildings and features that were not included in the original Mission 66 site design, compatible architectural designs would help to mitigate the potential adverse visual impacts associated with new construction, resulting in an improvement of the historic scene over current conditions. Long-term limited adverse cumulative impacts on historic buildings and cultural landscape features would also result from primarily past actions. Potential future actions to improve facilities in conformance with the Secretary of the Interior's Standards are anticipated to have long-term beneficial impacts.

PREHISTORIC ARCHEOLOGICAL RESOURCES

Environmental Consequences as a Result of Alternative A (No Action)

Under alternative A, no substantial changes to visitor use activities or proposed construction of new park facilities would occur. Consequently, known or potential archeological resources are unlikely to be affected by ground-disturbing construction activities. NPS archeologists would continue to monitor the condition of known archeological sites. Appropriate protection measures would continue to be implemented as necessary to reduce or avoid adverse impacts on sites that could occur from natural erosion, visitor use (e.g., the development of social trails or other inadvertent impacts), the unauthorized removal of artifacts, and other factors. Ongoing actions under alternative A would therefore result primarily in long-term beneficial impacts on archeological resources.

Cumulative Impacts. Archeological sites in the vicinity of the Cottonwood Spring historic district have been adversely impacted primarily by past disturbances associated with erosion resulting from flash flooding or sheet washing events that have disturbed the stratigraphic context of sites to varying degrees. Sites have also been disturbed by development (e.g., establishment of the Cottonwood Spring campground) and other related actions. Although these disturbances have diminished the integrity of archeological resources in some areas or portions of particular sites that have received heavy visitation, sufficient overall integrity remains for selected sites to retain their individual national register eligibility and for the collection of sites as a whole to retain eligibility as a prehistoric landscape.

The impacts associated with implementation of alternative A would have primarily long-term beneficial impacts and only limited adverse impacts on archeological resources. Other primarily past actions have resulted in limited adverse impacts to the integrity of archeological resources. Consequently, the limited adverse impacts of the other actions described above combined with the impacts of alternative A would cumulatively result in long-term limited adverse impacts on archeological resources. The impacts associated with the alternative A would represent a small component of the adverse cumulative impact.

Conclusion. Under alternative A, no facility development or substantial ground disturbance would occur that could adversely affect archeological resources. The National Park Service would continue to monitor and protect archeological resources in the Cottonwood Spring area

as feasible under existing laws and policies, resulting in long-term, localized, beneficial impacts. Long-term limited adverse impacts on archeological resources would occur from visitor use, erosion, and development that could diminish resource integrity. Long-term limited adverse cumulative impacts on archeological resources also would occur from implementation of alternative A in conjunction with other past, present, or reasonably foreseeable actions.

Environmental Consequences as a Result of Alternative B (NPS Preferred)

Under alternative B, several proposed actions have the potential to disturb known or potential archeological resources in the project area. However, all project areas would be archeologically surveyed to ensure that archeological resources, should they be identified, are avoided or adequately protected and documented. New construction would include a visitor center and a new septic system / leach field (in a surveyed area where no archeological resources have been identified). A new water well would also be established along the route of the existing supply line to the visitor center area; the well would be located in an area surveyed and assessed to avoid disturbance to significant archeological resources. A hiking trail would be established between the visitor center and campground, and another nature trail would be improved. Ground disturbance associated with these undertakings would entail an archeological survey and possible monitoring during construction to avoid and protect significant sites.

Actions under alternative B have the potential to disturb known or potential archeological resources. However, because all project areas would be archeologically surveyed to identify sites and appropriate protection measures would be implemented as necessary during construction to avoid or minimize disturbances, only limited long-term adverse impacts on archeological resources are anticipated from implementation of alternative B. Long-term beneficial impacts on archeological resources would also occur from continuing NPS efforts to monitor and protect archeological resources in the project vicinity.

Cumulative Impacts. Archeological sites in the vicinity of the Cottonwood Spring historic district have been adversely impacted primarily by past disturbances associated with erosion resulting from flash flooding or sheet washing events that have to varying degrees disturbed the stratigraphic context of sites. Sites have also been disturbed by development (e.g., establishment of the Cottonwood Spring campground), the unauthorized collection of artifacts by visitors, and other factors. Although these disturbances have diminished the integrity of archeological resources in some areas or portions of particular sites that have received heavy visitation, sufficient overall integrity remains for selected sites (including CA-RIV-2054) to retain their national register eligibility and for the collection of sites as a whole to retain eligibility as a prehistoric landscape.

The impacts associated with implementation of alternative B would have primarily long-term beneficial impacts and only limited adverse impacts on archeological resources. Other primarily past actions have resulted in limited adverse impacts to the integrity of archeological resources. Consequently, the limited adverse impacts of the other actions described above combined with the impacts of alternative B would cumulatively result in long-term limited adverse impacts on archeological resources. The impacts associated with alternative B would represent a small component of the adverse cumulative impact.

Conclusion. Under alternative B, proposed new construction and development activities have the potential to disturb archeological resources. However, all project areas would be archeologically surveyed to ensure that archeological resources, should they be identified, are avoided or adequately protected. Because limited adverse impacts could also occur from visitor use, erosion, and other factors that could diminish resource integrity, the National Park Service would continue to monitor and protect archeological resources in the Cottonwood Spring area as feasible under existing laws and policies. Long-term, localized, beneficial impacts on archeological resources would occur from continuing NPS efforts to monitor and protect archeological resources in the project vicinity. Long-term limited adverse cumulative impacts on archeological resources would also occur from the implementation of alternative B in conjunction with other past, present, or reasonably foreseeable actions.

GROUNDWATER

Environmental Consequences as a Result of Alternative A (No Action)

The no-action alternative would result in a continuation of current trends of groundwater withdrawal from the Cottonwood sub-basin aquifer to serve the water demands for the existing Cottonwood visitor center. It could be assumed that the current water extraction trend at the visitor center from park visitors and staff would continue into the future under these conditions and gradually increase over time as visitation increases. Likewise, the partial aquifer recharge from septic system return flow from these Cottonwood facilities would also more or less continue on a similar trajectory. The effect of this use on the Cottonwood sub-basin aquifer would be ongoing and long-term. However, based on water budget estimates of groundwater inflow and outflow under the no-action alternative, NPS hydrologists conclude that this continued groundwater pumping would have a minimal effect on the Cottonwood sub-basin aquifer because even the potential worst case annual net loss in groundwater storage would be a very small fraction of the aquifer volume range of 56,000 to 84,000 acre-feet per year (NPS 2018). In turn, the effects of the no-action alternative would not likely alter the long-term sustainability of the aquifer. Please refer to the NPS memo in the appendix for details on this analysis. In addition, under the no-action alternative, the effect of the existing impervious surfaces and altered surface hydrology in the project area would remain as is and continue to have a negligible effect on the groundwater.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions with the potential to affect the Cottonwood sub-basin aquifer include the groundwater extraction demands of the Cottonwood maintenance facility, park housing facility, and the campground. The impacts from water demand for these park uses are likely on the order of magnitude similar to that of the visitor center and are minimal relative to the sub-basin volume. Because the dynamics of the Cottonwood sub-basin's connectivity to the large Pinto Basin aquifer is not fully understood, the effect of external changes in the Pinto Basin aquifer on the Cottonwood sub-basin cannot be quantified at this time. However, scientific assumptions would suggest this effect would likely be very minor. In addition, while continuing and increasing municipal water demands and groundwater drawdown from urban development in the surrounding region (particularly to the south, and more specifically, the proposed Eagle Mountain Pumped Storage and Hydroelectric Project) certainly would continue to affect groundwater condition in the region, the

connectivity of these adjacent aquifers to the Cottonwood sub-basin or the larger Pinto Basin aquifer is not readily known. In sum, via water budget estimates and hydrological data analysis, the overall cumulative impacts to the Cottonwood sub-basin aquifer from past, present, and reasonably foreseeable future projects in combination with the no-action alternative, would likely be long-term, minimal, and at a local, sub-basin scale. The increment of impact contributed by the no-action alternative to this cumulative effect would be intermediate.

Conclusion. Under the no-action alternative, ongoing groundwater extraction uses for the Cottonwood visitor center could continue to result in minimal, long-term, adverse impacts to the Cottonwood sub-basin aquifer. However, these effects would not likely alter the long-term sustainability of the aquifer. Cumulative impacts, including the no-action alternative effects, would also be long-term, minimal, and at a local, sub-basin scale. The increment of impact contributed by the no-action alternative to this cumulative effect would likely be intermediate.

Environmental Consequences as a Result of Alternative B (NPS Preferred)

Because alternative B includes an increase in visitor capacity at the visitor center (to meet current visitor needs), this alternative could eventually result in a commensurate increase in visitation at Cottonwood over time. However, as part of this alternative, water use efficiency measures would be built into the visitor center design in pursuit of a zero net gain in water demand for the proposed expansion. These measures, which would include low-flow toilets and other water-efficient appliances, would help minimize adverse effects from drawing down Cottonwood sub-basin aquifer as visitor use continues or increases at the Cottonwood visitor center. Likewise, the aquifer recharge from septic system return flows at these Cottonwood visitor center could also continue and may possibly increase if visitor water use happens to increase.

The effect of this water withdrawal on the aquifer would be ongoing and long term. However, based on water budget estimates of groundwater inflow and outflow under alternative B, NPS hydrologists conclude that the anticipated groundwater pumping would have a minimal effect on the Cottonwood sub-basin aquifer because even the potential worst case annual net loss in groundwater storage would be a very small fraction of the aquifer volume range of 56,000 to 84,000 acre-feet per year (NPS 2018). In turn, the effects of alternative B would not likely alter the long-term sustainability of the aquifer. Please refer to the NPS memo in the appendix for details on this analysis. In addition, under alternative B, the effect of the existing and proposed increases in impervious surfaces and altered surface hydrology in the project area would have a negligible effect on groundwater given the very small scale of impervious development relative to the surrounding groundwater basins.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions with the potential to affect the Cottonwood sub-basin aquifer include the groundwater extraction demands of the Cottonwood maintenance facility, park housing facility, and the campground. The impacts from water demand for these park uses are likely on the order of magnitude similar to that of the proposed visitor center under alternative B and are very minimal relative to the sub-basin volume. Scientific assumptions would suggest this effect would likely be very minor. In addition, while continuing and increasing municipal water demands and groundwater drawdown from urban development in the surrounding region (particularly to the south, and more specifically,

the proposed Eagle Mountain Pumped Storage and Hydroelectric Project) certainly would continue to affect groundwater condition in the region, the connectivity of these adjacent aquifers to the Cottonwood sub-basin or the larger Pinto Basin aquifer is not readily known. In sum, via water budget estimates and hydrological data analysis, the overall cumulative impacts to the Cottonwood sub-basin aquifer from past, present, and reasonably foreseeable future projects in combination with the alternative B, would likely be long-term, minimal, and at a local, sub-basin scale. The increment of impact contributed by alternative B to this cumulative effect would be small.

There was some discussion of the future actions that are planned by non-NPS actors outside of the Cottonwood area, particularly housing developments and the proposed Eagle Mountain Pumped Storage and Hydroelectric Project. At this time, future projects associated with residential housing development would be at a distance from the park that would preclude direct impacts. The Eagle Mountain Pumped Storage and Hydroelectric Project—the planned reuse of a former mine site for storage of water for hydroelectric power—may have the potential to adversely impact groundwater levels in the park, at least temporarily. The project would involve building a facility to pump and maintain water into an upper reservoir during the day, using plentiful solar and wind energy, and then release it into a lower reservoir at night to run turbines and create electrical power during peak nighttime energy use. Initially filling the reservoir would require 24,000 acre-feet of groundwater from the local aquifer, with an additional 1,500 acre-feet per year lost to evaporation. Estimates vary on what the impact to the groundwater level would be from the project.

Conclusion. Under alternative B, groundwater extraction for uses at the Cottonwood visitor center would result in minimal, long-term, adverse impacts to the Cottonwood sub-basin aquifer. However, despite potential increases in visitor use at the proposed visitor center expansion (from 25% increase in parking lot capacity), the application of water use efficiency measures built into the visitor center design would help minimize increases in water demand as visitation increases. These effects would not likely alter the long-term sustainability of the aquifer. Cumulative impacts on groundwater, including the effects of alternative B, would also be long-term, minimal, and at a local, sub-basin scale. The increment of impact contributed by alternative B to this cumulative effect would be small.

VISITOR USE AND EXPERIENCE

The effects of the alternatives on visitor use and experience in the project area were analyzed based on impacts resulting from: 1) new opportunities for recreation in key visitor experiences, 2) impacts to current visitor experiences resulting from changes to visitor use patterns, 3) visitor safety, 4) emerging visitor interests, use characteristics, patterns, and trends, and 5) visitor demand and expectations at key areas. The impact analysis was based on the knowledge and best professional judgement of planners, comparisons of conditions from data from park records, and studies of similar actions and impacts when applicable. Management strategies and mitigation measures associated with the indicators and thresholds presented in chapter 2 are also included in the impact analysis.

Impact Analysis Questions:

- How would opportunities for visitor access, information, and circulation change as a result of the alternatives?
- How would the diversity of visitor experiences and opportunities change as a result of the alternatives?
- How would visitor safety, both real and perceived, be affected by the alternatives?

Environmental Consequences as a Result of Alternative A (No Action)

Visitor Information and Circulation. The no-action alternative would continue to provide a visitor center with less than adequate facilities to support current and projected visitor use with regard to information dissemination, education, and circulation (wayfinding) in the Cottonwood area. Visitor safety would continue to be compromised as bees congregate around the outdoor water source (drinking fountains at the restroom building). Mitigation measures for visitor safety would continue through Joshua Tree National Park's online messaging about the 10 essentials for hiking and backcountry safety. Challenges for visitors in the Cottonwood area would continue.

Diversity of Visitor Experience and Opportunities. The no-action alternative would result in a continuation of congestion in the access parking lot for key visitor experiences in the Cottonwood area. Continued congestion may encourage visitors to continue driving past the visitor center and might result in them missing educational information or awareness of hiking opportunities and, therefore, have an adverse impact on the visitor experience. With no additional visitor education, human waste is likely to continue to be problematic and present an adverse impact to the visitor experience.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions with the potential to affect the visitor experience include the restoration and enhancement of campsites at Cottonwood Campground (e.g., enhancing native vegetation to improve privacy screening and aesthetics). The impacts from these projects would produce long-term, considerable, local to regional scale beneficial impacts to the visitor experience. When combined with the no-action alternative, the cumulative impacts would provide the most extensive beneficial impact to the visitor experience by providing enhanced privacy at the campground and expanding the range of availability opportunities for visitor education.

Conclusions: With the current and projected visitor use, combined with current management, the volume of visitors are likely to be underserved by the present facilities in the Cottonwood area. This would adversely impact visitor information and circulation, continue to impede the expansion of the diversity of visitor experiences, and likely adversely impact the overall visitor experience.

Environmental Consequences as a Result of Alternative B (NPS Preferred)

Visitor Information and Circulation. The improvements to the visitor center under alternative B would support park managers' goals for the Cottonwood area by improving visitor information, education, and circulation resulting in beneficial impacts to the visitor experience. The new and enhanced infrastructure would provide space for visitor education about on and

off-trail travel, natural and cultural resources in the area, and opportunities for comprehensive park stewardship education. The added space would facilitate beneficial impacts to the visitor experience through education, stewardship, and information. In addition, visitor experience would be improved through a reduction in wait times for initial visitor contact and fee collection. The expansion of the visitor center and parking lot are likely to reduce congestion and wait times by adding capacity to accommodate additional visitors seeking information about the Cottonwood area. Visitor safety would also be beneficially impacted by the action to move the restrooms and water source indoors, which would greatly reduce visitor interaction with bees attracted to outdoor water fountains.

Diversity of Visitor Experience and Opportunities. Alternative B would result in overall beneficial improvements to the visitor experience and specifically the diversity of visitor experience and opportunities. Establishment of the nature trail between the campground and visitor center would enhance visitor connectivity within the Cottonwood area and expand the range of available visitor opportunities. Connectivity would also be enhanced by improving the existing short nature interpretive trail in the visitor center area. This would beneficially impact the range of available visitor experience in Cottonwood and simultaneously provide additional visitor education. The action to expand the shaded picnic area would accommodate additional visitors and contribute to beneficial impacts to the visitor experience, especially during the very warm days at Joshua Tree National Park.

Alternative B would reduce the congestion at a primary access point for key visitor experiences in the Cottonwood area and overflow parking at the Oasis trailhead would be formalized, providing 15 additional spaces. Decreases in congestion often result in beneficial impacts to the visitor experience as the availability of visitor opportunities increase with the decrease in congestion. Additional visitor education about park stewardship and specifically low impact principles such as Leave No Trace are likely to decrease the impact of human waste and result in beneficial impacts to the visitor experience.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions with the potential to affect the visitor experience include the restoration and enhancement of campsites at Cottonwood Campground. The effects from these projects would produce long-term, considerable, local to regional scale beneficial impacts to the visitor experience when combined with the actions in alternative B. These beneficial impacts would comprise of enhanced privacy at the campground and would expand the range of available opportunities for visitor education.

These projects, if carried out with sensitivity to the historic significance of the architecture of the maintenance facility and Mission 66 residences, as well as the landscape design in the campground, would have the potential to impart permanent beneficial impacts to the cultural resources of the Cottonwood area. Improved visitor options at Cottonwood Spring and the improved vegetated screening in the campground would also be beneficial to visitor experience in the park. All of the proposed projects would be expected to provide cumulative beneficial impacts to cultural resources and visitor experience and would complement the improvements to visitor experience that are part of the current planning effort.

Conclusions: Under alternative B, the visitation levels would likely continue to gradually increase, following current projections. With increased visitation and new actions to improve facilities, visitor information, and circulation, as well as the diversity of visitor experiences, opportunities, and safety, the volume of visitors is likely to be well supported in the Cottonwood area under this alternative. This would beneficially impact visitor information and circulation, continuing to expand the diversity of visitor experiences and beneficially impact the overall visitor experience.

Chapter 5

Consultation and Coordination

INTERNAL SCOPING

An interdisciplinary team of professionals from the park and Denver Service Center staff conducted the internal scoping. Team members met multiple times in 2015, 2016, and 2017 to discuss the purpose and need for the project, various alternatives, potential environmental impacts, reasonably foreseeable actions that may have cumulative effects, and resource protection measures. The team also gathered background information and discussed public outreach for the project. Over the course of the project, team members conducted numerous individual site visits to view and evaluate the proposed development areas within the Cottonwood area.

EXTERNAL SCOPING

Scoping is an early and open process to determine the breadth of issues and alternatives to be addressed in an environmental assessment. External scoping began with a public scoping notice released on February 8, 2017, describing the preferred alternative and soliciting comments or concerns with the proposal to construct a new visitor center and make other improvements. The park communicated information about the proposed project to individuals; businesses; organizations; state, county, and local governments; federal agencies; and American Indian tribes During the 30-day scoping period, the public was given an opportunity to comment on the proposed project using the NPS Planning, Environment, and Public Comment website at http://parkplanning.nps.gov/jotr or by mailing comments to the park. No substantive comments from the public were received on the PEPC website during the scoping period.

LIST OF PREPARERS

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Appendix

APPENDIX A: TECHNICAL MEMORANDUM DESCRIBING EVALUATION OF GROUNDWATER WITHDRAWAL IMPACTS

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United States Department of the Interior

NATIONAL PARK SERVICE
Water Resources Division
1201 Oak Ridge Drive, Suite 250
Fort Collins, CO 80525

In reply use:

April 23, 2018

TECHNICAL MEMORANDUM

To: David Smith, Superintendent, Joshua Tree N.P.

From: Gary Karst & Steve Rice

Subject: Evaluation of Groundwater Withdrawal Impacts Associated with the Proposed Expansion of the Cottonwood Campground Visitor Center, Joshua Tree N.P.

The technical services of NPS Water Resource Division (WRD) hydrologists were requested by Joshua Tree N.P. (JOTR) and Denver Service Center personnel to evaluate the potential impact of groundwater withdrawal on local groundwater resources, for use in the environmental assessment related to a proposed expansion of the existing Cottonwood Campground Visitor Center. This technical memorandum briefly documents the methods and results of our analysis. The analysis is predicated on a water budget approach that evaluates the likely inflows and outflows to the local aquifer to determine if the proposed groundwater extraction will have detrimental impacts on the estimated volume of groundwater stored in the aquifer.

Hydrogeologic Setting

The Cottonwood Campground Visitor Center area is located in a small valley in the southern portion of the park near the base of the Cottonwood Mountains. The small valley is bisected by an ephemeral drainage, referred to as Smoke Tree Wash, which drains into the substantially larger Pinto Basin. This valley is arid, receiving about 4.5 inches of average annual precipitation, based on monthly monitoring from 2006 - 2017 at the nearby Cottonwood Canyon meteorological station. As is typical in arid desert settings in southwestern U.S., only a small fraction of the annual precipitation is believed to recharge the groundwater system, largely as a result of periodic streamflow infiltration events. This is consistent with conclusions drawn by the USGS in a 2004 study (Nishikawa et al., 2004) for the town of Joshua Tree near the northwest boundary of the park. The USGS study concluded that "*the average climate condition for the study area likely does not generate significant recharge relative to the recharge generated during anomalously wet years or*

storm periods. This indicates that recharge for the study area may be very sensitive to potential changes in climate or to variations owing to normal climate cycles."

Based on past geophysical studies conducted in the area of interest by the USGS for JOTR (Langenheim et al., 2007 and Langenheim et al., 2016), the local groundwater flow system appears to be contained within a small, headwater sub-basin of the larger Pinto Basin that extends north and east of the Cottonwood Campground Visitor Center area (**Figure 1**). This sub-basin, referred to here as the Cottonwood sub-basin, is about 22,200 acres in size, compared to 407,400 acres for the Pinto Basin.

The USGS geophysical studies indicated the depth to bedrock in the Cottonwood sub-basin ranges from less than 80 feet to nearly 900 feet within the color-gridded area shown in **Figure 2**. The current water supply for the campground and visitor center facilities is withdrawn from this sub-basin approximately 3 miles north of the visitor center area (Figure 2). In estimating the volume of groundwater in storage, a range was estimated based on a depth to water of 164 feet (50 meters) suggested from the USGS seismic profiling in the area and 219 feet (67 meters) indicated from JOTR's water level measurement at the existing production well. The range of groundwater in storage was determined to be about 84,000 acre-feet and 56,000 acre-feet, respectively. These totals assume the sub-basin is filled with sand/gravel having a drainable porosity (i.e., specific yield) of 0.15, and therefore does not account for geologic complexities such as interbedded clay/silt layers which may contain considerable volumes of water that are not readily released from storage when pumping occurs.

Park personnel report that the water level in the current water supply well (Figure 2) has declined from about 170 feet below land surface to about 219 feet below land surface over several decades. Given the low withdrawal rate reported for this well, it's possible that the decline in water level in this area is related to the aquifer being less permeable in this area, which would create a deeper drawdown cone around the well. This is partially supported by the limited well log information for this well, which describes encountering sand with interspersed clay and gravel intervals (Langenheim et al., 2016), where the lower permeability clay layers could be helping to deepen the drawdown cone. Another factor that could be impacting the water level in this area is the presence of the Smoke Tree Fault Zone in the near vicinity of the water supply well. The seismic profiling performed by Langenheim et al. (2016) shows the existing supply well is located between the two main strands of this fault zone. If the fault zone is acting as an impediment to groundwater flow in this area, it also could help to explain some of the decline in water level over time. Additionally, given the age of the well, it's also possible that the well screen is clogged with mineral deposits causing the well to be less efficient and creating the appearance of declining water levels in the area.

Water Budget Analysis

A water budget analysis was utilized to evaluate the potential impact that current and projected groundwater withdrawals may have on over-drafting the groundwater aquifer in the sub-basin.

Over-draft of the aquifer occurs when outflows from the aquifer exceed inflows to the aquifer, causing depletion in the estimated amount of groundwater in storage. A water budget analysis was conducted to evaluate the impacts under the No Action alternative (current conditions) and under the Proposed Action alternative.

Potential inflow components to the water budget for the Cottonwood sub-basin include recharge from precipitation, subsurface inflow to the sub-basin and return flow related to septic/wastewater seepage. Potential outflow components to the water budget for the sub-basin include evapotranspiration discharge, groundwater withdrawals and subsurface outflow from the sub-basin.

Recharge from precipitation was estimated using two methods. The first method involved estimating recharge coefficients developed from recharge estimates reported in the aforementioned 2004 USGS investigation. The recharge coefficients were estimated by dividing the estimated recharge amounts for the drainage basins by the respective drainage basin areas involved in that study and applying these recharge coefficients to the area of the Cottonwood sub-basin. Using the estimated sub-basin area of 22,200 acres and multiplying by the estimated recharge coefficients of 0.0038 acre-feet/acre and 0.0068 acre-feet/acre, resulted in an estimated annual recharge of about 85 to 150 acre-feet/year to the Cottonwood sub-basin aquifer.

The second method involved utilizing a chloride mass balance (CMB) approach to estimating recharge. The CMB method of estimating groundwater recharge has been used extensively in areas where recharge rates are often low in comparison to total precipitation, making other methods of recharge estimation, such as the water balance method, less reliable (Scanlon and others, 2002). Recharge was calculated using values for annual precipitation and the average concentration of chloride in precipitation and groundwater. A nearby precipitation station (NADP CA67) provided precipitation and precipitation chloride data, and samples collected from the Smoke Tree Well between 1974 and 2009 (n=9) provided groundwater chloride concentrations (USGS, April 2018).

Calculations indicated a range of approximately 60 to 85 acre-feet/year of recharge to the Cottonwood sub-basin aquifer. One caveat to make, however, is that the calculation assumes that average annual precipitation and chloride content have not changed appreciably over time. This is generally true for areas with groundwater of moderate age (decades-centuries), however unpublished results of carbon-14 age dating of basin fill groundwater in this area indicate the presence of very old (thousands of years) groundwater. If precipitation rates were higher then, current recharge rates may be overestimated using this method.

Based on these two methods, there appears to be some overlap in the estimated range of recharge, as the low end of the range for the first method overlaps with the high end of the range for the second method. Given the uncertainties in estimating recharge, the water budget analyses will use an estimated recharge from precipitation ranging from 60 to 150 acre-feet/year to be conservative in evaluating the potential range of impacts.

At present, there is no evidence to suggest that subsurface inflow to the Cottonwood sub-basin is occurring, as the sub-basin extends to the topographic divide of the surrounding Cottonwood

Mountains. Until contrary evidence becomes available, it is assumed that the topographic divide serves to separate the Cottonwood sub-basin groundwater flow system from any similar groundwater flow system located south or west of the topographic divide of these mountains.

Return flow to the groundwater aquifer related to septic/wastewater seepage likely is occurring from the operations at the campground and visitor center area. McQuillan and Bassett (2008) summarized the results of a couple of studies in New Mexico which estimated the return flow from septic systems as a percentage of the amount of water delivered to consumers. The studies indicated that about 42 to 47 percent of the average amount of water delivered per household, seeped back to the water table as return flow from septic systems. Using the lower percentage and applying it to the total annual amount of groundwater delivered to the campground and visitor center area, septic/wastewater return flow for the visitor's center area is estimated to be about 1.7 acre-feet/year under the No Action alternative and 1.2 acre-feet/year under the Proposed Action alternative.

Groundwater outflow represented by evapotranspiration discharge appears to be limited to areas around a handful of small springs in the sub-basin, as the known depth to groundwater (164 – 219 feet below ground surface) in the sub-basin appears to be too deep in most areas to support phreatophytic plant communities. The exception is in the near vicinity of the few springs in the sub-basin where spring discharge is assumed to be fully consumed via phreatophyte evapotranspiration. Based on a spring inventory conducted in the park by Sada and Jacobs (2008), total spring discharge (and evapotranspiration discharge) is estimated to be about 3 acre-feet/year for the sub-basin.

The current annual groundwater withdrawal estimate was based on recent well flow estimates measured by park personnel. This total annual water use was apportioned among three primary areas: 1) usage at the visitor center area, 2) usage at employee housing, and 3) usage in the campground and for grounds irrigation. Monthly well flow measurements for the existing water supply well have been recorded by park personnel in 2015 and 2016 indicating an average annual well withdrawal of about 1.26 million gallons/year or about 4 acre-feet/year during this period. Engineering estimates of water usage at the visitor center using 2016 visitation data suggests that about 2.2 acre-feet/year of water was used by visitors and employees during this period. Estimates of current water usage at employee housing is based on USGS estimates of daily use in the amount of 80 gallons per person (USGS, December 2016) and assumes 3 people per household. Given 5 families are living in employee housing, this amounts to about 1,200 gallons/day or about 1.3 acre-feet/year. The remaining 0.5 acre-feet/year of current withdrawals is attributed to campground and irrigation use. This amount is based on estimates of 20 recreational vehicles filling up an average 40 gallon water tank every day during the 6 month peak period (Oct - Mar) when both campground loops are open, and approximately 5 recreational vehicles filling up every day during the 6 month low period (Apr – Sep) when only one of the campground loops is open.

The projected annual groundwater withdrawal estimate was based on making adjustments to engineering estimates of the current water usage at the visitor center, as the Proposed Action alternative has been revised to remove the expansion of the campground loop from the plan. Since

2016 visitor data used in the projected withdrawal estimate overlaps with the well flow measurement period (2015-2016), we can do a comparative impact analysis of current versus projected visitor center water use that evaluates the difference of using water-saving fixtures at the visitor center under the Proposed Action alternative versus using the existing fixtures under the No Action alternative. Estimates of projected water usage at employee housing and for campground and irrigation use under the comparative impact analysis remain unchanged from current conditions, as the campground and employee housing water use are unaffected by the revised Proposed Action alternative.

Design engineers analyzed projected water usage at the visitor center using 2016 visitor data and flush rates of 1.28 gallons per flush (gpf) for new toilets and 0.125 gpf for new urinals that will meet current California Code, along with a use rate of 0.5 gallons per minute (gpm) for public lavatories. These flush rates differ from a flush rate of 2.5 gpf used for the old toilet and urinal fixtures under the analysis of current water use at the visitor center. Engineering estimates of projected water usage at the expanded visitor center under 2016 visitation conditions suggests that about 1.0 acre-feet/year of water would have been used by visitors and employees.

If groundwater outflow is occurring from the Cottonwood sub-basin, it is assumed this would occur through what may be a bedrock spillway located in the northeast portion of the sub-basin in the vicinity of where Smoke Tree Wash exits the sub-basin. Based on data collected as part of the recent 2016 USGS gravity survey conducted in the sub-basin, this spillway was interpreted by the NPS as roughly corresponding with the lowest depression in the underlying bedrock through this area (Figure 2) which might allow groundwater to escape the sub-basin and flow northeast into the remaining portion of the Pinto Basin. However, limited data on the depth to groundwater in the sub-basin suggests that the groundwater level in the sub-basin might be below the level of the bedrock spillway. Given the uncertainties in estimating the depth to bedrock (+/- 50 feet) presented in the USGS gravity survey study, we cannot definitively conclude that there is subsurface groundwater outflow occurring without conducting additional geophysical or drilling studies in the area of the spillway that might confirm or deny the likely existence of groundwater in this area.

As a result, the water budget analyses looked at both possibilities and the associated effects on over-drafting the aquifer. In the first scenario, subsurface outflow is assumed to be occurring at a rate of 57 to 147 acre-feet/year, estimated from the difference between natural recharge from precipitation (60 – 150 acre-feet/year) and natural discharge from evapotranspiration (3 acre-feet/year) occurring under pre-pumping conditions. In the second scenario, subsurface outflow is assumed to be zero, testing the hypothesis that the sub-basin has not filled enough over time to spill groundwater out of the sub-basin, thus causing it to be isolated from the remainder of the Pinto Basin groundwater flow system.

The results of the water budget analysis under the No Action alternative (current conditions) are presented in **Table 1**. Results for Scenario #1 indicate that groundwater withdrawals would cause a very small annual depletion of the groundwater estimated to be stored in the aquifer. Under this scenario, about 2.3 acre-feet of groundwater would be removed from storage every year, as

outflows will slightly exceed the range of inflows evaluated. This depletion represents about 1.5% to 3.8% of the estimated amount of annual inflow to the aquifer and a negligible amount of the estimated 56,000 to 84,000 acre-feet of groundwater in storage.

Results for Scenario #2 indicate that about 54.7 to 144.7 acre-feet of water would be added to storage every year when factoring in all other outflows. Under this scenario, groundwater withdrawals would lower the net estimated amount of annual inflow going into storage by about 2.6% to 6.5%.

The results of the water budget analysis under the Proposed Action alternative are presented in **Table 2**. Results for Scenario #1 indicate that groundwater withdrawals would cause a smaller annual depletion of the groundwater stored in the aquifer compared to the No Action alternative (Table 1). Under this scenario, about 1.6 acre-feet of groundwater would be removed from storage every year, as outflows will slightly exceed the range of inflows evaluated. This depletion represents about 1.1% to 2.7% of the estimated amount of annual inflow to the aquifer and a negligible amount of the estimated 56,000 to 84,000 acre-feet of groundwater in storage.

Results for Scenario #2 indicate that about 55.4 to 145.4 acre-feet of water would be added to storage every year when factoring in all other outflows, which is slightly greater than under the No Action alternative. Under this scenario, groundwater withdrawals would lower the net estimated amount of annual inflow going into storage by about 1.8% to 4.6%.

Based on the water budget analyses, it would appear that even with the small amount and sporadic nature of recharge that likely is occurring in the sub-basin, NPS pumping would not appear to significantly impact the amount of water in storage or going into storage under the No Action alternative or the Proposed Action alternative. Comparison of the results in Tables 1 and 2 indicates that water use associated with the use of low-flow bathroom fixtures under the Proposed Action alternative will be less impactful to groundwater resources in the sub-basin than the water use associated with the continued use of existing bathroom fixtures under the No Action alternative. The newer fixtures would cut visitor center water use by about 55%. If waterless urinals are used instead of the new urinals, visitor center water use would be cut an additional 1% based on this analysis. While the amount of water saved under the Proposed Action alternative is small (1.2 acre-feet/year), its effect is better demonstrated on the additional number of visitors that could be served at the visitor center annually with the same amount of water. Under the No Action alternative, using 2016 visitation data to this area, approximately 260,000 visitors were served using 2.2 acre-feet/year. Under the Proposed Action alternative, approximately 575,000 visitors could be served annually using 2.2 acre-feet/year.

Additional Considerations

Park personnel are also considering the drilling and installation of a second well in the vicinity of the existing water supply well that could be used both as a monitoring well to track water level responses and as a back-up supply well if maintenance is required on the existing supply well. As a monitoring well, the second well should provide real-time information on the aquifer response to

ongoing pumping at the existing supply well, which would be helpful in monitoring and managing the water withdrawals so as not to adversely impact groundwater resources in the sub-basin. In siting this proposed well, consideration should be given to the potential effects the Smoke Tree Fault Zone may have on drawdown, as well as selecting a site that provides sufficient saturated thickness to supply water for several decades if this well is to eventually supply water. Possible areas for consideration for siting this proposed well include those within or adjacent to the deepest portion of the sub-basin (dark blue grid cells in Figure 2) and those in reasonable proximity to Smoke Tree Wash and the alignment of the water line connecting the existing supply well to the visitor center area. A recommended site meeting these criteria is shown in Figure 2.

Park personnel and NPS WRD personnel are looking at conducting additional geophysical investigation in the area where the bedrock spillway is interpreted, to determine if groundwater is present in this area. The investigation would likely involve the use of an electrical resistivity survey to determine depths to groundwater and bedrock in this area. Subsequent information on whether or not groundwater exists in this area would be helpful to understanding and managing the long-term effects of the groundwater withdrawal in the sub-basin.

Finally, it is recommended that park personnel continue to collect and record monthly visitation data, as well as water withdrawal measurements at the existing water supply well and the proposed well, if and when it is used for water supply purposes. Such data have been valuable in conducting this analysis and will be useful in managing the groundwater resources in the sub-basin, especially if visitation continues to increase. The park should also consider installing totalizer flow meters to the water lines supplying the visitor center, campground and employee housing areas to monitor monthly and annual water usage at these facilities. These recommendations also apply to other campground/visitor center areas in the park where future plans for expansion may occur that require a similar environmental impact analysis as part of the planning process.

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Table 1. Water budget analysis for the Cottonwood sub-basin, Joshua Tree N.P under the No Action alternative (current conditions).

	SCENARIO #1		SCENARIO #2	
GROUNDWATER INFLOWS (ac-ft/yr)				
Recharge from precipitation	60	150	60	150
Subsurface inflow	0	0	0	0
Septic system return flow	1.7	1.7	1.7	1.7
Subtotal	*61.7*	*151.7*	*61.7*	*151.7*
GROUNDWATER OUTFLOWS (ac-ft/yr)				
Evapotranspiration	3	3	3	3
Groundwater extraction				
• Visitor center water use	2.2	2.2	2.2	2.2
• Employee housing water use	1.3	1.3	1.3	1.3
• Campground & irrigation water use	0.5	0.5	0.5	0.5
Subsurface outflow	57	147	0	0
Subtotal	*64*	*154*	*7*	*7*
CHANGE IN GROUNDWATER STORAGE (ac-ft/yr)	-2.3	-2.3	54.7	144.7

Table 2. Water budget analysis for the Cottonwood sub-basin, Joshua Tree N.P under the Proposed Action alternative.

	SCENARIO #1		SCENARIO #2	
GROUNDWATER INFLOWS (ac-ft/yr)				
Recharge from precipitation	60	150	60	150
Subsurface inflow	0	0	0	0
Septic system return flow	1.2	1.2	1.2	1.2
Subtotal	*61.2*	*151.2*	*61.2*	*151.2*
GROUNDWATER OUTFLOWS (ac-ft/yr)				
Evapotranspiration	3	3	3	3
Groundwater extraction				
• Visitor center water use	1.0	1.0	1.0	1.0
• Employee housing water use	1.3	1.3	1.3	1.3
• Campground & irrigation water use	0.5	0.5	0.5	0.5
Subsurface outflow	57	147	0	0
Subtotal	*62.8*	*152.8*	*5.8*	*5.8*
CHANGE IN GROUNDWATER STORAGE (ac-ft/yr)	-1.6	-1.6	55.4	145.4

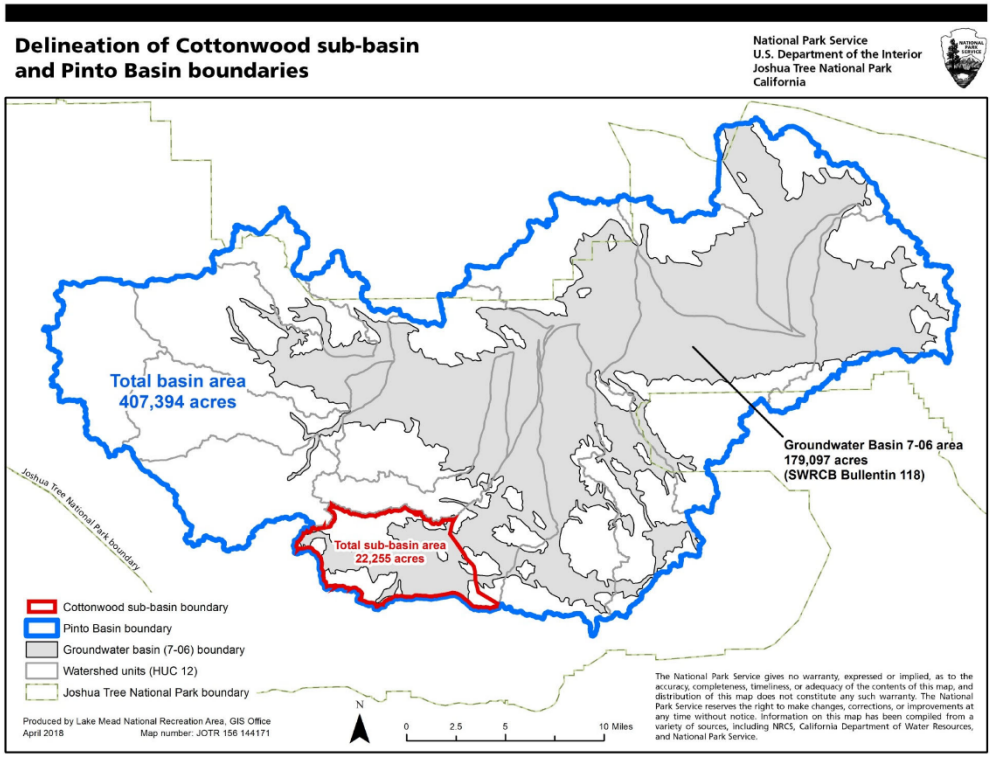

Figure 1. Delineation of Cottonwood sub-basin and Pinto Basin boundaries.

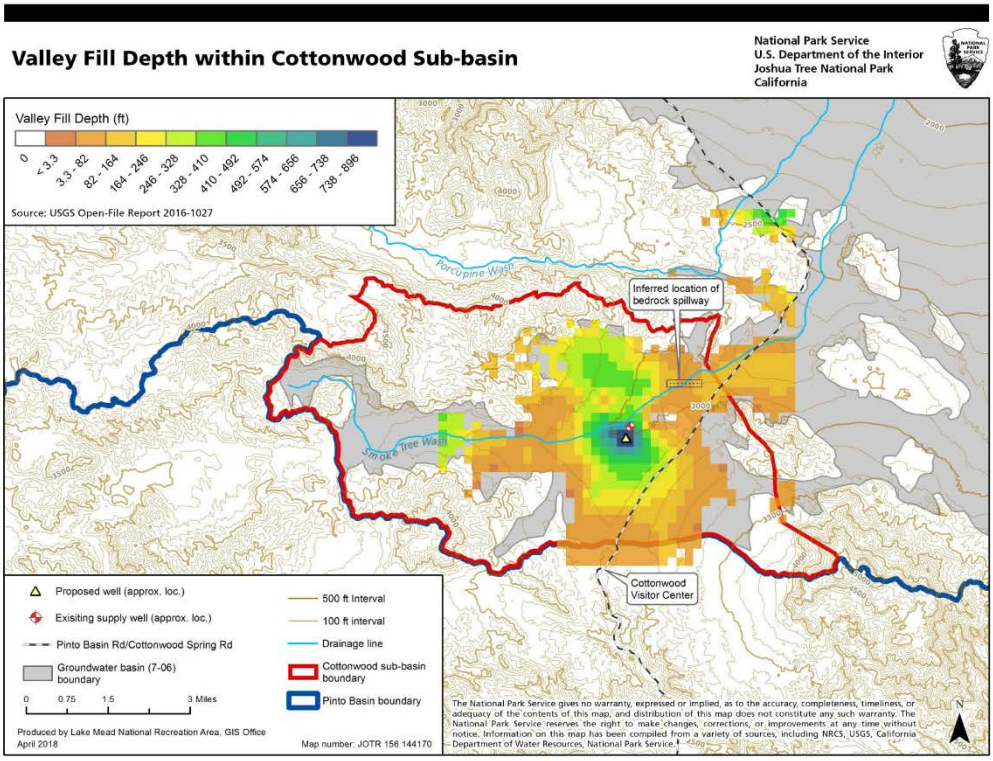

Figure 2. Valley-fill depth within Cottonwood sub-basin.

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