



State of the Park Report

Devils Postpile National Monument California



2016

On the cover: Top of the Devils Postpile Formation, August 2015. NPS photo

Disclaimer. This State of the Park report summarizes the current condition of park resources, visitor experience, and park infrastructure as assessed by a combination of available factual information and the expert opinion and professional judgment of park staff and subject matter experts. The [internet version](#) of this report provides the associated workshop summary report and additional details and sources of information about the findings summarized in the report, including references, accounts on the origin and quality of the data, and the methods and analytic approaches used in data collection and assessments of condition. This report provides evaluations of status and trends based on interpretation by NPS scientists and managers of both quantitative and non-quantitative assessments and observations. Future condition ratings may differ from findings in this report as new data and knowledge become available. The park superintendent approved the publication of this report.

Executive Summary

In 1916, the Organic Act established the National Park Service (NPS) with the mission to preserve unimpaired the natural and cultural resources and values of national parks for the enjoyment, education, and inspiration of this and future generations. All park units are encompassed by the mission of the Organic Act as further legislated by the 1978 Redwoods Amendment to expressly include all units including monuments, recreation areas, seashores, etc. With this amendment the United States Congress emphasized the provisions of the Organic Act, and made equal all areas of the National Park System for equal protection from impairment and/or derogation of their resources. (Throughout this report the terms monument, park, and DEPO are used interchangeably).

NPS Management Policies (2006) state that “The Service will also strive to ensure that park resources and values are passed on to future generations in a condition that is as good as, or better than, the conditions that exist today.” As part of the stewardship of national park units for the American people, the NPS has begun to develop State of the Park reports to assess the overall status and trends of each park’s resources. The NPS will use this information to improve priority setting and to synthesize and communicate complex park condition information to the public in a clear and simple way.

The purpose of this State of the Park report is to:

- Provide to visitors and the American public a snapshot of the status and trend in the condition of a park’s priority resources and values;
- Summarize and communicate complex scientific, scholarly, and park operations factual information and expert opinion using non-technical language and a visual format;
- Highlight park stewardship activities and accomplishments to maintain or improve the State of the Park;
- Identify key issues and challenges facing the park to help inform park management planning.

The purpose of Devils Postpile National Monument is to preserve and protect the glacially exposed columns of the Devils Postpile, scenic Rainbow Falls, and the wilderness landscape of the upper Middle Fork San Joaquin River in the Sierra Nevada for scientific value, public interest, and inspiration.

Significance statements express why the park unit’s resources and values warrant national park unit designation. Devils Postpile National Monument is significant because:

- Devils Postpile is one of the world’s finest examples of columnar jointing, displaying volcanic rock columns polished by glaciers and revealing a mosaic of polygons on its dome shaped top.
- The monument is located in one of the largest contiguous designated wilderness areas in the lower 48 states that includes three national forests and three national parks in the Sierra Nevada.
- For a small area, the monument supports and maintains unusually rich ecological diversity reflective of its location at the intersection of three biogeographic regions. The physical setting and context create exceptional opportunities for scientific study and shared learning.
- The monument provides a traditional national park experience in a rustic setting that promotes learning and intimate (time-honored) visitor experiences that include enjoying the sights and sounds of nature.
- The establishment of the monument provides compelling insight into the history and evolution of national parks and national forests, beginning in the early years of the public lands conservation and preservation movement.

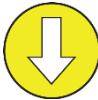
The summary table below, and the supporting information that follows, provide an overall assessment of the condition of priority resources and values at DEPO based on scientific and scholarly studies and expert opinion. The internet version of this report, available at <http://www.nps.gov/stateoftheparks/depo/>, provides additional detail and sources of information about the resources summarized in this report, including references, accounts on the origin and quality of the data, and the methods and analytical approaches used in the assessments. Reference conditions that represent “healthy” ecosystem parameters, and regulatory standards (such as those related to air or water quality) provide the rationale to describe current resource status. In coming years, rapidly evolving information regarding climate change and associated effects will inform our goals for managing park resources, and may alter how we measure the trend in condition of park resources. Thus, reference conditions, regulatory standards, and/or our judgment about resource status or trend may evolve as the rate of climate change accelerates and we respond to novel conditions. In this context, the status and trends documented here provide a useful point-in-time baseline to inform our understanding of emerging change, as well as a synthesis to share as we build broader climate change response strategies with partners.

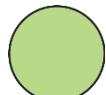
The Status and Trend symbols used in the summary table below and throughout this report are summarized in the following key. The background color represents the current condition status, the direction of the arrow summarizes the trend in condition, and the thickness of the outside line represents the degree of confidence in the assessment. In some cases, the arrow is omitted because data are not sufficient for calculating a trend (e.g., data from a one-time inventory or insufficient sample size).

Condition Status		Trend in Condition		Confidence in Assessment	
	Warrants Significant Concern		Condition is Improving		High
	Warrants Moderate Concern		Condition is Unchanging		Medium
	Resource is in Good Condition		Condition is Deteriorating		Low

State of the Park Summary Table

Priority Resource or Value	Condition Status/Trend	Rationale
Natural Resources web ▶		
Air Quality		Vistas at the monument are occasionally obscured by pollution-caused haze. Ozone can reach levels that can make breathing difficult for sensitive groups and cause injury to ozone-sensitive plants. Human-derived nitrogen deposition can promote growth of invasive annual grasses and increase the risk and frequency of wildfire. Airborne toxics, including mercury, can deposit with rain and snow and accumulate in organisms, such as fish and frogs. The trend is unknown.
Geologic Features and Processes		<p>Numerous geologic studies have improved our knowledge of the age and extent of the lava flow that formed the Devils Postpile as well as the geologic history of the area. Geologists will soon publish an updated map and report focused on the geology in and around the monument, greatly improving the accuracy of the Geologic Resources Inventory and map for the monument.</p> <p>Monitoring of the Postpile formation provides managers with information on the extent and condition of the glacial polish and need for protection, as well as the stability of the columns.</p> <p>There are several potential geohazards, such as volcanic activity and earthquakes, in the area and the monument is involved with ongoing collaboration with other agencies for risk assessments, evacuation plans, and emergency response.</p>

Priority Resource or Value	Condition Status/Trend	Rationale
Upper Middle Fork San Joaquin River		<p>The Upper Middle Fork of the San Joaquin River provides essential habitat for nearly all flora and fauna at the monument. The overall condition of riverbanks and associated habitat is good. Warmer temperatures due to climate change are likely to advance snowmelt with earlier spring runoffs and reduced spring snowpack. There is also an increased potential of flooding from heavier rainfalls and elevated snowline. Altered flow patterns can potentially affect the timing and amount of available water, as well as water quality.</p> <p>Groundwater resources currently appear to be stable but human impacts at locations such as Soda Springs can result in a deteriorating condition. Management of direct human impacts can improve the condition to some extent. Researchers are currently investigating the effects of climate change and drought on groundwater resources. The downward trend considers the substantial variation in the volume of flow that may last several years, as recently experienced in the drought, and the anticipated shifts by advanced timing of snowmelt and reduced spring snowpack. Lack of long term local data requires relying on other monitoring sites that can only provide medium confidence. A stream gage installed in 2009 on the Middle Fork of the San Joaquin River will provide long term monitoring data that can help to determine site specific trends.</p>
Native Plant Communities		<p>Due to the monument's unique location near a low Sierra Nevada pass, plant species of both the east and west slopes of the Sierra and also the Great Basin are present. In addition, the topographic and geologic diversity supports a high number of plant species in meadows, forests, riparian areas, and shrubland plant communities in a relatively small area. While some populations of nonnative and invasive plants do occur, ongoing prevention, survey, and treatment are reducing the size and distribution of these populations. The overall trend appears to be stable but the introduction of nonnative species and a changing climate have the potential to affect this trend over time.</p>
Conifer Forests		<p>Two large disturbance events, the 1992 Rainbow Fire and a large windstorm in 2011, have profoundly affected the stand structure, regeneration, and fuel loads in conifer forests. High burn severity areas of the Rainbow Fire that were formerly conifer forest are still dominated by shrubs and have limited conifer regeneration. Conifer regeneration is occurring in unburned and lower burn severity areas. The windstorm that blew down many larger diameter trees will have long term impacts on forest stand structure and greatly increased the fuel load. These conditions can lead to more extensive and higher intensity wildfires.</p> <p>Monument staff has worked with the Inyo National Forest on fuel mitigation projects, including pile burning in 2013–2015 and a prescribed burn conducted in 2015. Additional fuel load management in the Reds Meadow and monument will need to be addressed to reverse this trend.</p>

Priority Resource or Value	Condition Status/Trend	Rationale
Landscape and Ecosystem Processes		<p>Over 100 years of fire exclusion, along with climate change, has greatly altered the fire regime, including frequency, size, season, type, and severity. Reintroducing fire and mechanical treatments to reduce tree density and fuel load can help to restore this natural disturbance process and improve ecosystem resistance and resilience. The monument conducted an interagency prescribed fire in 2015, a step in restoring this important ecological process.</p> <p>Evidence from Sierra Nevada snow surveys indicate that snowline is moving up in elevation and it is likely that more rain than snow may fall during the winter months. In addition, data indicate that snow is melting earlier in the season and will have a cascading effect on plant communities, insects, and wildlife.</p> <p>Understanding of the potential impacts of climate change is limited to what has occurred in the past and general predictive models. Ongoing studies, such as researching the dynamics of cold air pooling, are providing monument staff with site specific information that will help guide climate change adaptation strategies.</p>
Meadow Ecosystems		<p>Overall, meadow ecosystems in the monument are in good condition. Site specific human impacts can be mitigated through targeted revegetation and visitor education. The trend appears to be stable but non-native species, as well as climate change impacts on snowpack and temperature, remain a threat.</p>
Native Mammals		<p>Thirty-six mammal species occur in the monument; ten of which are bats. This total is consistent with the expected number of species based on available habitat types; indicating that terrestrial mammal diversity is good and bat species diversity is fair to good. However, little is known about population sizes or trends. Because most of the monument and surrounding lands are undeveloped and/or are designated wilderness, population sizes and densities are expected to remain within a normal range for the region. Although loss of habitat connectivity does not appear to be a threat, habitat loss due to catastrophic fire events and changes in habitat diversity and distribution due to climate change are of concern.</p>
Native Birds		<p>Birds represent about 70 percent of the total number of vertebrate species in the monument. The number of bird species is well within the expected range for the habitat types present and the size of the monument. There is cause for concern about the abundance of birds in the monument, as declines in numerous species have been documented at the regional level; current trends in local bird abundance is uncertain due to limited information for the monument.</p> <p>As the climate changes, increased temperature, decreased snowpack, altered fire regimes, and plant community shifts will likely alter the ranges of bird species. For example, some species currently in the monument may shift further north. In addition, timing of food availability, nesting, and migration synchronicity will favor some species while greatly impacting others. Habitat loss from regional land-use or in wintering grounds for migrating birds has significant impacts on bird populations.</p>
Dark Night Sky		<p>Based on a measurement of dark night sky quality conducted six kilometers northeast of the monument in 2015, the Anthropogenic Light Ratio (ALR) is 0.15, which is considered good. This value is a measure of light pollution determined by the ratio of the Average Anthropogenic Sky Glow (human contributions to sky glow) and Average Natural Sky Luminance. Although population growth in local communities is expected, the trend is stable due to lighting regulations controlling new lighting sources. To preserve the dark night sky, monument staff has replaced all night lighting to reduce sky glow and glare and minimized duration of light disturbance by installing motion sensors.</p>

Priority Resource or Value	Condition Status/Trend	Rationale
Acoustic Environment		The mean L ₅₀ Impact (L ₅₀ dBA), a measure of noise contributed to the existing acoustical environment by anthropogenic sources, is 0.3 dBA. Anticipated increases in ground-based and aircraft traffic indicate a worsening trend in the quality of acoustic resources.
Cultural Resources		web ▶
Archeological Resources		NPS staff completed a survey for archeological resources after the 1992 Rainbow Fire and identified 11 sites. 36% of the sites listed in the NPS Archeological Sites database are in good condition. Thus far, one archeological site, the Devils Postpile Cabin Remains, has been determined eligible for listing on the National Register of Historic Places. The site record was updated in 2012 and a nomination review is in process.
Cultural Anthropology		<p>The area encompassing the monument has a rich history of American Indian presence and use. The relationship between the lands in and around the monument and local tribes plays an important role in perpetuating cultural ties and practices. Tribal site visits and consultations with monument staff have contributed knowledge and understanding of present and past connections to the area to the NPS. In 2016, an Ethnographic Overview and Assessment for the monument and Sierra Nevada Network of Parks began with a projected completion date of 2018.</p> <p>Site specific knowledge of historic uses was gathered and analyzed for the monument's Historic Resource Study (HRS), completed in 2013. General knowledge on prehistory is based on research conducted at Yosemite, Sequoia and Kings Canyon National Parks, and the adjacent Inyo National Forest.</p>
Cultural Landscapes		NPS cultural resource staff conducted site visits and a literature search to identify potential cultural landscapes at the monument. These include historic trails, evidence of domestic animal grazing, and early tourism. A complete inventory and evaluation of cultural landscapes has not been conducted but a funding proposal is in place to complete this project.
Historic Sites, Structures, and Places		<p>The monument has several historic resources including: the Devils Postpile Cabin Remains site (also an archeological site) the Devils Postpile Ranger Cabin (currently serves as the ranger station /visitor contact building), and several trails.</p> <p>The Devils Postpile Cabin Remains site, which includes the remains of a stone hearth and associated features, has been determined eligible for National Register listing. The hearth was stabilized in 2013 and an interpretive panel will be installed in 2016. The Ranger Cabin has been evaluated and a nomination to the National Register is in process with an anticipated designation in 2016.</p> <p>The Mammoth Pass Trail, a historic trail corridor that contains scattered historic materials, could be part of a larger cultural landscape associated with American Indian trans-Sierra trade and the early development of mining in the Mammoth region, but has not been evaluated for National Register listing.</p> <p>The section of the John Muir Trail that passes through the monument could be eligible as a National Register historic site associated with the history of recreation and conservation in the Sierra Nevada.</p> <p>Several nearby historic buildings on the Inyo National Forest have a connection to the monument, including Red's Guard Station and the adjacent bathhouse and are under review for significance.</p>

Priority Resource or Value	Condition Status/Trend	Rationale
History		The NPS completed and published a combined Historic Resource Study and Administrative History titled <i>Nature and History on the Sierra Crest: Devils Postpile and the Mammoth Lakes Sierra</i> in 2013. The book provides baseline documentation of the monument's historic resources and the historic contexts and themes with which they are associated. It also provides a narrative history of the monument's establishment and management that gives a historic basis and context for future management decisions.
Museum Collections		The monument's museum collections are currently stored in three dispersed National Park Service units. Monument staff is improving access and documentation by consolidating the collections. A project to catalog backlogged slides and historic materials is ongoing.

Visitor Experience

[web ▶](#)

Number of Visitors		In 2015, the monument received nearly 30% more visitors when compared with 2014, and nearly 50% more than the ten year average (2005–2014). Weather, road closures, and other factors ranging from marketing, economics, to wildland fires affect annual visitation numbers but the trend is showing increased visitation. Visitation is increasing at many NPS units and is expected to be substantially higher for the 2016 NPS Centennial. In 2015, wilderness use on the Pacific Crest Trail and John Muir Trail increased more than 50% when compared to 2013.
Visitor Satisfaction		Based on visitor satisfaction surveys, visitor contact rates, crowding, and shuttle bus wait times, this metric is good and stable. The percentage of visitors satisfied with their visit in 2013 was 99.0%, which is slightly higher (2.9%) than the average for the previous ten years. The number of visitor contacts was slightly lower due to staffing. Crowding at monument destinations remained below established thresholds, and shuttle bus wait times are below the standard of 30 minutes.
Interpretive and Education Programs – Talks, Tours, and Special Events		Attendance at formal ranger programs is increasing with the addition of ranger-led walks during the peak season. The quality of educational programs has increased although the number of programs has decreased due to limited staff, particularly during the winter months.
Interpretive Media – Brochures, Exhibits, Signs, and Website		Between 2008 and 2015, monument staff replaced/improved nearly all waysides and directional signs. In addition, updates to the park website, social media and brochures offer alternative ways for visitors to learn about the monument. Exhibits in the visitor contact station are outdated and need upgrades.
Accessibility		Monument staff has made many improvements in accessibility, including the addition of accessible comfort stations, parking, and a campsite. Additional improvements to accessibility are needed and a project to identify and remedy insufficiencies is planned for 2015.
Safety		Monument staff completed a visitor safety plan in 2009 and implement strategies identified in that plan annually. All employees participate in safety training and a comprehensive training plan is under development.
Partnerships		The monument's volunteer program receives volunteer work primarily through internships. Although this is a strong point for youth engagement, the lack of consistent, local volunteerism is a challenge. Monument staff is continually fostering formal and informal partnerships and has valuable partners in each program area.

Priority Resource or Value	Condition Status/Trend	Rationale
Recreational Opportunities		The monument provides exceptional recreational opportunities for visitors including hiking, camping, fishing, and access to backpacking. Bird watching and nature observation are also popular and provide traditional park experience.
Park Infrastructure		web ▶
Overall Facility Condition Index		Monument staff continues to maintain and improve the condition of park trails, grounds, and buildings with seasonal, term, and permanent staff that work primarily from mid-May to October. Project funding supports seasonal staff and youth groups such as the Youth Conservation Corp, American Conservation Experience, and Student Conservation Association, who make the upward trend possible. Despite progress, comfort stations are outdated and some sections of trail require extensive work and stabilization.
Park Carbon Footprint		The monument belongs to a nationwide network of parks that are putting climate-friendly management at the forefront of sustainability planning. The monument's climate action plan describes commitments to reduce emissions of greenhouse gases at the park by 2016. Combined emissions from park operations, concessioner operations, and visitor activities within the monument during the 2008 baseline year were roughly equivalent to the emissions from the energy use of four households each year.
Wilderness Character		web ▶
Overall Wilderness Character		Overall, wilderness character is in good condition, although an altered fire regime degrades the natural quality of wilderness. Solitude or primitive and unconfined recreation opportunities are excellent in most of the monument wilderness but are diminished at the Rainbow Falls area during periods of high visitation. The monument's General Management Plan identifies this area as a wilderness portal, which provides visitors with an introduction to wilderness. The substantial increase in hikers on the Pacific Crest Trail and John Muir Trail (which pass through the monument) may also impact this character.

Summary of Stewardship Activities and Key Accomplishments to Maintain or Improve Priority Resource Condition

The list below provides examples of recent stewardship activities and accomplishments by park staff and partners to maintain or improve the condition of priority park resources and values for this and future generations:

Natural Resources

- Established a stream gage on the Middle Fork of the San Joaquin River in the monument in collaboration with the United States Geological Survey (USGS) and NPS Sierra Nevada Inventory and Monitoring Network (SIEN)
- Established a weather station at the monument in collaboration with the USGS, SIEN, Scripps Institution of Oceanography, and California Department of Water Resources to monitor temperature, precipitation, snow cover, wind speed and direction, and soil moisture
- Completed research on the age of the Postpile formation
- Completed Devils Postpile National Monument Wetland Inventory and Assessment in 2009
- Completed a soundscape assessment and monitoring report at different locations in the monument
- Completed an interagency prescribed burn to reduce fire risk and restore a more natural fire regime

Cultural Resources

- Completed the Historic Resource and Administrative History Study (*Nature and History on the Sierra Crest: Devils Postpile and the Mammoth Lakes Sierra*)

- Stabilized the historic Devils Postpile Cabin Remains site after a 2011 windstorm uprooted two large lodgepole pines and exposed artifacts
- Completed two condition assessments of cultural resource sites: in 2007, and 2013 following the 2011 windstorm
- Nominated two sites for listing on the National Register of Historic Places

Visitor Experience

- Engaged with Firstbloom, an environmental education program in partnership with the Bishop Paiute tribe focused on environmental stewardship for youth in 4th and 5th grades
- Developed a climate change curriculum utilizing a combination of classroom, virtual, and field-based methods to provide students with hands-on opportunities to explore climate change through the lens of the National Park Service
- Provided an additional daily ranger-led Devils Postpile walk in the afternoon and reached over 1,700 visitors
- Updated, replaced or in some cases added, nearly all wayside panels and directional signs between 2008 and 2015 to improve visitor experience and orientation
- Developed a partnership with the Outdoor Experiences program sponsored by Los Angeles Department of Water and Power and managed by the Mono Lake Committee to bring underrepresented urban youth to public lands in the Sierra including the monument

Park Infrastructure

- Replaced all electric tank water heaters with propane on-demand water heaters to conserve overall energy use
- Installed motion-detecting and night-sky friendly exterior and restroom lighting monument wide
- Upgraded the electrical system in 2014 to provide safer, more reliable and energy-efficient delivery of electricity to monument buildings
- Installed recycling containers in every location where there is a trash can
- Replaced wood shingle roofs with metal on all monument housing, offices and the ranger station to reduce fire hazards
- Removed vegetation and burnable material around all of the buildings to reduce fire risk
- Constructed a new employee facility in 2012 to provide a kitchen, showers, and restrooms for employees in a clean and energy-efficient environment
- Improved the primary hiking trail to the Postpile formation for better access

Key Issues and Challenges for Consideration in Management Planning

Devils Postpile National Monument is dedicated to fulfilling the NPS mission of natural and cultural resource preservation and providing a quality visitor experience connected to the monument's purpose and significance. This is accomplished with our professional staff and efforts to improve our capacity through partnerships and interagency collaboration, as well as engaging youth, tribes, and visitors through traditional and innovative ways. An ongoing challenge for the monument is building capacity and garnering support to respond to the multiple challenges in the face of increasing visitation and declining budgets. For example, a warming climate, prolonged drought, and lack of snow are increasing pressure to extend the open season to contribute to the economic sustainability of gateway communities while still safeguarding resources and providing adequate visitor services and recreational opportunities. These pressures present operational and carrying-capacity challenges that will require collaborative solutions. As the monument engages in the Centennial celebration and looks forward to the second century, we must consider the effects of past history, current demands, and future uncertainties.

In Chapter 4, we highlight some of the most significant challenges facing Devils Postpile National Monument. We also provide an overview of our recently approved General Management Plan that provides a framework for how we will manage the monument in the coming decades, along with a list of positive management actions that can help address these challenges.

Chapter 1. Introduction

The purpose of this State of the Park report for Devils Postpile National Monument is to assess the overall condition of the park's priority resources and values, to communicate complex park condition information to visitors and the American public in a clear and simple way, and to inform visitors and other stakeholders about stewardship actions being taken by NPS staff to maintain or improve the condition of priority park resources for future generations. The State of the Park report uses a standardized approach to focus attention on the priority resources and values of the park based on the park's purpose and significance, as described in the park's Foundation Document or General Management Plan. The report:

- Provides to visitors and the American public a snapshot of the status and trend in the condition of a park's priority resources and values.
- Summarizes and communicates complex scientific, scholarly, and park operations factual information and expert opinion using non-technical language and a visual format.
- Highlights park stewardship activities and accomplishments to maintain or improve the state of the park.
- Identifies key issues and challenges facing the park to inform park management planning.

The process of identifying priority park resources by park staff and partners, tracking their condition, organizing and synthesizing data and information, and communicating the results will be closely coordinated with the park planning process, including natural and cultural resource condition assessments and Resource Stewardship Strategy development. The term "priority resources" is used to identify the fundamental and other important resources and values for the park, based on a park's purpose and significance within the National Park System, as documented in the park's foundation document and other planning documents. This report summarizes and communicates the overall condition of priority park resources and values based on the available scientific and scholarly information and expert opinion, irrespective of the ability of the park superintendent or the National Park Service to influence it.

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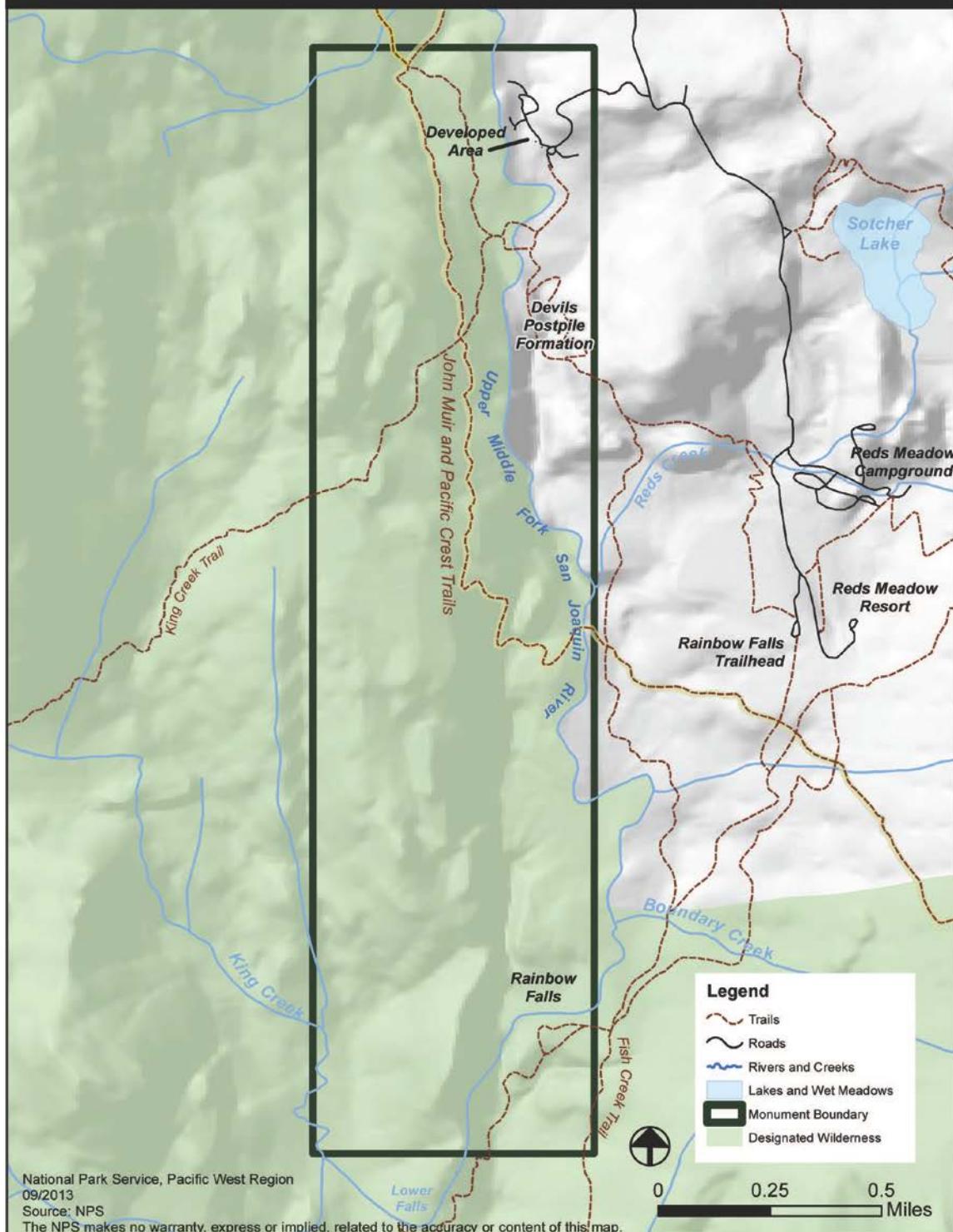
- Devils Postpile is one of the world's finest examples of columnar jointing, displaying volcanic rock columns polished by glaciers and revealing a mosaic of polygons on its dome-shaped top.
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- Devils Postpile National Monument provides a traditional national park experience in a rustic setting that promotes learning and intimate (time-honored) visitor experiences that include enjoying the sights and sounds of nature.
- The establishment of the monument provides compelling insight into the history and evolution of national parks and national forests, beginning in the early years of the public lands conservation and preservation movement.

Monument Map

Devils Postpile National Monument

U.S. Department of the Interior

National Park Service



Map of Devils Postpile National Monument

Regional Context

Devils Postpile National Monument

U.S. Department of the Interior

National Park Service



Location of Devils Postpile National Monument in California

Chapter 2. State of the Park

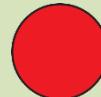
The State of the Park is summarized below for five categories—Natural Resources, Cultural Resources, Visitor Experience, Park Infrastructure, and Wilderness Character—based on a synthesis of the park’s monitoring, evaluation, management, and information programs, and expert opinion. Brief resource summaries are provided below for a selection of the priority resources and values of the park. Clicking on the [web ▶](#) symbol found in the tables and resource briefs below will take you to the internet site that contains content associated with specific topics in the report.

The scientific and scholarly reports, publications, datasets, methodologies, and other information that were used as the basis for the assessments of resource condition are referenced and linked throughout the report and through the [internet version of this report](#) that is linked to the NPS [IRMA data system](#) (Integrated Resource Management Applications). The internet version of each report provides additional detail and sources of information about the findings summarized in the report, including references, accounts on the origin and quality of the data, and the methods and analytical approaches used in data collection and the assessments of condition. Resource condition assessments reported in this State of the Park report involve expert opinion and the professional judgment of park staff and subject matter experts involved in developing the report. This expert opinion and professional judgment derive from the in-depth knowledge and expertise of park and regional staff gained from their being involved in the day-to-day practice of all aspects of park stewardship and from the professional experience of the participating subject matter experts. This expert opinion and professional judgment utilized available factual information for the analyses and conclusions presented in this report. This State of the Park report was developed in a park-convened workshop.

The status and trends documented in Chapter 2 provide a useful point-in-time baseline measured against reference conditions that represent “healthy” ecosystem parameters, or regulatory standards (such as those related to air or water quality). We also note that climate change adaptation requires us to continue to learn from the past, but attempting to manage for conditions based on our understanding of the historical “natural” range of variation will be increasingly futile in many locations. Thus, these reference conditions, and/or our judgment about resource condition or trend may evolve as the rate of climate change accelerates and we respond to novel conditions. Our management must be even more “forward looking,” to anticipate plausible but unprecedented conditions, also recognizing there will be surprises. In this context, we will incorporate climate considerations in our decision processes and management planning as we consider adaptation options that may deviate from traditional practices.

2.1. Natural Resources

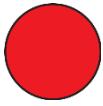
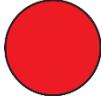
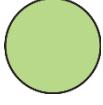
Air Quality



[web ▶](#)

Devils Postpile National Monument is a relatively remote site far from large cities yet air quality is impacted by long-range up canyon movement of polluted air from the California Central Valley and the San Francisco Bay Area, resulting in unhealthy conditions at times. In addition, the monument is located within a county designated by the Environmental Protection Agency as nonattainment (not meeting established standards) for ground level ozone. The monument is also in the San Joaquin Air Pollution Control District, which exceeds particulate matter ($PM_{2.5}$) standards for human health. Interpolation of data from off-site monitors indicates that air quality conditions warrant significant concern. Pollutants such as ozone, particulate matter, and nitrogen are typically byproducts of emissions from industries and manufacturing activities, burning fossil fuel, chemicals, and fertilizers. These pollutants can be a respiratory irritant, causing coughing, sinus inflammation, chest pains, scratchy throat, lung damage, and reduced immune system functions. They can also impact wildlife and vegetation.

Ongoing studies of air quality conditions at the monument indicate that concentrations of some parameters are of concern including elevated ground-level ozone ([Bytnarowicz et al. 2013](#)) and $PM_{2.5}$ concentrations (Schweizer pers. comm. 2015) although they are well below levels indicated by interpolated (estimates based on regional or national values) data. These studies need to continue to determine trends and actual onsite conditions.

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Ozone	Human Health: annual 4th-highest 8-hour concentration <75 parts per billion		<p>Pollutants like ozone are of particular concern to NPS managers; when present in high concentrations they can have a negative impact on plants and wildlife, and they can also be unhealthy for monument visitors and staff.</p> <p>The monument is within a county designated by the Environmental Protection Agency as “nonattainment” (not meeting) for ground-level ozone standards of the annual 4th-highest 8-hour concentration of 75 parts per billion (ppb). Based on NPS Air Resources Division benchmarks and interpolation of nearby data, the 2008–2012 estimated ozone is 88.1 ppb (NPS-ARD 2015). Four years (2007, 2008, 2013, and 2014) of onsite data indicate that the 4th-highest 8-hour concentration was 70.6 ppb (Burley pers. comm. 2014). This indicates that occasionally, ground-level ozone levels may be unhealthy to both monument visitors and NPS staff (Bytnerowicz et al. 2013).</p> <p>Based on interpolated data and limited years of onsite data, ozone is of significant concern with a medium degree of confidence but as monitoring continues, the rating could change.</p>
	Vegetation Health: 3-month maximum 12-hour W126 (metric that focuses on plant response to ozone exposure during daylight hours in the growing season)		<p>Based on interpolated data, the 2008–2012 estimated W126 of 23.5 parts per million-hours (ppm-hrs.) exceeds the NPS Air Resources Division benchmarks (>13 ppm-hr. warrants significant concern) (NPS-ARD 2015). In 2007 and 2008, onsite measurements were 16 and 15 ppm-hr., respectively, for the 12-hour W126 standard (the 24 hour standard was 21 and 19 ppm-hr., respectively) (Bytnerowicz et al. 2013).</p> <p>There are at least 6 ozone-sensitive plants in the monument (see list of ozone-sensitive plant species) including Jeffrey pine. Chlorotic mottle (damage to needles and leaves caused by ozone) was observed on 10 of 80 Jeffrey pine trees examined in 1993, 1 of 37 trees in a permanent plot established in 2001, and 5 of 42 trees in the same plot in 2014. All observed injury was very slight, comprising no more than 10% of the surface area of needles four years old or older, with younger foliage uninjured.</p>
Deposition	Sulfur Wet Deposition		<p>Sulfur can acidify soils and surface waters, which may impact ecosystem health and ecosystems in the park were rated as having high sensitivity to acidification effects (Sullivan et al. 2011a, Sullivan et al. 2011b). Based on NPS Air Resources Division benchmarks of 0.5 kilograms per hectare per year, wet sulfur deposition rates at the monument are expected to be low (NPS-ARD 2015). Sulfur deposition is generally very low in California and unlikely to affect most ecosystems, while nitrogen deposition is higher with more widespread effects.</p>

Nitrogen Deposition		<p>Excess nitrogen from atmospheric deposition acts as fertilizer, favoring the growth of invasive, non-native, nitrogen-loving grasses, such as cheatgrass, that out-compete native plant species adapted to nitrogen-poor conditions. Fenn et al. (2008) documented the replacement of lichen species that are important for wildlife food and habitat at the parks and other sites throughout the Sierra Nevada and San Bernardino Mountains, with weedy, nitrogen-loving species.</p> <p>Nitrogen deposition warrants significant concern. Pardo et al. (USFS 2011) suggested maintaining a critical load of less than 2.5–4 kilograms per hectare per year (kg/ha/yr.) of nitrogen to protect lichens and other vegetation in the Northwestern Forested Mountains ecoregion, which includes the monument. Based on interpolated data, the 2010–2012 estimated average total (wet plus dry) nitrogen deposition was 4.9 kg/ha/yr (NADP 2013). In addition, 2013 data for NH₃, NO₂ and HNO₃ collected at the monument during a 4 month period indicate annual totals of 5.5 kg/ha/yr (Bytnarowicz, pers. comm. 2015). Both suggest that current levels of nitrogen deposition are above ecosystem health thresholds.</p> <p>The degree of confidence at the monument is medium as estimates are based on interpolated data from more distant wet deposition monitors and a single year of onsite data. Ongoing studies will provide the monument with additional onsite data and trends.</p>
Mercury/Toxics Deposition		<p>In nearby Sequoia & Kings Canyon National Parks and Yosemite National Park, Landers et al. (2008) found airborne contaminants such as mercury and pesticides in fish, vegetation, snow, air, water, and lake sediments. Some concentrations in fish exceed contaminant health thresholds established for wildlife and humans (Ackerman et al. 2008, Schwindt et al. 2008, Eagles-Smith et al. 2014). In addition, research at nearby parks suggests that pesticides from the adjacent Central Valley play a strong role in the regional decline of several amphibians (McConnell et al. 1998, LeNoir et al. 1999, Sparling et al. 2001, Fellers et al. 2004, Hageman et al. 2006, Davidson and Knapp 2007).</p> <p>The State of California Office of Environmental Health Hazards Assessment issued a California Statewide health advisory due to elevated mercury concentrations in fish in all lakes and reservoirs in the state without site-specific advice (OEHHA 2013). Onsite data for the monument are not available to determine trend or improve confidence in actual conditions.</p>
Visibility	Haze Index 	<p>Visibility can be impaired as a result of wind events, pollution from the San Joaquin Valley, and smoke from wildland fires. Average visibility warrants moderate concern based on NPS Air Resources Division benchmarks and the 2008–2012 estimated average visibility of 4.8 deciviews above estimated natural conditions (NPS-ARD 2015). No trend information is available because there are not sufficient on-site or nearby visibility monitoring data.</p>

Particulate Matter	PM _{2.5} non-attainment status		<p>The EPA sets the National Ambient Air Quality Standard for particulate matter of small diameter (PM_{2.5}) based on human health effects. PM_{2.5} poses health risks for humans and can cause or exacerbate respiratory problems. Devils Postpile National Monument falls in the San Joaquin Valley Air Pollution Control District, which does not meet the standard for both the 24-hour PM_{2.5} public health standard of 35 micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$) and the annual PM_{2.5} standard of 12.0 $\mu\text{g}/\text{m}^3$.</p> <p>Onsite measurements at the monument in the summer months of 2013 and 2014 averaged 19 $\mu\text{g}/\text{m}^3$ and 9 $\mu\text{g}/\text{m}^3$ respectively, with the highest mean 24 hour PM_{2.5} of 59.3 $\mu\text{g}/\text{m}^3$ (2013) and 18.7 $\mu\text{g}/\text{m}^3$ (2014) (Schweizer pers. comm. 2015).</p> <p>Episodes of high concentrations of fine particles at the monument are typically short term and due to smoke from wildland fires; health advisories are issued during these periods. When smoke is not present, data show that ambient conditions have very low concentrations of PM_{2.5}. Continued onsite monitoring will help to determine actual conditions and trend.</p>
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Geologic Features and Processes



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The majority of the Sierra Nevada is composed of granitic rocks with isolated remnants of the pre-Sierran metamorphosed rocks. However, the Sierra Nevada in the vicinity of Devils Postpile National Monument also contains a rich assemblage of relatively young volcanic rocks, including the Devils Postpile itself (see the following Resource Brief for more detail). Nearby volcanoes have erupted often over the past 40,000 years with an eruption occurring every 250 to 700 years over the last 5,000 years. One of the more recent eruptions (ca. 1350) deposited up to 18 inches of pumice in and around the monument. Despite the frequency of eruptions nearby, the probability of such an eruption occurring in any given year is less than 1%. This area has numerous active faults, five of which are considered capable of producing earthquakes up to magnitudes of 6.7 ([Chen et al. 2014](#)).

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Condition	Integrity of the Devils Postpile; Affected Area of glacial polish		<p>The Devils Postpile formation is protected to allow natural processes to continue unimpaired. Some visitor impacts including informal trails can accelerate erosion and damage formations. In this area, this is acceptable as key to visitor experience. However, some pristine areas need to be protected. For example, glacial polish on the top of the Postpile is exposed to visitor traffic, which could dull the polish over time. Condition of glacial polish is determined through repeat photography.</p> <p>Columns of the Postpile formation collapse periodically, with several falling during an earthquake in the 1980s. This is monitored through repeat photography.</p>

Knowledge	Devils Postpile lava flow source and extent		<p>Geologists have conducted multiple explorations of the Reds Meadow Valley to determine the source of the Devils Postpile lava flow, estimated to have occurred 82,000 years ago, to no avail. In addition, the full extent of the flow is not completely mapped but is determined to be composed of basaltic trachyandesite.</p> <p>Geologists estimate that the dacite flow in the Rainbow Falls area occurred 98,000 years ago. Knowledge of the type and age of flows in the monument becomes more refined as dating techniques improve along with onsite mapping.</p>
Inventory	Volcanic formations (Devils Postpile, buttresses, Rainbow Falls); Granitic features		<p>The Geologic Resources Division completed a geologic inventory and map in 2009 based on the limited existing data. Geologists will soon publish an updated map and report that will provide much more detailed and accurate information about the geology of the area including timing, extent, and type of lava flows and granitic formations.</p> <p>A geology brochure is available to the public and any new information will be made available through the park website, updated brochures, and interpretive programs.</p>
Geohazards	Percent of Geohazards Mapped/Monitored (Earthquakes, Volcanic activity, Rockfall, Slumps/Landslides, Debris Flows)		<p>The impact of volcanic and or seismic activity on the monument will depend on the location, size, wind direction, magnitude of earthquake and type of eruption. Along with safety concerns, these events could accelerate collapse of the columns of the Devils Postpile formation.</p> <p>While volcanic flow hazards can be highly destructive and life threatening, the impact is generally localized. In comparison, fine ash fall hazards can have widespread and significant impact on human health, infrastructure, and agriculture. Although the monument does not have focused hazards mapping or monitoring, the USGS recently published a report for the area, "Scenario Earthquake Hazards for the Long Valley Caldera-Mono Lake Area, East-Central California" (Chen et al. 2014) that can provide some guidelines for risk assessments.</p>

Resource Brief: Geology of Devils Postpile

The Devils Postpile geologic feature is a small part of a single lava flow estimated to be about 360 feet deep that cooled in a way that promoted column formation. The formation as we see it today was exposed by the scouring action of glaciers plucking into the hardened flow to reveal the buried columns, unveiling a polished mosaic of polygons on the surface and majestic columns as the glacier melted away. Glaciers are also responsible for the brilliant polish and dome shape that makes the Devils Postpile so unique among the world's other outcroppings of columnar rock.

The most recent studies, which used relatively precise Argon isotope techniques, suggest that the Postpile formed about 82,000 years ago (Mahood 2010). This date places the Postpile flow within an interglacial period between the Tahoe and Tioga glaciations. Despite extensive searching, geologists have not found the vent (or origin) for the Postpile basalt.



The Devils Postpile Formation

Most columnar rock formations around the world occur in basaltic or andesitic rock, although the process of columnar jointing can occur in other mediums besides lava such as mud, salt pans, and frost. Recently, classification has been refined and the formal petrologic name is basaltic trachyandesite. Today, for general reference the volcanic geologic units of the monument are referred to as basalt, dacite, and andesite.

The top of the Postpile is smooth and rounded, allowing visitors to access the top of the formation and examine the shapes of the columns. Hexagons (about 50%) and pentagons (about 37%) dominate the geometry of the Postpile (Huber and Eckhardt 2001, Beard 1959). The percentage of six-sided columns at Devils Postpile is comparable to other well-studied outcropping of columnar rock, such as Devils Tower, Wyoming and Giant's Causeway, Ireland (Huber and Eckhardt 2001).



Top of the Devils Postpile Formation

Upper Middle Fork of the San Joaquin River



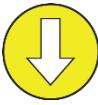
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Both surface and groundwater influence ecosystems at the monument. Surface water resources within the monument include the Upper Middle Fork of the San Joaquin River, streams, waterfalls, springs, and small ponds and are a principal attraction to visitors. The river and its tributaries provide essential habitat for nearly all flora and fauna at the monument. Riverine, riparian and wetland ecological processes are dependent on characteristics of river flow (amount, seasonality, flood frequency, and duration of high and low flows), water quality and riverbank conditions. High flows are important for transporting sediment and nutrients downstream while low flows provide conditions for reproduction of aquatic life. Timing of river flow greatly impacts aquatic, riparian, and associated wetland flora and fauna food sources and reproduction. With climate change, anticipated impacts on the Upper Middle Fork of the San Joaquin River include earlier snowmelt runoff due to rising temperatures and greater variability and extremes (e.g., flooding) in stream flow. This can affect water quality and aquatic life and threaten infrastructure in flood zones.

Water quality is critical to the health of aquatic and terrestrial life in the monument. While there is not a detailed record of water quality information for the monument, a few baseline assessments have indicated that water quality is generally good. More information is needed to thoroughly evaluate water quality (see Resource Brief). Threats to water quality are recreational use, atmospheric deposition of pollutants, pollution from roads and parking lots (from road surfaces and fluids from autos), and former mining operations upstream of the monument. Healthy and stable river banks provide riparian habitat and help maintain quality of aquatic habitat including stable water temperatures and water chemistry. Excessive human trampling of riverbanks can lead to vegetation loss, accelerated erosion, and habitat degradation.

Groundwater supports many of the streams, seeps, and wetlands found at the monument and if available water were to decrease significantly or dry up completely, associated habitat and dependent flora and fauna would be greatly impacted. Most springs discharge outside of the monument but feed perennial streams that flow through the monument into the river.

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Hydrology: Volume	<ul style="list-style-type: none">• Discharge – annual average• Winter and summer low and high flows		<p>A stream gage on the Middle Fork of the San Joaquin River provides data beginning in 2009. Flows recorded by this gage and others in the region have expressed a marked downturn during 2012–2015, reflecting extended drought in the region. Longer term trends of discharge from a regional analysis of multiple long-term Sierra Nevada stream gages conducted by Andrews (2012) found no significant trends in the average annual volume of flow. A weak but non-significant trend showing higher winter low flows (Andrews 2012) appears likely to have been driven by increasing minimum temperatures over the last 30–40 years that contributes to more rain and less snow.</p> <p>The 2012–2015 California drought resulted in significant decreases in volume of water in the San Joaquin River. However, the future trend is uncertain, and as the only long term monitoring site on the San Joaquin above the dams, this site is very important for continued monitoring to establish more definitive indicators of trend and tracking the sizeable variability anticipated to occur in the San Joaquin River.</p>

Hydrology: Timing	<ul style="list-style-type: none"> • Timing of peak flow • Percent of annual flow occurring in April, May, June, July 		<p>A stream gage on the Middle Fork of the San Joaquin River provides data beginning in 2009. Because we have only a few years of onsite data, we base condition and trend on two regional analyses of multiple long-term stream gages in the Sierra Nevada (Andrews 2012, Peterson et al. 2008) with focus on Miller's Crossing (discontinued in 1991), a stream gage located downstream of the monument.</p> <p>Andrews (2012) found the following:</p> <ul style="list-style-type: none"> • Decrease in the total discharge between April and July (historical timing of peak flow) • Earlier spring snowmelt • Earlier onset of low winter and summer flows on some gages <p>Peterson et al. (2008) found the following:</p> <ul style="list-style-type: none"> • Earlier peak flow comparing 1952 and 1990 at Miller's Crossing and 19 other gages • Increase in peak flow at some gages <p>The downward arrow indicates the current and projected trend in earlier peak runoff and streamflow in the San Joaquin River. While earlier peak runoffs can be part of natural variations that can impose extended dryness, these are also the anticipated future trends from climate change. These effects could also provoke higher flood potentials from heavier rainfall and elevated snowlines. Climate change will likely advance the timing of snowmelt, reducing spring snowpack and affecting water quality.</p> <p>A stream gage installed in 2009 will provide long term monitoring data that can help to determine site specific trends.</p>
Water Quality	<ul style="list-style-type: none"> • pH • Temperature • Specific conductance • Dissolved oxygen • Fecal coliform 		<p>Since 2010, monument staff regularly measures four characteristics of water quality twice a month between May and October: pH, temperature, specific conductance, and dissolved oxygen. Results appear to be consistent with other nearby water bodies and indicate good condition. Intermittent sampling of fecal coliform indicates low levels and is not a cause for concern for human health.</p> <p>This rating is based on four parameters and does not consider other important measures of water quality (e.g., nitrogen, phosphorus, acid neutralization capacity, etc.) due to lack of data. In addition, climate change and the effects on river flow may also affect water quality. As a result, we are not able to fully evaluate water quality and determine a trend.</p>

Riverbank Condition	<ul style="list-style-type: none"> • Bank stability • Channel morphology 		<p>A 2009 condition assessment of riverbanks at the monument indicates that 63% were very stable, 17% were slightly disturbed, 6% exhibited considerable signs of vegetation and soil disturbance, and 14% were highly disturbed (Vezeau et al. 2011). Based on these results, riverbank condition within the monument boundaries is generally good, in part because much of the river bed and banks is composed of bedrock or boulders. However, a limited number of high-visitation areas exhibit high degrees of vegetation disturbance and soil erosion.</p> <p>Riverbank revegetation and fencing to limit informal trails and protect sensitive areas has improved the condition, and continued assessments and proactive management is expected to maintain this trend.</p>
Groundwater	Spring Fed Streams – Water Quality and Quantity		<p>Measurements of discharge and occasional water sampling of spring-fed streams has occurred for many years and provide information on changes in flow through wet years and droughts. The springs show seasonal and long-term variations in discharge, but only small variations in chemistry. The springs have thus far proven drought resilient, but the effects of prolonged drought or decreasing snowpack are difficult to predict. Nearby groundwater extraction has the potential to impact these resources given that they are likely interconnected.</p>
	Human impacts at Soda Springs and associated habitat		<p>Visitors can easily access Soda Springs, the largest mineral spring in the Reds Meadow Valley, by following one of the many informal trails leading to the spring. Due to the lack of delineated access, trampling of vegetation, soil compaction, and manipulation of the spring upwelling area (e.g., encircling the upwelling area with rocks) occurs regularly. Although these impacts are unlikely to affect the water quality and/or quantity, managers are working to protect the springs and associated habitat through improved visitor information, delineation of access, and monitoring of vegetation, soil, and water quality.</p>

Resource Brief: Water Quality

Good water quality is critical to the health of aquatic and terrestrial life. While water quality standards exist for drinking water, only limited standards have been defined to protect the health of wildlife, vegetation, and other organisms. Threats to water quality in the monument include recreational use, atmospheric deposition of pollutants, non-point source pollution from roads and parking lots (from road surfaces and fluids from autos), and former mining operations upstream of the monument. In addition, climate change may increase water temperature, which has cascading effects on water quality.

Devils Postpile National Monument staff monitors four water quality parameters biweekly from May to October: water temperature, pH, specific conductance, and dissolved oxygen. All of these appear to meet regional standards. Fecal coliform bacteria are also periodically measured and have found fecal coliform levels were well below the defined standards ([Vezeau et al. 2011](#), Lutrick et al. 2010). Recent sampling in the Inyo National Forest near the monument found that the other four parameters met standards set by regional water management organizations ([Chamberlin 2009](#)). See the box to the right for importance and definitions of the parameters.

Devils Postpile sits on the west slope of the Sierra Nevada and is exposed to air pollution from more populous regions of California. Atmospheric deposition of nutrients and other pollutants occurs as airborne particles slowly fall to the ground (referred to as “dry” deposition) but is accelerated during precipitation events (referred to as “wet” deposition). During cold months when precipitation falls as snow, nutrients will accumulate in the snowpack and flush into surface streams and lakes when the snow melts. Even minor changes in water chemistry and availability of nutrients like nitrogen, sulfur, and phosphorous can significantly alter the ecological balance of Sierra Nevada surface waters because they are naturally low in these elements.

[Vezeau et al. \(2011\)](#) sampled total dissolved nitrogen, nitrate and nitrite, total dissolved phosphorus, total phosphate, orthophosphate and petroleum hydrocarbons in the Middle Fork of the San Joaquin River. Results from the tests indicated levels well below standards for nitrate and nitrite, and low levels for the other parameters. Long-term data on nitrogen and phosphorous nutrient parameters would help the monument evaluate trends in local and regional pollution impacts on water quality. See [Kuhn and Whitaker \(2014\)](#) for more summary information. Monitoring of water quality will continue at the monument to ensure protection of aquatic and terrestrial flora and fauna.

Definition of Water Quality Parameters Currently Monitored

Water temperature controls many physical, chemical, and biological processes in lakes and streams. For example, water temperature affects chemical reaction rates, dissolved oxygen concentrations, algal productivity, and health and reproduction of aquatic life.

pH is the measure of hydrogen ion activity; many organisms are sensitive to this indicator, which determines the level of acidity of the aquatic habitat. A change in pH may indicate acidic inputs and a reduced capacity of water to neutralize acids.

Specific conductance is the measure of waters’ ability to conduct an electrical current and provides a broad measure of the concentration of ions in water. A change in specific conductance may indicate air pollutant deposition in waters or visitor use impacts.

Dissolved oxygen sustains aquatic organisms that require oxygen, including zooplankton, algae, amphibians, and fish. Low levels of dissolved oxygen can indicate nutrient loads that lead to excessive growth of organisms that consume oxygen from the water column at an increasing rate.

Fecal Coliform are the most common microbiological contaminants of natural waters. Fecal coliform live in the digestive tracks of warm-blooded animals, including humans, and are excreted in the feces. Although most of these bacteria are not harmful and are part of a normal digestive system, some are pathogenic to humans. The presence of fecal coliform in water indicates the possible presence of organisms that can cause illnesses such as gastroenteritis, Hepatitis A, ear infections, and cholera.

Resource Brief: Water Quantity

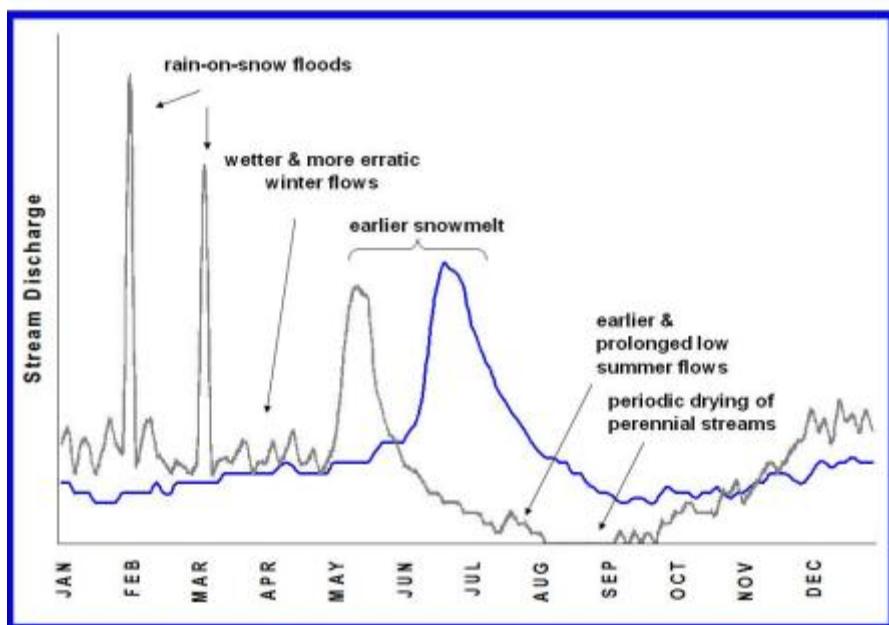
The distribution and movement of water and its interactions with the surrounding environment, or *hydrology*, is monitored in the Middle Fork of the San Joaquin River to better understand how water dynamics change seasonally and over long time periods. Water in the Sierra Nevada influences plant and animal distributions as well as providing a large percentage of the state's water supply.

In 2009, Devils Postpile NM staff worked closely with the U.S. Geological Survey to install an automated gage in the Middle Fork of the San Joaquin River to measure streamflow. [The Sierra Nevada Network Inventory & Monitoring Program](#) includes this gage in its river hydrology monitoring project as one of 14 gaging stations monitored in rivers across the network parks. The objectives of this project are to:

1. Detect long term trends in timing and volume of streamflow using fixed, continuous, water stage recording stations at existing stream gages in selected major watersheds, and
2. Record, measure, and/or calculate a set of specific hydrologic measures related to the timing and quantity of streamflow (e.g., stage, discharge, number of days to onset of snowmelt, measures related to low and high flows).



NPS Physical Scientist and Student Conservation Association interns take river discharge measurements in Devils Postpile. NPS photo 2012.



Hydrograph depicting changes in Sierra Nevada hydrology predicted to occur with shifting precipitation dynamics and climate warming. The line with one major peak (blue line) is the typical historic hydrograph, and the gray line illustrates the anticipated changes. Some of these changes are already being observed. From David Herbst, Sierra Nevada Aquatic Research Lab.

This project will enable monument staff to acquire information on a variety of hydrologic measures that provide more local information on seasonal patterns of streamflow and how these change over time with anticipated impacts of climate change on the amount, type, and timing of precipitation.

The most pronounced observed and anticipated effects of climate changes are earlier snowmelt runoff due to rising temperatures, a lower snowpack volume at mid-elevations, and greater climatic variability and extremes (see figure at left). These changes will likely have profound effects on ecosystems within park and national forest lands as well as effects on communities throughout California.



Due to Devils Postpile National Monument's unique location near a low Sierra Nevada pass, species of both the east and west slopes of the Sierra Nevada and also the Great Basin are present. Though small in size, the monument is diverse enough in its topography and geology to support numerous plant communities, including forest, shrub, meadow, and riparian systems. However, non-native plants compete with native plants for resources (water and nutrients), degrade wildlife habitat, and can alter fire regimes. Although nonnative plant occurrence and spread is relatively limited at the monument, continued treatment and survey are important due to potential for new introductions and spread of existing populations. Active invasive plant management began in 2001, and nearly all populations of bull thistle and wooly mullein have been contained and appear to be at a maintenance level. Small populations of cheatgrass persist in two locations but rigorous annual treatment appears to be limiting further spread, although cheatgrass populations outside of the monument remain as a potential seed source.

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Native Species	Species richness (number of species)		Based on a vascular plant inventory conducted in 2001, (Arnett and Haultain 2005 , Arnett et al. 2014) 373 plant species occur in the monument, representing 60 families and 199 distinct genera. Three rare plants also occur in the monument including Bolander's woodreed (<i>Cinna bolanderi</i>), alpine gold, (<i>Hulsea brevifolia</i>), and cutleaf monkeyflower (<i>Mimulus laciniatus</i>), although focused monitoring has not been conducted. The 2001 survey provides a baseline for species richness and locations of rare taxa but will need to be repeated to detect trends.
Non-native Species	Species richness; Extent and number of populations of species of management concern		Eleven nonnative species are known to occur in the monument and three of these—bull thistle (<i>Cirsium vulgare</i>), woolly mullein (<i>Verbascum thapsus</i>), and cheatgrass (<i>Bromus tectorum</i>)—are considered invasive by the California Invasive Plant Council (Cal-IPC 2006) while the other species are considered nonnative but not invasive. Based on treatment history, annual data collection, and assessments of the spatial distribution and size of populations, the trend is improving. However, with climate change and the possibility of new inadvertent introductions, invasive species could increase and change the improving trend.



High-severity disturbance events can cause loss of adult trees that serve as seed sources, and can sometimes result in conversion from forest to other types of vegetation such as a mix of shrub and understory herbaceous plants, particularly with repeat disturbance. By the term severity, we refer to the impact of disturbances on vegetation; tree mortality and changes in fuel loads were the primary metrics measured in post-disturbance monitoring that are related to fire severity (See Landscape and Ecosystem Processes for more information on fire regime characteristics). At the monument, two different disturbance events have affected forest structure and fuel loads in recent decades: the 1992 Rainbow Fire and the 2011 Devils Windstorm. Numerous monitoring plots document changes in fuel loads and stand structure including regeneration, with an emphasis on quantifying fire effects. Only one research project has focused on the impacts of the windstorm.

Forest stand structure represents the number of trees occurring in different size classes for each species. Disturbance events, incidence of insects and disease, and climate affect both the species composition and proportion of trees in different size classes. In particular, disturbance events create gaps in the canopy that provide conditions for regeneration and contribute to stand diversity. Sufficient regeneration of young trees is important to sustain the populations of different conifer species and maintain forests in the monument.

Fuel load is typically represented as tons per acre and refers to the amount of dead and down wood and material available to burn, and greatly impacts fire behavior. Fire exclusion in the Sierra Nevada, which largely began after Euro-American settlement, has resulted in mixed-conifer forest stands becoming denser and having unprecedented accumulations of surface fuels (sticks, logs, needles, and other debris) and increased ladder fuels that can carry fire into the canopy of trees. A consequence of these changes is an increased likelihood of high severity wildfires burning through the mixed-conifer forests (such as the 1992 Rainbow Fire), rarely encountered in pre-Euro-American times.

Monument staff has worked with the Inyo National Forest on fuel mitigation projects, including pile burning in 2013–2015 and a prescribed burn conducted in 2015. Additional fuel load management in the Reds Meadow and monument will need to be addressed to reverse this trend.

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Regeneration	Number of seedlings per acre		In areas burned by the 1992 Rainbow fire, regeneration was greatest in areas with low or moderate fire severity where some canopy trees survived. Lowest densities were found in high severity areas located more than 328 feet (100 meters) from surviving trees (Caprio et al. 2006). Recruitment of new individuals occurs either through wind dispersed seeds from mature trees or from rodent and small mammal seed caches in the ground made prior to the disturbance. Tree regeneration warrants moderate concern but is stable because while regeneration of trees has declined in areas where high-severity fire killed all trees, regeneration is still occurring in other areas of the monument.

Stand Structure	Density of trees by size class and species		<p>Observed decreases in density and changes in tree species composition after the Rainbow Fire were directly related to fire severity (Caprio et al. 2006). Little change occurred in areas experiencing low severity fire. Areas that burned with moderate severity experienced greater than 87% declines in tree density and changes in species composition, with a relative decrease of live red and white firs. High severity sites showed dramatic decreases in density (from 572 trees/acre to 2 trees/acre); with only a few Jeffrey pines surviving.</p> <p>In areas not affected by the Rainbow Fire, fire exclusion has resulted in an unnaturally high density of trees that may increase the risk of future high severity fires.</p> <p>The 2011 Devils Windstorm caused significant windthrow of large diameter trees of all species (Hilimire et al. 2013) and will have a long-term effect on stand structure and fuel loads and unknown effects on tree regeneration and future mortality.</p> <p>Stand structure warrants significant concern with a declining condition due to the combination of high severity fire and the blowdown occurring in less than 20 years, and subsequent increased vulnerability to insects and disease.</p>
Fuel Loads	Dead and down woody debris; live fuels		<p>During the first five years following the Rainbow Fire (1993–1997), total fuel load increased slowly then increased four-fold over the next five years (1997–2002). The accelerated rate of accumulation in the latter five years is attributed to the falling of dead standing trees killed by the fire (Caprio and Webster 2006). Regardless, total fuel load remained about 40% of the amount recorded in unburned plots.</p> <p>Increased fuel loads from the 2011 windfall event that toppled many large trees may also increase the risk of fire spread and severity in some areas. Monument staff has worked with the Inyo National Forest on fuel mitigation projects, including pile burning in 2013–2015 and a prescribed burn conducted in 2015. Additional fuel load management in the Reds Meadow and monument will need to be addressed to reverse this trend.</p>



Landscape level processes, including disturbance such as fire, have profound, long-term effects on ecosystems. A fire regime is the general pattern in which fires naturally occur in a particular ecosystem over an extended period of time. Characteristics that define fire regimes include frequency, severity, size, type, and seasonality. Frequency is how many fires occurred over a specified time period. Severity refers to the impact of a fire on ecosystem components such as soil and vegetation. Fire severity is primarily estimated based on the proportion of overstory trees killed by fire (Stephens et al. 2013) but also on the degree of changes to soil properties, such as soil structure, infiltration capacity, and hydrophobicity resulting from the burning of ground-covering vegetation and organic matter. Fire intensity describes the physical characteristics of fire (e.g., residence time, rate of spread, depth and duration of soil heating), all of which can help to explain the severity and secondary ecosystem effects of the fire. Type of fire refers to character of historic fires and includes: ground (burns mostly in the organic matter beneath the surface—such as peat), surface (burns the surface fuels on the forest floor and the low vegetation) and crown (burns through the upper crowns of trees). Seasonality refers to the time of year that fires occur. More than a century of fire exclusion has greatly altered the fire regime in the monument and surrounding area.

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Fire Regime	Frequency		A fire history study at Devils Postpile reported average (or mean) site fire return intervals from 14.2 to 18.3 years (Caprio et al. 2006 , Caprio 2006). Single intervals ranged from three (lower elevations) to thirty years (higher elevations). These results indicate that fire was not an unusual event in most of the area's forest communities, while the absence of fire for the 105 to 120 years before 1992 was unprecedented and probably contributed significantly to the severity of the Rainbow Fire. An interagency prescribed burn conducted in 2015 is a step towards reintroducing fire as a disturbance process.
	Severity		Evidence suggests that the past fire regime in the monument and surrounding areas was predominantly characterized by low to moderate fire intensity and low to moderate burn severity with small patches of high severity. The Rainbow Fire killed unnaturally large patches of overstory trees. Of the 84% of the monument that burned in the Rainbow Fire, more than 51% of this area experienced moderate to high burn severity in terms of vegetation (fire that killed 50 to over 90% of overstory trees) (NPS 2005). Burn severity of soils was not measured but was likely moderate to high severity.
	Size		In the western United States, increased frequency and size of fires is associated with increased temperatures, earlier spring snow melt, and longer fire seasons (Westerling et al. 2006). These changes are linked to regional climate change. In the mixed-conifer forests of the Sierra Nevada, larger, more severe fires are also associated with land-use changes and decades of fire exclusion (McKelvey et al. 1996). While the size of the Rainbow Fire does not appear to have been outside the range of historic variability, unnatural fire effects present challenges to land managers due to high fuel loads, droughts, and warming temperatures that increase the length of fire seasons.

Type		The overall frequency of past fires suggests they were predominantly surface fires. Today, a larger proportion of the region is burning with stand-replacing (crown) fires that result in large patches of tree mortality. Some areas of the monument have experienced type conversions from forest to shrubland after high-severity crown fire events.
Seasonality		In the most recent decade, the length of the fire season has been increasing due to warming temperatures and diminishing snowpack (Westerling et al. 2006 , Stephens et al. 2013). Historically, most fires occurred in mid to late summer through early fall. With longer fire seasons, fires may occur more frequently in early spring and impact nesting birds and flowering and fruiting vegetation and also greatly alter habitat conditions. A trend toward longer fire seasons has implications for human health (air quality), fire management capacity, and the ecology of plant communities that are adapted to shorter fire seasons.
Snowpack	Date and Magnitude of Peak Snow Water Equivalent; Date of snow disappearance	Andrews (2012) documented that April 1st results from manually-measured snow courses in nearby Yosemite to Sequoia and Kings National Parks have decreased significantly at elevations below 8,500 feet. The monument (at 7,560 feet) lies within the rain-to-snow elevational transition band. Monument staff recently (2010) established a snow course and automated snow pillow and as we gather data over time, site-specific trend information will be available. Regional data are sufficient to determine a general trend toward smaller snowpack and earlier melt due to warmer temperatures.
Climate Change	Scientific understanding of trends (temperature, precipitation, hydrology, ecology, and phenology)	The NPS continues to provide and foster state-of-the art science to better understand the impacts of climate change and develop science-based adaptive management strategies for natural and cultural resource managers. Monument staff is working with partners to develop and sustain a historical archive of climate, weather, hydrologic, and ecological conditions for the past, present, and future conditions and trends. The results will be integrated into decision making about resource management and visitor use patterns to inform models, adaptation strategies, and impact mitigations.

Resource Brief: Rainbow Fire

On August 20, 1992, after six years of drought, lightning ignited the Rainbow Fire on the Inyo National Forest downstream of Devils Postpile National Monument. Winds greater than 60 miles an hour, heavy fuel loads, dense conifer stands, and drought conditions resulted in the fire burning 6,000 acres within 24 hours. By September 8, 8,347 acres had burned with large areas of complete overstory tree mortality. Approximately 84% of the monument's 800 acres burned with varying degrees of severity, with more than 50% moderate to high severity.

Fire history studies use tree rings to date scars from past fire events and have documented that the prehistoric fire frequency for the monument's mixed-conifer forests ranged from 3 to 30 years between fires with an average 14-to-18-year interval between fires ([Caprio et al. 2006](#)). The Rainbow Fire was the first to burn in the monument in more than 100 years. A century of fire exclusion had resulted in increased surface fuel loads and greater forest density, with many young trees that created ladder fuels to carry fire from the ground into the crowns of larger trees. A combination of fire history information and monitoring data suggests that the amount of overstory tree mortality from the Rainbow Fire was unprecedented.

Based on monitoring data ([Caprio and Webster 2006](#)), postfire decreases in tree density and changes in tree species composition were directly related to fire severity. Little change occurred in areas experiencing low severity effects, either in overall density or species composition. Areas burned with moderate severity underwent declines in density and changes in species composition with most firs, particularly white fir, being killed. Even more striking were the changes observed at high severity sites where density declined from 1,260 trees per hectare (572/acre) to five trees per hectare (2 trees/acre). Only a few Jeffrey pine survived the fire.

Fire management concerns related to the postfire recovery of the Rainbow Burn include the lack of a local seed source in areas burned by moderate and high severity fire where large patches of overstory were killed. In these areas another fire may kill most regenerating trees and severely limit future tree establishment because seed sources are too distant. However, areas where low severity fire occurred, or that have some seed source remaining, might benefit from the use of prescribed fire to maintain fuel and forest density at a prehistoric level. Monument staff has completed some mechanical work and plans an interagency prescribed fire to reduce fire risk near the developed areas but continued challenges include managing fire in the wilderness areas. Monument staff works closely with other National Park Service and U.S. Forest Service staffs to plan and implement alternative fuel treatments to help reduce the risk of high-severity wildfire in the monument. Over the past several years, monument staff implemented fuel treatments to reduce fire risk and a prescribed burn conducted in 2015 to restore this important ecological process.



Shrub and herbaceous species such as manzanita, whitethorn, and wild currant now dominate an area where the Rainbow Fire killed all of the overstory trees. Young trees have not been able to establish as distance to seed sources (living trees) is too great. NPS 2004.

Resource Brief: Monitoring Weather and Climate at Devils Postpile

Information on day-to-day changes in temperature, precipitation, windspeed, and other variables, or *weather*, is important for visitors planning trips to Devils Postpile National Monument, and for helping monument managers understand short-term variation in natural processes and resources. For example, the behavior of wildfires is affected by variation in daily weather. Long-term characteristics of atmospheric conditions, or *climate*, are also important to monitor, as climate is one of the most important broad-scale drivers influencing the Sierra Nevada ecosystem. Climate influences the distribution of plants and animals, snowpack and streamflow dynamics, and fire regimes. Warming temperatures related to global climate change are already resulting in a decrease in Sierra Nevada snowpack water content and earlier melt of the snowpack in the spring. These patterns can cause summer drought stress for plants, animals, and California communities and agricultural areas.

In 2005, National Park Service staff worked with the California Department of Water Resources and Scripps Institution of Oceanography to install a weather monitoring station at Soda Springs Meadow ([Balmat and Scott 2010](#)). The meteorological station measures ambient air temperature, barometric pressure, relative humidity, surface radiation, wind speed, wind direction, and precipitation. In addition, it is equipped with snow pillows—*instruments that can detect the amount of water content in the snow pack*.

Weather monitoring provides information about climate drivers that influence surface water and groundwater resources at Devils Postpile and the biological communities that depend on them. These data will contribute to the long-term understanding of climate in the Southern Sierra Nevada, allow fire managers to predict how a wildfire might spread over the landscape, provide information for California water managers to predict water availability for the local growing seasons, and contribute to the understanding of other ecosystem processes and resources in the monument. Sierra Nevada Network Inventory and Monitoring staff will use data from this station as part of their climate monitoring project.

The existence of a highly visible weather station and online real-time weather data present excellent opportunities for interpretation of weather, climate, climate change, snowpack, streamflow, and other related topics for the monument's visitors and neighboring communities. Data from the Soda Springs weather station is uploaded daily and can be viewed year-round in graph format by visiting [Scripps' website](#). For more weather information, the [California Department of Water Resources Website for Devils Postpile](#) provides daily readings from the monument's meteorological station.



The Devils Postpile meteorological station in Soda Springs Meadow. An interpretive sign explains the importance of long-term weather data and why the station was located here. NPS photo: Jeff Balmat 2009

Meadow Ecosystems

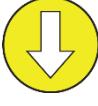


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Wet and dry meadows provide ecosystem services such as nutrient retention, flood control, and sediment storage as well as critical habitat for numerous plant and animal species. They harbor a high proportion of biodiversity in the Sierra Nevada relative to the small area they occupy. Soda Springs Meadow is the largest wetland and riparian complex in the monument and its condition is measured by native plant species diversity, invertebrate diversity, hydrology, and anthropogenic impacts. The Sierra Nevada Network Inventory and Monitoring Program has initiated monitoring of plant communities, hydrology, and invertebrates in Soda Springs Meadow, but there are insufficient data for trends to be assessed at this time.

Local impacts from recreation, water use, and non-native species, as well as regional-scale anthropogenic stressors like climate change and air pollution can affect wet and dry meadows. Humans can directly impact meadows by creating informal trails, which damage vegetation, alter water flow, compact soils, accelerate erosion, and fragment habitat. Other anthropogenic disturbance may include past actions such as ditching, altering water flow, and/or planting non-native grasses. Climate change may reduce water availability in wetlands and result in drying conditions and changes in species composition. Deposition of pollutants such as nutrients and pesticides may also affect the health of plant communities in wetlands. In addition, nonnative species compete with native plants for habitat, may replace native species important to wildlife, and can alter hydrology. Protection of meadow vegetation and habitat is important for maintaining ecosystem function and resilience. Current management efforts, including fencing and a formalized trail system, help to reduce informal trail development and use within the meadows, protecting this sensitive habitat.

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Percent Wetlands in Desired, Good, or Poor Condition	California Rapid Assessment Method Score		A spatially comprehensive assessment of all wetlands within the monument conducted in 2006 found most wetlands to be at or above the desired condition using the California Rapid Assessment Method for Wetlands and Riparian Areas (CRAM) (Denn and Shorrock 2009). Based on the assessment, thirty-seven percent of the monument's wetland acres represent desired condition, sixty-three percent are in good condition, and less than 0.5% are in poor condition. Repeating the assessment in the future will provide a trend in condition.
Soda Springs Meadow Plant Community	Native plant species richness Presence/abundance of non-native, invasive plant species		The initial years of data collection for the Inventory and Monitoring program's wetland monitoring plot (2009, 2014) identified a total of 29 native and 0 nonnative vascular plant species and 1 bryophyte. These data will be compared with other similar wetlands to determine if this is within the range of expected species richness. No trend was determined. Other monitoring in Soda Springs meadow indicate that non-native grasses including Kentucky bluegrass (<i>Poa pratensis</i>), annual poa (<i>Poa annua</i>), sweet timothy (<i>Phleum pratense</i>) and dandelion (<i>Taraxacum officinale</i>) do occur but abundance, distribution and effect on meadow condition are unknown.

Soda Springs Meadow Hydrology	Depth to groundwater during growing season; Abundance of obligate wetland plants		Based on data from a groundwater monitoring well installed in Soda Springs Meadow in 2010, water levels between October 2011 and December 2012 were lowest in the months of October–February, after a period of little precipitation (autumn) when river levels are low, or snow covers the ground. Groundwater levels begin to rise in late February–March, peak in April–May, then decline through the summer months and into fall. When compared to other montane meadows, this is a fairly typical pattern for an average precipitation year. Intermittent measurements of four groundwater monitoring wells on the east side of Soda Springs Meadow indicate that groundwater levels are strongly influenced by river levels. Long term data is needed to determine trend.
Soda Springs Meadow Invertebrates	Terrestrial invertebrate diversity		A 2005 survey in dry meadow habitat documented 77 species, representing eleven orders and 50 families (Holmquist 2005). Annual monitoring of diversity of terrestrial invertebrates as part of the Inventory and Monitoring program's wetland monitoring plot (see resource brief) documented 62 invertebrate taxa in 39 families (2009). This is within the range of invertebrate diversity expected for this type of habitat (Holmquist, personal communication). Repeat inventory and survey are needed to determine trend.
Soda Springs Meadow Anthropogenic Disturbance	Presence/abundance of anthropogenic disturbance		Extent and condition class of informal trails in Soda Springs Meadow were assessed in 2009 and 2010. Results indicate that the majority of trails fall under the “stunted vegetation” condition class, which has a much higher potential for recovery than other condition classes. There was a moderate increase in impacted area in 2010 (as compared to 2009). This variation may be due to meadow wetness; in wet years the meadow stays saturated longer in the season and is more susceptible to trampling impacts. Evidence of historic grazing and impacts from adjacent trails were observed in the monument's wetland monitoring plot.

Resource Brief: Wetlands Monitoring in Soda Springs Meadow

Wetlands are a focus for long-term monitoring in the Sierra Nevada because they provide invaluable ecosystem services such as nutrient retention, flood control, and sediment storage as well as critical habitat for a variety of plant and animal species. The [Sierra Nevada Network Inventory & Monitoring program \(SIEN\)](#) established a long-term monitoring plot in the largest wetland in Devils Postpile National Monument, Soda Springs Meadow, in 2009. This monitoring project will provide basic information on the condition of targeted wetlands and to allow for the evaluation of long-term trends in wetland plant communities, groundwater dynamics, and invertebrates in Sierra Nevada national parks. This information provides a foundation for research, strategic planning, and interpretive programs.

Wetlands harbor a high diversity of plants that provide important habitat and forage for a variety of animal species. Tracking changes in wetland vegetation provides the opportunity for early detection of non-native species and information about how plant species respond to environmental change such as a warming climate. In wetland plots, SIEN staff monitors plant species composition and abundance annually.

The amount and seasonality of surface water from snowmelt, rivers, and streams, as well as groundwater levels, determine the water availability in wetlands during the growing season. Water availability affects what species of plants can grow in a wetland and the quality of habitat it provides for wildlife. Since water is so important to the condition of a wetland, groundwater level is monitored via a simple well installed in the monitoring plot, using a data logger and hand measurements.



Backswimmer in a Sierra Nevada wetland.
Photo: Jeff Holmquist.

Many insects' life cycles begin in rivers and wetlands; as adults, the insects disperse into adjacent upland forests and woodlands as the season progresses. Invertebrates are important prey for birds and small mammals, and serve as pollinators for plants. Invertebrates are also critical in decomposition, nutrient cycling, and physical processes. Monitoring invertebrate diversity in the wetland plot will increase understanding of the relationships between vegetation, invertebrates, and water availability in Devils Postpile and other Sierra Nevada wetlands.



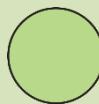
Installation of vegetation monitoring plot in Soda Springs Meadow. NPS photo 2009.



Measuring the water level in a wetland groundwater monitoring well. NPS photo 2009.

Native Mammals

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Devils Postpile National Monument, as part of the larger Middle Fork of the San Joaquin River watershed, has highly varied topography and vegetation and provides valuable habitat for mammals. In addition, the close proximity to relatively low passes contributes to local biodiversity by allowing movement of animals among surrounding diverse habitats. Native mammals are an important part of the ecosystem: they serve as grazers, browsers, and predators and they distribute seeds and nutrients across the landscape.

Limited information exists about the status and trends of mammals in and near the monument. Previous regional extinctions (grizzly bear), and potential losses or declines from human activities such as trapping (wolverine and Sierra Nevada red fox), suggest cause for concern and the need for additional inventory and monitoring data.

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Mammals (not including bats)	Species richness (Number of species)		<p>Based on all surveys (Patton and Chow 2015, Werner 2004) and observations, 23 mammal species (excluding bats) are documented as “present,” two as “probably present,” and one as “unconfirmed” (NPSpecies).</p> <p>Recent surveys in nearby Yosemite National Park show that the distributions of several small mammal species have changed, with some expanding their ranges or moving up in elevation, while others have shown range contractions or moved down. Potential drivers for the range shifts include habitat change due to altered fire regimes, or warmer drier conditions due to climate change (Moritz et al. 2008, Moritz et al. 2011). The greatest concern is for high elevation species whose distributions have retracted upwards. If the observed trends persist, these species may disappear as they reach the uppermost elevations in the Sierra and have nowhere left to go.</p>
Bats	Number of species Species of conservation concern		<p>A bat inventory conducted in 2001 and 2004 documented ten bat species, three of which are special status, in the monument (Pierson and Rainey 2009). An additional three species are likely to occur but were not positively identified during the inventory. Based on the limited data available, the current condition of bat species within the monument is fair to good (Kuhn and Whittaker 2014). Regionally, the most significant threat to bats is habitat loss, but drought and its effect on emergent aquatic insects, which play a major role in bat diet, is also a concern.</p>



Birds are particularly good indicators of change in terrestrial ecosystems because of their high body temperature, rapid metabolism, and prominent position in most food webs. Birds contribute substantially to animal diversity, representing about 70 percent of the total number of vertebrate species in Devils Postpile National Monument, and are a major focus of interest to monument visitors and the general public. As the Sierra Nevada's climate changes, increased temperature, decreased snowpack, altered fire regimes, and plant community shifts will likely alter the ranges of Sierra Nevada bird species. For example, as snowmelt occurs earlier, plant flowering and fruiting may not be in sync with bird arrival, foraging, and reproduction. Mountain-dwelling birds have already responded to climate change in many parts of the world by shifting their ranges upslope, and similar changes may already be occurring in Sierra Nevada parks. The Sierra Nevada Network Inventory & Monitoring Program initiated a bird monitoring project in 2011 that tracks bird density and distribution. Trend data are not yet available.

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Bird Populations	Species richness (Number of species)		<p>A variety of bird inventory, monitoring, and assessment projects have provided information about numbers of bird species in Devils Postpile National Monument (Siegel and Wilkerson 2004, Heath 2007, Steel et al. 2012a, 2012b). Including both formal and unofficial surveys, the total number of species detected within the monument is at least 114 and a formal species list is tracked in the online database NPSpecies. Twenty bird species documented in or near the monument are listed on one or more sensitive species lists.</p> <p>The Sierra Nevada Network bird monitoring project was initiated in 2011 (Siegel et al. 2010) and conducts annual point counts at the monument, thus providing data to assess species richness and density over time. During the first year of monitoring, 42 species were detected (Holmgren et al. 2012). Information from a combination of bird inventory and monitoring projects in the monument and regional assessments suggests that species richness is well within the range of what would be expected for the habitat types and size of the monument.</p>
	Bird density (Number of birds per unit area)		<p>Previous short-term monitoring of birds at the monument (2002–2006) indicated that some species were in decline and others increasing, but overall bird densities increased over this time frame (Heath 2007, Kuhn and Whittaker 2014). Regional Breeding Bird Surveys show larger numbers of species declining (Sauer et al. 2008). Seventeen of the species noted as declining at the regional level occur at Devils Postpile National Monument (Kuhn and Whittaker 2014). While the bird community condition was rated as fair to good (Kuhn and Whittaker 2014), numerous stressors affect birds across the region as well as in wintering grounds for migrating birds. There is cause for concern about the abundance of some bird species, and their current status is uncertain due to limited information on population trends.</p>

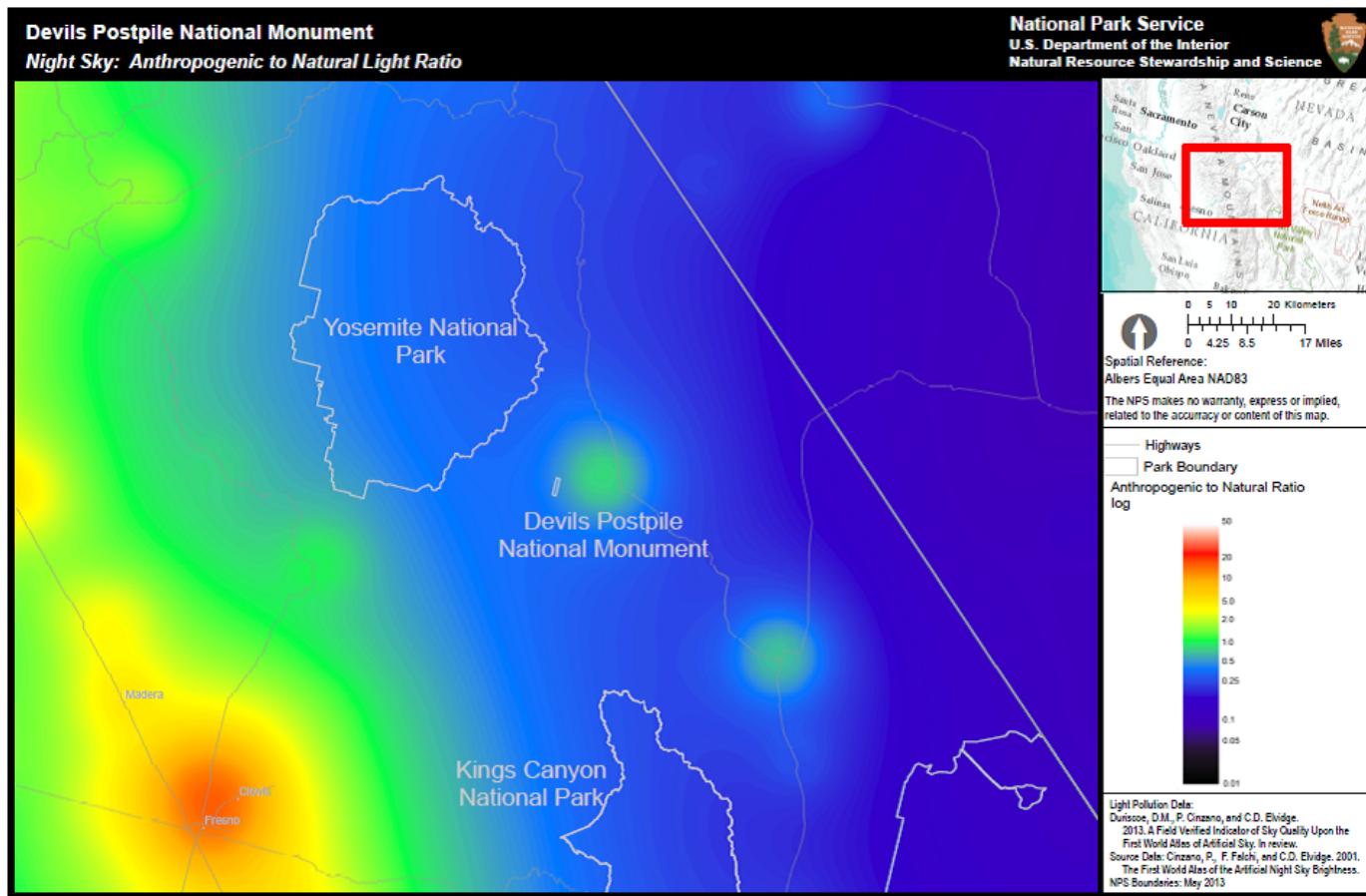
Dark Night Sky



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The night sky has been a source of wonder, inspiration, and knowledge for thousands of years. Unfettered night skies with naturally occurring cycles of light and dark are integral to ecosystem function as evident by the fact that nearly half the species on earth are nocturnal. The quality of the nighttime environment is relevant to nearly every unit of the NPS system as the nighttime photic environment and its perception of it by humans (the lightscape) are both a natural and a cultural resource and are critical aspects of scenery, visitor enjoyment, and wilderness character. Based on these considerations and the character of the park, it is recommended that Devils Postpile National Monument be categorized as non-urban, more sensitive. To preserve the dark night sky, the monument replaced all night lighting to reduce sky glow and glare, and minimized duration of light disturbance by installing motion sensors. This also reduces the impact on wildlife and allows visitors to experience a dark night sky. Learn more in the document [Recommended Indicators of Night Sky Quality](#), and the NPS Natural Sounds & Night Skies Division [website](#).

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Anthropogenic Light	Anthropogenic Light Ratio (ALR) — Average Anthropogenic Sky Glow: Average Natural Sky Luminance		Based on a quality measurement conducted six kilometers northeast of the monument in 2015, the Anthropogenic Light Ratio (ALR), a measure of light pollution, is 0.15, which is considered good. This is significantly lower than the modeled ALR, which is 0.52 because this geospatial model does not consider terrain. Although population growth in the local communities is expected, the trend is stable due to lighting regulations to control new lighting sources. The monument is separated from the Town of Mammoth Lakes by a mountainous ridge that blocks the artificial light. Some light from Mammoth Mountain Ski area may impact dark night sky but this is localized.



NPS Natural Sounds & Night Skies Division and NPS Inventory and Monitoring Program MAS Group 20141022

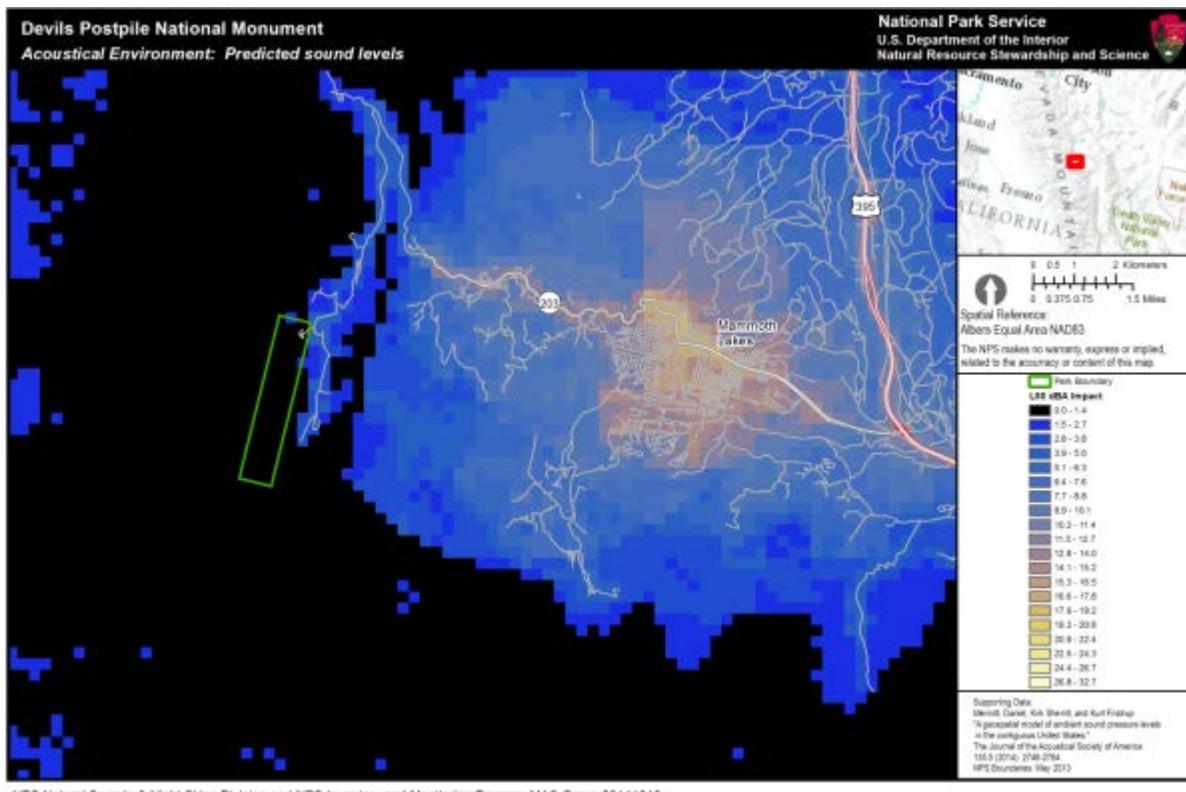
Acoustic Environment



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Every unit in the national park system has a unique acoustic environment, and every unit should understand what its desired acoustic environment would be. The quality of the acoustic environment affects visitor experience and ecological function. Acoustic resource condition, both natural and cultural, should be evaluated in relation to visitor enjoyment, wilderness character, ecosystem health, and wildlife interactions. Based on these considerations and the character of the park, the acoustic resources at Devils Postpile National Monument are in good condition under non-urban criteria. This also reduces the impact on wildlife and allows visitors to experience a dark night sky. Learn more in the document [Recommended Indicators for Acoustic Resource Quality](#) the NPS Natural Sounds and Night Skies Division [website](#), and the figure below.

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
L ₅₀ Impact	L ₅₀ dBA – a measure of noise contributed to existing acoustical environment by anthropogenic sources.		The mean L ₅₀ Impact (L ₅₀ dBA), calculated as the difference between existing ambient and natural ambient models, is 0.3 dBA. This indicates that the acoustic resources are in good condition based on non-urban criteria. Onsite measurements indicate that aircraft and vehicles contribute the highest proportion and frequency of anthropogenic sound (Formichella et al. 2007). Conditions may deteriorate due to anticipated increases in aircraft traffic in recent decades (Federal Aviation Administration 2010). However, flight paths from the local Mammoth Lakes Airport are not allowed over the monument.



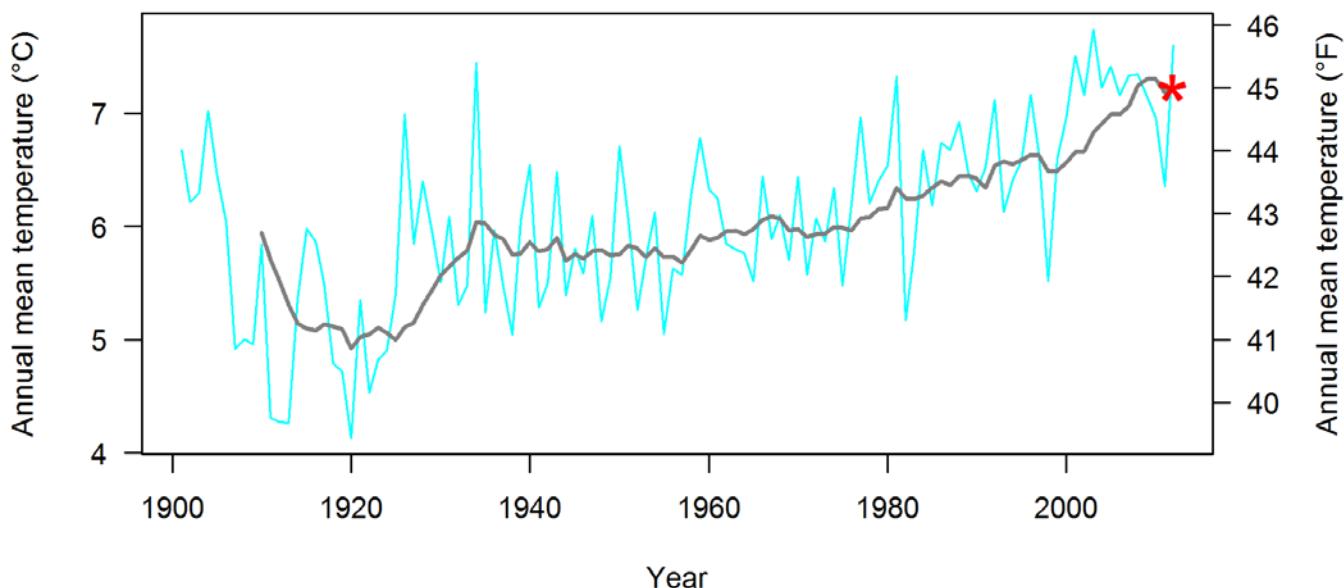
Specific L₅₀ dBA impact map for Devils Postpile National Monument, as generated by ver. 2.31 of geospatial model

Resource Brief: Climate Change at Devils Postpile National Monument

The climate in and around Devils Postpile is changing. Warming temperatures and shifts in the precipitation regime are affecting streamflow, wetlands, and ecosystem processes such as fire. Several studies document these observed changes, future projections, and potential impacts to park management. Findings include:

Observed trends:

Temperature: The past 10–30 years at Devils Postpile, on average, have been ‘extreme warm’ for 6 of 7 temperature variables ([Monahan and Fisichelli 2014](#)). This includes annual, summer, and winter temperature. ‘Extreme warm’ is defined as warmer than 95% of the historical range of conditions (1901–2012). See the figure below for an example using annual temperature. This finding suggests that resources within the park are already experiencing relatively anomalous conditions.



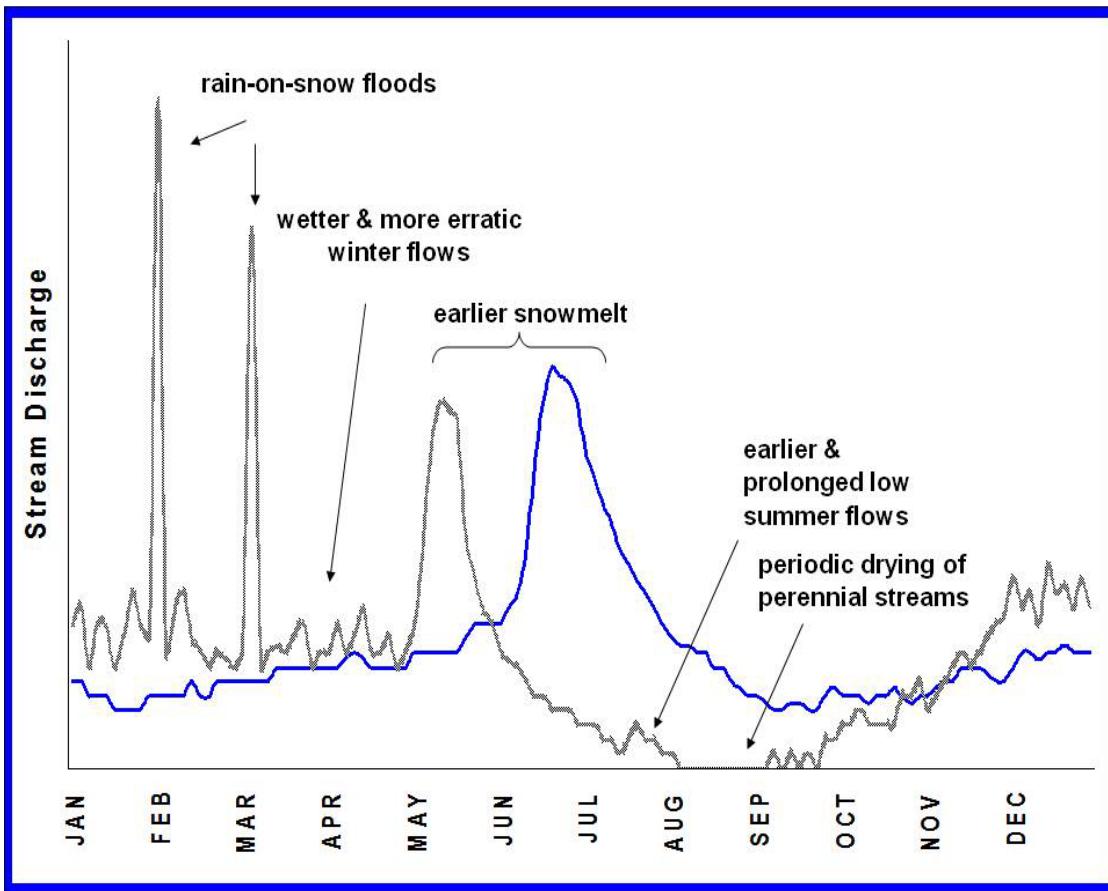
Graph showing the historical range of variability and the annual mean temperature at Devils Postpile and surrounding area. The blue line shows temperature for each year, the gray line shows temperature averaged over progressive 10-year intervals and the red asterisk shows the average temperature of the most recent 10-year interval (2003–2012).

Precipitation: The effect of climate change on the amount of annual precipitation is less clear than temperature changes but there are indications that the timing (seasonality) and type (rain vs. snow) is changing.

Hydrology: A synthesis of stream gage data across the Sierra Nevada indicates the following ([Andrews 2012](#), [Peterson et al. 2008](#)):

- Decrease in the total discharge between April and July (historical timing of peak flow)
- Earlier spring snowmelt
- Earlier onset of low winter and summer flows on some gages
- Earlier peak flow (22.5 days) comparing 1952 and 1990
- Increase in peak flow at some gages

Historical and projected streamflow changes are shown in the figure below.



Hydrograph depicting potential changes in Sierra Nevada hydrology predicted to occur with shifting precipitation dynamics and climate warming (gray line) and the typical historical hydrograph (blue line). Some of these anticipated changes are already being observed.
From David Herbst, Sierra Nevada Aquatic Research Lab.

Wetlands: The amount and seasonality of surface water from snowmelt, rivers, and streams, as well as groundwater levels, determine the water availability in wetlands during the growing season. Water availability affects what species of plants occur and the quality of wildlife habitat. Observed changes in stream flow are likely to affect wetland ecosystems and the flora and fauna that characterize them.

Ecosystem Processes: Plant communities at Devils Postpile are adapted to frequent fire (every 14–18 years) but over a century of fire exclusion contributed to the intensity of the 1992 Rainbow Fire, which resulted in high tree mortality. These areas remain shrub dominated communities with little conifer regeneration. Due to warming temperatures and diminishing snowpack in the most recent decade, the length of the fire season is increasing ([Westerling et al. 2006](#), Stephens et al. 2013). Historically, most fires occurred in mid to late summer through early fall but with a longer fire season, fires may occur in early spring and impact nesting birds, flowering and fruiting vegetation and greatly alter habitat conditions.

The Impact of Climate Change on Park Resources and Visitors:

- Recent climatic conditions are already shifting beyond the historical range of variability.
- Ongoing and future climate change will likely affect all aspects of park management, including natural and cultural resource protection as well as park operations and visitor experience.
- Park management can use these findings from these studies and ongoing research to plan for future impacts of climate change.

2.2. Cultural Resources

Archeological surveys of Devils Postpile and the surrounding area suggest that people have been present in the Devils Postpile area, crossing the Sierra crest west of present day Mammoth Lakes as far back as 7,500 years ago, and using and shaping the landscape in ways that reflected their physical needs and cultural values. Obsidian found within the monument suggests that the valley was used seasonally by tribes on the east and west sides of the Sierra and was likely part of a trade route from the Casa Diablo geothermal area, where the obsidian originated.

Volcanic activity, erosion, animals, and harsh winters have erased much of the evidence of the region's past, yet evidence of human presence remains and cultural resource specialists have identified historic and archeological sites, objects, trails, and places. Although access, heavy snow pack, high elevation, frequent volcanic activity, and territorial conflict has insulated the area from development occurring in more populated areas to the east and west, Devils Postpile National Monument preserves landscape features and historic resources reflecting the varied activities of many groups of people, including American Indians, miners, sheepherders, conservationists, scientists, park managers, rangers, local residents, and tourists.

Some archeological and/or historic sites, structures, and/or cultural landscapes may be of such significance to be eligible for consideration for Historic Register listing. Authorized by the National Historic Preservation Act of 1966, the National Park Service's National Register of Historic Places is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect America's historic and archeological resources that include districts, sites, buildings, structures, and objects. The Title 1 statute protects historic and prehistoric archeological sites within the definition of "historic properties that have cultural significance and worthy of preservation."

Sections 110 and 106 of the National Historic Preservation Act of 1966, which authorized the Register, require all federal agencies to maintain programs to identify, evaluate, and nominate to the Register any historic properties they own or control and to consider the effects of their actions on such properties. Steps in the process of consideration for listing include evaluation of the property and a nomination submitted to the State Historic Preservation Office; if determined eligible, a nomination is submitted for consideration for listing on the Register.

The cultural resources of Devils Postpile National Monument help reveal and connect us to the stories of people who have lived in, passed through, used, protected, or simply enjoyed this scenic landscape nestled in the central Sierra Nevada. The history of the monument is part of the history of the Sierra Nevada, and of the environmental transformation of mountain landscapes throughout the American West.

For more information, see the Devils Postpile National Monument historic resource study and administrative history, *Nature and History on the Sierra Crest: Devils Postpile and the Mammoth Lakes Sierra* ([2013](#)).

Archeological Resources



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Archeological resources represent evidence of past human activity that are generally at least 100 years old, and can provide understanding of patterns of past human behavior, cultural adaptation, and related topics. Archeologists utilize scientific or scholarly techniques and detailed observation to place artifacts in context of place and time for better understanding of past human relationships to nature and culture. Archeological resources can include stratified layers of household debris and the weathered pages of a field notebook, laboratory records of pollen analysis and lithic remains of obsidian. Archeological features are typically buried but may extend above ground. They are commonly associated with prehistoric peoples but may be products of more contemporary society. What matters most about an archeological resource is its potential to describe and explain human behavior such as family organization and dietary patterns, which have helped us to understand the spread of ideas over time and the development of settlements from place to place.

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research is conducted to understand the relationship of the park's archeological resources to the historical contexts for the park and surrounding area.		The Historic Resource Study and Administrative History, <i>Nature and History on the Sierra Crest: Devils Postpile and the Mammoth Lakes Sierra</i> , of the monument were completed in 2013 and identify historic contexts represented in known archeological sites.
Inventory	Percentage of park adequately surveyed.		The monument has completed 100% pedestrian inventory survey for archeological resources, completed after the 1992 Rainbow Fire.
Documentation	Research results are shared with park managers, planners, interpreters, and other NPS specialists; and integrated into park planning documents.		Summaries of archeological knowledge and plans for protections are described in the monument's General Management Plan (2015) and will be integrated into the Resource Stewardship Strategy.
Certified Condition	Percentage of archeological resources in good condition.		Four of twelve sites (33%) are listed and certified in good condition in the NPS Archeological Sites Management Information System. Two condition assessments have been completed, one in 2007 and the other in 2013 following the Devils Windstorm of 2011. Human impacts to the sites appear to be comparatively negligible, although the windstorm impacted some trees with blazes. Human causes are generally limited to minimal downslope wash, at some sites, and recreational use indicated by illegal fire rings and modern refuse at some sites that is mitigated by management actions.



The NPS defines ethnographic resources as any cultural and natural features in a park or monument that are of traditional significance to traditionally associated peoples. These peoples are the contemporary park neighbors and ethnic or occupational communities that have been associated with a park for two or more generations (40 years), and whose interests in the park's resources began before the park's establishment.

The Sierra divide east of Devils Postpile is typically described as a boundary between the North Fork Mono tribe to the west and the Owens Valley Paiute and Northern Paiute to the east. There is some debate as to how long these groups have been in the Sierra. Tribal histories suggest that contemporary tribes are descendants of the original inhabitants of the area. Some archeological interpretations suggest that Numic-speaking people have been widespread in the Great Basin for at least 10,000 years. A 1993 archeological survey of the monument indicated that the region was most likely "utilized seasonally" in the summer and fall perhaps by the North Fork Mono and Northern Paiutes. The Owens Valley Paiutes may have also used the Reds Meadow Valley at times. Trade between the North Fork Mono groups and the Eastern Sierra Paiutes by way of Mammoth Pass and the Reds Meadow Valley did occur. It is also likely that some groups entered the Reds Meadow Valley to collect materials for basketry and to hunt deer and other species. Today, the area's early trade and American Indian occupation and use are represented by numerous archeological sites in the monument.

In 2009, Devils Postpile National Monument outreached to local tribal groups during the General Management Plan scoping process and learned of the interest in involving tribal youth in educational and stewardship partnerships. This led to the staff at Devils Postpile National Monument and Bishop Paiute Tribe developing a partnership. The program, initially funded by the National Park Foundation, has grown into a sustainable and successful tribal outreach program and has engaged over 150 youth and their families from the Bishop Paiute Tribe. This partnership facilitates and reinforces connections between tribal youth and Devils Postpile National Monument.

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research exists to understand the relationship of traditionally associated tribes to the resources, places, and site.		Significant knowledge of historic uses was gathered and analyzed for the monument's Historic Resource Study (HRS). General knowledge on prehistory is based on research conducted at Yosemite, Sequoia and Kings Canyon National Parks, and adjacent Inyo National Forest. Site visits and consultations with traditionally associated tribes have contributed knowledge to understanding present and past connections to the area. The upward trend indicates that we are increasing knowledge of the connections that contemporary traditionally associated American Indian populations have to the monument's ethnographic resources through the ongoing ethnographic overview and assessment.
Inventory	Appropriate consultations document resources and uses, traditionally associated people, and other affected groups, and cultural affiliations.		In 2015, An Ethnographic Overview and Assessment for the Sierra Nevada Network of Parks, which includes the monument, began with a projected completion date of 2018. Consultations will continue, and project statements will be developed to enhance the inventory of ethnographic resources through ongoing consultation with traditionally associated American Indians about park programs and interpretive projects.

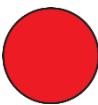
Documentation	Research results are shared with park managers, planners, interpreters, and other NPS specialists; and integrated into appropriate park planning documents.		The Historic Resource Study (2013) has been distributed to park managers, planners, interpreters, and other NPS specialists and integrated into planning and interpretive programs. The ongoing Ethnographic Overview and Assessment will be distributed to tribes for review and input. It will also document data gaps and make recommendations for filling those gaps through future research, park programs, and/or projects.
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Cultural Landscapes



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Cultural landscapes are settings humans have created in the natural world and reflect the interweaving of multiple cultural events, values, and practices. They reveal fundamental ties between people and the land—ties based on our need to grow food, give form to our settlements, meet requirements for recreation, and find suitable places for burial of deceased. Cultural landscapes contain both natural and constructed features: plants and fences, watercourses and buildings. They range from formal gardens to cattle ranches, from cemeteries and pilgrimage routes to village squares. They are special places: expressions of human manipulation and adaptation of the land. (For more information, [Click here](#))

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research exists to understand the relationship of the park's cultural landscapes to the historic context(s) for the park.		Cultural resource staff conducted a literature search and identified potential cultural landscapes in the Historic Resource Study (HRS). A funding proposal is in place to expand inventory efforts and conduct an evaluation.
Inventory	The scope of cultural landscapes in the park is understood and a determination has been made whether or not they are a fundamental resource.		A funding proposal is in place to conduct an inventory and evaluation, and determine if sites may be eligible for the National Register. Research results will be communicated to park staff and other NPS specialists, and integrated into appropriate planning documents.
Certified Condition	Percent of cultural landscapes with adequate National Register documentation.		A Cultural Landscape Inventory has not been completed. When complete, it will recommend National Register documentation.

Historic Sites, Structures, and Places



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Historic structures are associated with events that have made significant contributions to the broad patterns of our history and must be at least 50 years old. They embody the distinctive characteristics of type, time period, and/or method of construction; additionally, they have yielded or have the potential to yield information important in history or prehistory. Many of these structures are nominated, eligible or listed on the National Register of Historic Places (NRHP). Devils Postpile National Monument has a determination of eligibility and nomination in process for the Devils Postpile Cabin Remains site. Additionally, the Visitor Center/Ranger Station was designated in 2016. Future requests may include the Mammoth Pass Trail and the John Muir Trail.

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research is conducted to understand the relationship of the park's historic structures to the historic context(s) for the park.		There are two known historic structures in Devils Postpile National Monument. The Devils Postpile Cabin Remains site (also an archeological site) which includes the remains of a stone hearth and associated features, has been determined eligible for the National Register of Historic Places and a nomination is in process. The Devils Postpile Ranger Cabin (which currently serves as the ranger station /visitor contact building), has been listed on the Historic Register in 2016.
Inventory	Percentage of historic structures eligible for the National Register in the List of Classified Structures (LCS) with accurate, complete, and reliable data.		There are two known historic structures in Devils Postpile National Monument and both have NRHP determinations of eligibility and nominations in process.
Documentation	Percentage of historic structures with adequate National Register documentation.		100%. The Devils Postpile Cabin Remains site has been determined eligible for National Register Listing and a nomination is currently under review. A nomination is in place for the Devils Postpile National Monument Ranger Cabin with expected designation in 2016.

Resource Brief: Historic Devils Postpile Cabin Remains

Today, a stone pile is all that remains of the Postpile Cabin, which collapsed under heavy winter snows in 1954. In 2013, historic preservationists from Yosemite National Park worked on stabilizing this structure, which is the original chimney and hearth of the cabin, originally built in the 1870s. After a strong wind event in November 2011, park staff discovered what were believed to be historic artifacts in the roots of several toppled trees. Archeologists have since surveyed these items, helping to piece together the story of this site. Moore, a miner who favored fine hats and tweeds, one-armed mule packer Joseph Ivanhoe, or "Postpile Joe," and intrepid ski pioneer Orland Bartholomew were just a few of the men likely drawn here by a sense of adventure. Little is known about these men and about many of the other men and women who called this valley home in those early days, but their pioneering spirit has made them part of the legacy of Devils Postpile National Monument.



Postpile Cabin 1934. NPS photo

As early as 1934, visitors expressed a curiosity about this cabin, and despite its disrepair, some even asked to camp in it. Visitors often want to know: Who lived in this cabin? Why were they here? What role did these people play in shaping this valley? Today, through the study of artifacts and history, the National Park Service continues to piece together answers to these questions and perhaps ones to a much bigger question. What can sites like this tell us about our role in the future of the monument?



Park preservationist stabilizes the cabin remains in 2013. NPS photo

During the process of piecing together the story and stabilizing the hearth, a determination of eligibility of Historic Sites was presented to the California State Historic Preservation Officer, and a nomination is in process as of 2015.

Resource Brief: Historic Ranger's Cabin at Devils Postpile National Monument

Today, the Devils Postpile Ranger Cabin is located at the center of the visitor day use area and serves as the primary contact site for visitors. However, the cabin historically functioned as a residence for onsite National Park Service rangers.

Although a 1979 renovation compromised the integrity of the cabin's exterior materials and workmanship, as the oldest standing building in Devils Postpile National Monument, the ranger cabin provides a unique connection to the early period of NPS planning and development at the monument. It typifies the emphasis on efficiency, creative reuse of materials, and functional construction that became a feature of national park planning and development during the late 1930s and early 1940s. The cabin also embodies the utilitarian approach to planning that formed at Devils Postpile during its early years as a subsidiary of Yosemite National Park. Initially a response to severe budget and staffing constraints, the focus on maintaining quality visitor contacts with minimal facilities became a hallmark of Devils Postpile's administrative evolution.



Ranger Cabin 2014. NPS photo

The ranger cabin has a fascinating history, and was built in July 1941 as the first administrative building at the monument to replace a temporary tent shelter that had served as the ranger residence and contact station since the mid-1930s.

The small, two-room cabin is constructed primarily of sugar pine lumber salvaged from the historic Sentinel Hotel in Yosemite Valley, which was razed between 1938 and 1941. Based on anecdotal information from Devils Postpile National Monument, rangers maintained that the cabin had been an outbuilding of the Sentinel Hotel and the entire building was trucked intact to the current site. Logistical challenges and equipment requirements for moving the structure whole, versus transporting salvaged material and building it from the ground up, make it almost certain that it was not moved intact. A 2014 building inspection also noted the presence of different paint colors on sections of the subfloor and roof sheathing, places where paint would not typically be on an intact structure. The consistency of the design and construction with the more functional late or post-rustic style of national park construction from the late 1930s and early 1940s further suggests that the cabin was assembled from salvaged materials, rather than transported intact. The cabin has been renovated since its construction with repairs necessary to maintain the functionality of a structure that was initially meant to be temporary.

The cabin retains a high degree of integrity of feeling, association, location, and setting. The building continues to serve its original function as the monument's primary visitor contact station. The setting has changed somewhat but these changes do not detract from the historic character of the cabin or its setting. A nomination for listing on the National Register of Historic Sites is in place with an expected designation in 2016.



Ranger Cabin 1954. NPS photo



History programs conduct research on the monument's past, including the tangible and intangible events prior to and after designation, and may include more current history in Historic Resource and Administrative Histories of individual park areas. Histories of an object, event, a personal experience, or place provide context and a way for people to relate to and understand different time periods. We often refer to two different time periods; pre-historic (represents the time period before Euro-American settlement) and historic (the time period after Euro-American settlement).

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research is conducted to understand the national significance and historical contexts for the park.		Cultural resource specialists completed and published a Historic Resource and Administrative History Study in 2013. Monument staff is currently working on a cultural resources component of the park website, which will include access to these two documents.
	Sufficient research is conducted to establish the reasons for park establishment and a history of the NPS management of the site.		The Historic Resource and Administrative History Study (2013) documented original sources of historic references. The designation of the monument in 1911 is documented as the result of efforts by Forest Service officials working with the Sierra Club to prevent a plan to dynamite portions of the Postpile to build a dam. The administrative history also provides a comprehensive, professionally researched, and peer reviewed account of the monument's management from 1911 through 2012.
	Research supports cultural resource management.		The results of the Historic Resource Study (HRS) are integrated into the General Management Plan and the draft Resource Stewardship Strategy.
Inventory	Cultural resources are inventoried and evaluated in consultation with State Historic Preservation Officers (SHPOs).		The Historic Resources Study was completed in 2013. Two structures are determined eligible and have draft nominations for National Register in process. The Mammoth Pass Trail, the John Muir Trail, and an area of tree carvings associated with early sheepherders have been identified as potential National Register resources; and will require additional project funding to develop associated documentation.
Documentation	Research results are distributed to park managers, planners, interpreters, and other NPS specialists and integrated into appropriate park planning documents.		The NPS shared the Historic Resource Study with park managers, planners, interpreters, and other NPS specialists and is used in planning and interpretation. The printed book is available to the public through the interpretive association, and a project is in progress to provide digital access through the monument's website.



Museum objects are manifestations and records of behavior and ideas that span the breadth of human experience and depth of natural history. They are evidence of technical development and scientific observation, of personal expression and curiosity about the past, of common enterprise and daily habits. Museum objects range from historic maps, letters, documents, photos, geologic collections, herbariums, insect collections, oral histories, and may in the future include videos. They are an invaluable part of the body of knowledge.

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Scope of museum collection in the park is understood and a determination has been made whether or not they are a fundamental or other important resource.		The value of the Body of Knowledge, a fundamental resource and value includes museum collections and is identified in the monument's General Management Plan and Foundation Plan.
Inventory	Percentage of existing collection that is accessioned and cataloged.		28,850 objects (99%) have been catalogued. Two previous monument employees donated 8,000 slide images showing monument activities and conditions over a 30 year span. These have been catalogued and accessioned in 2015. Some images will be uploaded to the nps.mmp.gov website where the NPS Museum Management Program has photos of some of the cultural resources in collections of many parks.
Documentation	Park has current and appropriate baseline documentation (scope of collections statement, collection management plan, and emergency response plans for safeguarding collection).		An Emergency Response Plan for Museum Collections was completed in 2014, and a fire drill has been conducted. NPS Standards for Museum Management for museum curation and storage standards will need and hazards identified. The Scope of Collections was completed in 2010. In 2016–17, the Archival Survey and Cataloguing project will provide updated status report of the archives and recommendations.
Condition	Percentage of museum collection reported in good condition.		Collections are in fair to good condition and are located at three different locations: Devils Postpile National Monument Headquarters, Mammoth Ranger Station Administrative Office, and Sequoia-Kings Canyon National Parks. The conditions of the facilities the collections are stored in will be reviewed in the 2016–17, the Archival Survey and Cataloguing project.

2.3. Visitor Experience

Devils Postpile National Monument represents a vestige of the traditional undeveloped park experience in a rustic setting that promotes learning and intimate (time-honored) visitor experiences. Generations of visitors to the monument have sought and continue to expect a relatively quiet and natural setting where natural sights and sounds predominate. The rustic setting and traditional park experience at Devils Postpile brings us closer to the land by providing opportunities for solitude, exploration, experiencing simple pleasures, and developing a sense of place. History and historic buildings, structures and places are part of this traditional, undeveloped park experience. Visitors' comments express the sense of place and tranquility from being close to the sights and sounds of nature.

Visitors enjoy a range of recreational experiences that have traditionally been available within the monument, with an increased emphasis on self-discovery and opportunities to connect with nature. Traditional, low-impact recreation such as camping, day-hiking, backpacking, fishing, private stock use, bird watching, wildlife viewing, and sightseeing are available. Interpretive services are focused on connections to traditional park experiences, a diversity of activities, orientation, education, and interpretation consistent with the traditional rustic character of the area. As a gateway or introductory wilderness experience for many visitors, the monument uses techniques, programs, and media conducive to preserving wilderness character and a traditional, rustic built environment within the monument.

Another key element of the high quality visitor experience is the sense of arrival to the watershed of the Upper Middle Fork of the San Joaquin River watershed. The eons of geologic history reflected in the colorful strata, spectacular mountains, the lakes and river valley have a sense of immersion into beauty, wilderness, and a refuge from the hustle bustle of the modern world.

Visitor Numbers



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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Number of Visitors	Number of visitors per year		In 2015, the monument received nearly 30% more visitors (148,010) when compared with 2014 (114,415), and nearly 50% more than the ten year average (2005–2014 = 100,929). Weather, road closures, and other factors ranging from economics to wildland fires affect annual visitation numbers but the trend is showing increased visitation. Visitation is increasing at many NPS units and is expected to increase more during the 2016 Centennial. Wilderness use on the Pacific Crest Trail and John Muir Trail has increased significantly based on the number of permits issued, a more than 50% increase between 2013 and 2015.

Visitor Satisfaction



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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Visitor Satisfaction	Percent of visitors who were satisfied with their visit		Based on the standard visitor satisfaction survey conducted each year, the percentage of visitors satisfied in FY13 was 99.0%, which is higher than the average for the previous five years (95.8%) and ten years (96.1%). Source: 2013 Visitor Survey Card Data Report

Informal Visitor Contacts	Number of informal visitor contacts		The total numbers of informal contacts (75,127) in 2013 was lower than the five year average of 86,700. Informal contacts are largely affected by the number of staff available.
Visitor Experience	Number of people encountered at one time		Baseline indicators and standards for visitor experience were determined for the Devils Postpile and Rainbow Falls viewing areas. For Devils Postpile, visitors shall not encounter more than 26 people at one time (PAOT) 90% of the time between 8am and 6pm. Based on data collection in 2013, no measurement exceeded 14 PAOT, well below the standard. For Rainbow Falls, visitors shall not encounter more than 44 PAOT 90% of the time between 8am and 6pm. Based on data collection in 2013, no PAOT measurement exceeded 22, well below the standard. Although these numbers indicate a preliminarily good pattern, very limited data has been collected and the trend could change over time, particularly with the increase in visitation.
Visitor Wait Times for Shuttle Bus Service	Waiting time		Visitors will not wait more than 30 minutes 90% of the time for shuttle buses at stops 6, 9, and 10. Based on data collection in 2013, the average wait time was 9.12 minutes, with the maximum wait time of 28 minutes, which falls below the standard. Although these numbers indicate a preliminarily good pattern, very limited data has been collected and the trend could change over time.

Interpretive and Education Programs – Talks, Tours, and Special Events



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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Education Programs	Number and quality of programs, and number of participants		The total number of programs in 2013 (22) is consistent with the 5-year average of 21.8; however, total attendance at those programs (614) was up from the 5 year average of 543 participants. The introduction of online curricula in 2013 was also a positive addition to the Education program. Shortages in funding for NPS staff to provide these programs are possible threats in the future.
Ranger Programs	Number and quality of programs and attendance		Formal program attendance in 2013 was 9,183, which was higher than the five year average of 7,053. The number of programs offered was 147, which was slightly less than the five year average of 169.4. Possible shortages in funding for NPS staff to provide these programs are a possible threat in the future.
Junior Ranger Programs	Number of programs and attendance		Devils Postpile offers free Junior Ranger books and patches upon their completion. The number of books (2,614) and patches (1,421) handed out in 2013 were slightly higher than the five year average of 2,513 and 1,421 respectively. A new book design in 2009 and assistance from Mammoth Lakes Welcome Center staff with the Junior Ranger program have improved opportunities for youth.

Community Interpretive Programs	Variety and longevity of events and community involvement		With long-running and sustainable programs like the Firstbloom program and Library Story Hour, community outreach programs have increased over the years, but staffing to maintain and expand programs remains a challenge.
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Resource Brief: Youth Engagement

Devils Postpile is committed to youth engagement through educational programming (see resource briefs on curriculum and Firstbloom), volunteerism, and internship opportunities. In the last five years, the monument has participated in Library Story Hour (pre-school), the Girl Scout Ranger program and has engaged several Boy Scout troops in service learning projects and programming. The monument also partners annually with the Student Conservation Association to employ youth through internships in facilities, resource management and interpretation and visitor services. Annually, the monument hosts between six and ten youth interns. The monument has been fortunate to receive project funding for youth projects and has partnered with other regional parks to engage YCC crews in monument work.



SCA intern engages youth in learning about natural resources. NPS photo 2015.

Resource Brief: Firstbloom

Firstbloom is an environmental education program focused on Bishop Paiute children in 4th and 5th grades. The program began in 2009 as a collaboration between the Bishop Paiute Tribe and Devils Postpile National Monument with funding from the National Park Foundation. This collaboration has grown to include support from the Bishop Union Elementary School Tribal Liaison and Owens Valley Career Development Center. Additional contributors include the U.S. Fish & Wildlife Service, Metabolic Studio, and the National Park Service. Firstbloom is a one-year program, beginning in September and ending in August. Students attend an introduction to the program and those that are interested sign a contract to participate for the full year. There is space for 30 kids per year. The group meets once or twice monthly, in accordance with a schedule that has been prepared prior to them signing up. Meetings range from two-hour after school activities to three-day camping trips in local national parks. Each year the program has an environmental theme, like watersheds, native plants or climate change, and each activity is focused on the theme chosen for that year. The program has reached over 180 tribal youth and their families during its six year run. The experiences are immersive, stewardship based, and part of a continuum of NPS experiences for tribal youth. In the past six years, the participants have visited Devils Postpile NM, Manzanar NHS, and Yosemite NP annually. Other national park sites have included Death Valley (five of six years), Cabrillo NM (one year), and Channel Islands NP (one year).



First Bloom group completing ecological restoration in Tuolumne Meadows, Yosemite. 2013. NPS photo

Resource Brief: Climate Curriculum

Climate science resources for educators have been developed at Devils Postpile National Monument. Through a combination of classroom, virtual, and field-based methods, students will have real hands-on opportunities to explore climate change through the lens of the National Park Service. The project contains two sets of curriculum, with eight lessons each, that focus on different aspects of climate change. Exploring Climate Science was designed around 5th grade Next Generation Science Standards and has a winter snow theme. Students will explore climate change through investigation of the snowpack and data collection of the snow water equivalent. In Climate Science in Focus, based on 9th grade Next Generation Science Standards, students examine rivers and collect data on streamflow. Both units are fully adaptable and allow teachers, community educators, non-profit partners, or other parks to pick and choose the lessons they would like to do and adapt them easily to their area. There are also sample field lessons included to make the curriculum even more user-friendly. Each set of curriculum has a Traveling Trunk containing the necessary materials to complete the unit that educators can check out. Procedures and worksheets for individual lessons are also provided. These are set up to be available to any educational institution free of charge.

Digital Outreach: Each unit contains a lesson called NPS connections. This allows teachers to connect virtually with Devils Postpile, or any National Park Service unit of their choice that offers virtual lessons related to climate science. How-to manuals have been developed and included in the teacher packets. The how-to manuals focus on setting up the lesson in the classroom and how to use a variety of virtual outreach tools such as Google Hangout, Facetime, and Skype. Web-based Resources: All lessons and curriculum components have been uploaded via the new NPS education portal. Educators have access to every lesson plan and accompanying worksheets, videos, and other materials via the education portal.



Students learn about snowpack through a climate curriculum 2014. NPS photo

Interpretive Media – Brochures, Exhibits, Signs, and Website



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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Wayside Signs (In Valley)	Condition and currency of signs		New waysides have been installed in most areas of the park in the last five years. Waysides are current and information and scholarship is accurate. All waysides are in the process of being added to FMSS. Only brand new waysides installed in 2014 have not yet been added.
Wayside Signs (Out of Valley)	Condition and currency of signs		New waysides have been installed at two interagency locations outside of the valley to address information and safety deficiencies. Minaret Vista waysides were installed in 2009 and Adventure Center waysides were installed in 2011. The monument continues to partner with the Inyo National Forest on wayside projects from which both agencies benefit.
Park Directional Signs (off-site)	Usefulness, quantity, and placement		Park directional signs exist on Highway 395 just outside of Mammoth Lakes. Additional signs along Main Street (Highway 203) provide directions for visitors once they get to Mammoth Lakes.

Exhibits	Geology Exhibit: Accuracy of information, general condition of the exhibit		This exhibit is outdated and in need of redesign and replacement. It provides decent information, but it is not ADA accessible and the depth of information limits its usefulness to children and adults with minimal knowledge of geology.
	Tree Exhibit: Accuracy of information, general condition of the exhibit		This exhibit is outdated and in need of redesign and replacement. Information is difficult to read, is not ADA compliant, and provides little if any interpretive opportunity for visitors.
Print Media	Accuracy and availability of primary park publications		In the last five years, improvements have been made in the design and content of the monument's newspaper and that was moved to an interagency paper covering all sites in the Reds Meadow Valley. New print material includes a geology site bulletin produced in 2011, multiple resource briefs available to visitors, and a new Spanish Language brochure completed in 2013. Currently, none of the monument's brochures, including the unigrid, are available in large print or braille format for those visitors with visual impairments and issues in partner distribution of printed materials exist.
Websites	Currency and scope of website; number of website visitors		Website material is up to date and accurate. Extensive improvements are under way to the cultural resources section of the site, with new content currently under review. Videos and other multimedia content have been added in the last three years. A website inventory was completed in 2014.
	Social media: Facebook updates and "likes," overall activity		The monument joined Facebook in 2008 and Twitter shortly thereafter. The diversity and quantity of posts has increased as has the amount of page "likes" and followers. The monument also has a YouTube page and adds produced videos annually.

Accessibility



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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Mobility	ADA compliance		DEPO has two accessible comfort stations, one in the day use area and one in the campground adjacent to an accessible campsite. All mandatory shuttle buses are designed for accessibility. Waysides recently added in the day use area of the monument provide information to visitors who choose not to or physically cannot make the hike to the Postpile or Rainbow Falls. The ranger station does provide a ramp for visitors with mobility impairments. Navigation of the trail to the Postpile is possible for visitors with assistance and trail capable wheelchairs. A ramp and railing was installed in 2012, which increased accessibility for visitors with mild to moderate mobility impairments or for those with assistance.

Auditory Accommodation	ADA compliance		Captioning is available on all YouTube videos for virtual visitors.
Public Transportation	Access to park via public transportation		Improvements to the sustainability and connectivity of the Reds Meadow Shuttle system have been made in the last five years. A partnership with Eastern Sierra Transit has improved consistency and communication with the shuttle bus system.
Multi-lingual Resources	Audio and print materials in multiple languages Bi-lingual staff		A new Spanish language brochure was completed in 2013. A Spanish language Junior Ranger book was designed and completed in 2012; however, funds to print the book have not yet become available. At times bi-lingual staff is available.

Safety



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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Visitor Safety	Recordable incidents		The safety of visitors is a park priority. The park works to quickly identify and mitigate potential hazards, and the number of accidents is very low. A visitor safety plan was completed in 2009. The monument works annually to implement strategies identified in that plan.
Staff Safety and Training	Number of staff trained		All park staff has completed Operational Leadership Training. CPR, First Aid, and AED training are offered to staff on a space available basis. Job Hazard Analysis is conducted before jobs throughout the park. Regular safety messages are given and distributed to staff members. A new safety plan is in progress. Evacuation plan and instructions have been completed and distributed to all staff.

Partnerships



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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Volunteers	Number and hours contributed		Volunteer hours and diversity of projects has increased annually over the last five years. Sustainability and maintaining returning volunteers continues to be a challenge. Volunteer hours have remained consistently between 2,000 and 3,000 hours annually; however SCA Interns provide most of those hours.
Partnerships	Number of official and unofficial partnerships		As a small park with a few staff, partnerships are key to all functions of the monument. Partners from the Town of Mammoth Lakes and Caltrans plow the roads for seasonal opening. Mono County and Town of Mammoth Lakes provide emergency services support for advanced life support, extended searches, and law enforcement backup. Inyo NF and the monument partner in providing fuels management, trail work, and visitor services at the Interagency Welcome Center along with Eastern Sierra Interpretive Association and Mammoth Tourism. Education partnerships for tribal youth are ongoing in the First Bloom program. A partnership with Outdoor Experiences program, the Los Angeles Department of Water and Power, and Mono Lake Committee brings underrepresented youth to monument. Research partnerships for data collection analysis are ongoing with Pacific Southwest Research Station coordinating multiple partners in air quality studies, and USGS and UC San Diego Scripps on hydrology, snowpack, and climate.

Recreational Opportunities



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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Hiking	Quality of trails		Routine maintenance and improvements are made to the existing trails annually. Trails provide access to both Postpile and Rainbow Falls. Wilderness trails provide access to the John Muir and Pacific Crest Trails.
Camping	Campsite availability and quality		The 21-site campground continues to offer first-come first served campsites to monument visitors. Campgrounds are patrolled regularly and rest rooms are cleaned daily.
Fishing	Fishing access and availability		Several access trails and points along the Upper Middle Fork San Joaquin River are provided for anglers. A commercial use permit system is in place for fishing guides.

2.4. Park Infrastructure

Overall Facility Condition Index



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The National Park Service uses a facility condition index (FCI) to indicate the condition of its facilities and infrastructure. FCI is the cost of repairing an asset, such as a building, road, trail, or water system, divided by the cost of replacing it. The lower the FCI number, the better the condition of the asset. The condition of the buildings and other infrastructure assets at each park is determined by regular facility inspections, or “condition assessments,” including daily informal inspections and formal yearly inspections. Deficiencies identified from these assessments are documented in the NPS Facility Management Software System and the cost for each repair determined. Repairs that cannot be completed within the year count against the condition of a structure. The total cost of these deferred repairs divided by the total cost to replace the structure results in the FCI, with values between 0 and 1 (the lower the decimal number, the better the condition). The FCI is assigned a condition category of Good, Fair, Poor, or Serious based on industry and NPS standards. Deferred maintenance projects that require additional funding are identified based on FCI. Planned preventive maintenance on critical components occurs during the year, using a park’s base budget. For additional information about how park managers use information about the condition of facilities and infrastructure to make decisions about the efficient use of funding for maintenance and restoration activities at the park, [Click Here](#).

Asset Category	Number of Assets 2008 / 2013	FCI 2008 / 2013	Condition Status/Trend	Rationale
Buildings	15 / 16	0.107 / 0.001		Buildings are maintained on a regular cyclic schedule. The increase in number is due to adding an employee facility, which greatly improved living conditions for staff. The comfort stations are in need of upgrades.
Campgrounds	1 / 1	0.176 / 0.143		Grounds maintenance in the campground is done annually. Work orders exist in the system for future years' projects contribute to current FCI.
Trails	12 / 12	0.272 / 0.144		Trail maintenance is performed annually. 2013 FCI show some trails in poor condition but this could be an artifact of having several years of planned maintenance work orders in queued projects. Some sections of trail need significant work to improve drainage and stabilization.
Waste Water Systems	1 / 2	0.079 / 0.083		The park added the interagency septic system to FMSS; the septic system is located adjacent to the Rainbow Falls trailhead parking lot. The aging lift station pumps will be updated and replaced in 2016
Water Systems	1 / 1	0.135 / 0.129		The water system is in need of upgrades to improve leaking pipes and replace pumps. A project to replace water lines is planned for 2016 and another to add a second smaller potable water tank for 2017.
Unpaved Roads	2 / 2	0.000 / 0.000		Unpaved parking lots and roads have needed little maintenance and show little sign of needing any major repair.

Paved Roads, Parking Areas, Bridges	1 / 1	0.028 / 0.037		Sections of the entrance road were widened in 2013 to improve traffic flow and safe travel of buses. The overall condition of the road is deteriorating over time and stormwater drainage is inadequate. To conduct preventative maintenance, project funding will be requested in future years. Two pedestrian bridges in the monument are in good condition.
All Others	8 / 8	0.041 / 0.098		The major component of this category is the Electric System. A project to update the electrical system was completed in 2014.

Resource Brief: Green Parks Plan

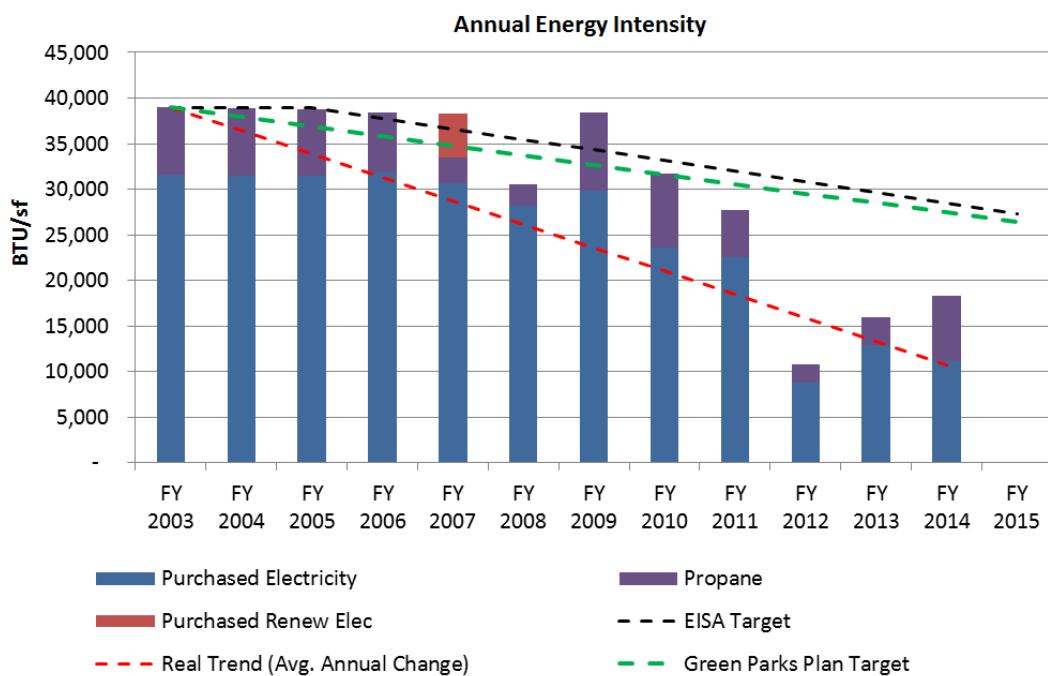
The NPS manages the largest number of constructed assets of any civilian agency in the Federal Government. It operates more than 67,000 structures that account for more than 50 million square feet of constructed space such as visitor centers and historic structures. The [Green Parks Plan](#) (GPP) defines a collective vision and a long-term strategic plan for sustainable management of NPS operations. A critical component of the implementation of the GPP will be informing and engaging parks' staff, visitors, and community partners about climate change and sustainability to broaden opportunities to foster change.

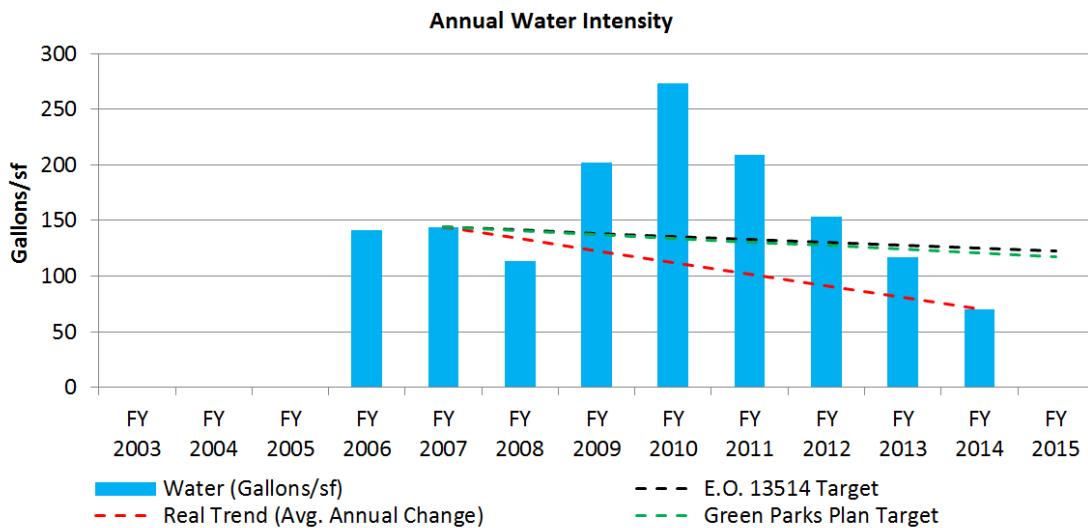
The Vision defined in the GPP plan is, “The NPS will preserve park resources unimpaired for the enjoyment of current and future generations by reducing its environmental impact through sustainable operations, design, decisions, and management at every level of the organization.” The plan is based on nine strategic goals that focus on the impact of facilities on the environment and human welfare. Two of those goals are closely aligned with Park Infrastructure as defined in this State of the Park report. Those are:

- Be Energy Smart: The NPS will improve facility energy performance and increase reliance on renewable energy; and
- Be Water Wise: The NPS will improve facility water use efficiency.

For Energy, one of the performance objectives is to reduce Servicewide building energy intensity by 35 percent by 2016 from the 2003 baseline, where energy intensity is energy consumption per square foot of building space. For Water, one of the performance objectives is to reduce potable water use intensity by 30 percent by 2020 from the 2007 baseline.

Historical data for energy and water consumption reported by Devils Postpile NM and available in the Energy Data Reporting Tool (EDRT) is shown below. Use can vary widely depending on length of season (e.g., large snowpack can delay opening of the monument) and weather conditions.





Highlights for DEPO include:

- Energy consumption has decreased dramatically in the last several years in part due to installation of and replacement with energy efficient appliances and fixtures.
- Energy intensity is well below the agency level goals.
- Water Intensity is well below agency level goals.
- Water use in 2014 decreased dramatically perhaps in part due to water conservation measures due to drought conditions.

Park Carbon Footprint

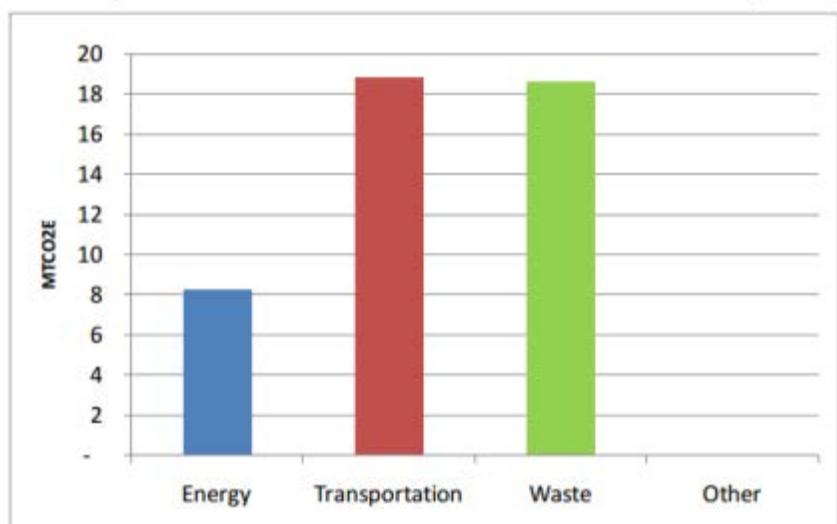
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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Greenhouse Gas Emissions	Metric tons of CO ₂ equivalent (MTCO ₂ E)		The largest emission sectors for Devils Postpile National Monument are transportation and waste, each totaling 19 MTCO ₂ E. The transportation sector is the combined emissions from park operations and visitor vehicles. All visitors, with some exceptions, are required to ride the shuttle bus, which significantly reduces emissions from visitor vehicles. It is estimated that the required use of the shuttle bus reduced vehicle miles traveled (VMT) into the monument by 437,779 miles in the 2009 season; this reduction in VMT decreased the CO ₂ emissions of our visitors by approximately 118 MTCO ₂ E. Measured decreases in energy consumption over the past five years indicate that the monument is reducing its carbon footprint.

Profile – Park Carbon Footprint

Carbon Footprint is measured by greenhouse gas (GHG) emissions resulting from the combustion of fossil fuels for transportation and energy (e.g., boilers, electricity generation), the decomposition of waste and other organic matter, and the volatilization or release of gases from various other sources (e.g., fertilizers and refrigerants). A decreasing carbon footprint indicates the park is striving to reduce its impact on the climate change through mitigation efforts. In 2008, the baseline GHG emissions were set within DEPO totaled 46 metric tons of carbon dioxide equivalent (MTCO₂E). This includes emissions from park and concessioner operations and visitor activities, including vehicle use within the park. To put this in perspective, a typical U.S. single family home produces approximately 12 MTCO₂ per year (U.S. EPA 2011). Thus, the emissions from park operations are roughly equivalent to the emissions from the energy use of four households each year.

The largest emission sectors for Devils Postpile National Monument are transportation and waste, each totaling 19 MTCO₂E. Purchased electricity comprises 89 percent of emissions from energy and 17 percent of total park emissions.



Devils Postpile National Monument intends to reduce emissions produced by park operations as follows:

- Energy use emissions to 35 percent below 2008 levels by 2016.
- Waste emissions to 35 percent below 2008 levels by 2016 through waste diversion and reduction.
- Maintain transportation emission levels.

To read more about what we are doing at Devils Postpile National Monument about Climate Change, check out our [Action Plan!](#)

2.5. Wilderness Character

Wilderness Character



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The Wilderness Act of 1964 requires the NPS to maintain Wilderness character, including the qualities of being “...untrammeled by man...undeveloped...natural,” and allowing for “...solitude or primitive and unconfined recreation.” The monument encompasses 798 acres (323.6 hectares) of which 687 acres (85%) is designated wilderness (Ansel Adams Wilderness) and linked with one of the largest contiguous wilderness areas in the lower 48. Devils Postpile provides a gateway for a myriad of wilderness experiences, and protects natural processes while providing opportunities for personal renewal, inspiration, artistic expression, and connection to the landscape. The Pacific Crest Trail and John Muir Trail pass through the monument’s wilderness. Use of these trails has increased significantly in the last five years and may impact wilderness quality.

Wilderness Quality	Condition Status/Trend	Rationale
Natural		Due to its relative isolation and position within a largely intact landscape managed as wilderness, natural resources within the monument are relatively unimpacted. However, outside stressors and threats, such as air quality, can affect natural systems. In addition, some non-native plants and animals occur in the monument. The most profound impact on the natural quality of wilderness is fire exclusion and the resulting altered fire regime. The Rainbow Fire (1992) resulted in unprecedented high severity due to unnatural accumulation of fuels and high density of trees after nearly 100 years of fire exclusion.
Undeveloped		The undeveloped quality of wilderness character in Devils Postpile National Monument is generally good. Installations include small temperature sensors, USGS river gaging equipment, and groundwater monitoring wells. Motorized equipment, such as chainsaws, may be used for administrative purposes, consistent with minimum requirement analyses. The park carefully reviews any new proposed installations and considers cumulative impacts and relevancy before making a determination.
Untrammeled		Wilderness within Devils Postpile National Monument is generally unhindered and free from most human manipulation. However, fire suppression does occur and degrades the untrammeled quality of wilderness. Other trammeling may include small ecological restoration projects to protect or improve the natural quality of wilderness.
Solitude or Primitive and Unconfined Recreation Opportunity		Devils Postpile National Monument wilderness offers a range of opportunities for solitude or primitive and unconfined recreation. The range extends from the well visited wilderness portal at Rainbow Falls to the John Muir trail, which passes through the second largest contiguous wilderness area in the lower 48 states. The easy access to wilderness within Devils Postpile National Monument does mean that opportunities for solitude can be compromised during peak visiting hours at the height of the summer season. However, morning and evening hours and the shoulder seasons offer visitors and wilderness enthusiasts more solitude, even at Rainbow Falls. Opportunities for primitive and unconfined recreation are reduced by several facilities that decrease self-reliant recreation. Trails are well developed and signs at trail junctions are common. The viewing area at Rainbow Falls includes interpretive panels, a hitching post, formalized viewing platforms, and a staircase to the base of the river. In addition, the Soda Springs bridge and stock bridge, as well as signage, reduce opportunities for primitive recreation in these specific areas. In most areas of the monument, solitude or primitive and unconfined recreation is available at all times. However, the substantial increase in numbers of hikers on the Pacific Crest Trail and John Muir Trail (both pass through the monument) in the past five years may reduce opportunities for solitude.

Chapter 3. Summary of Key Stewardship Activities and Accomplishments

Activities and Accomplishments

The list below provides examples of stewardship activities and accomplishments by park staff and partners to maintain or improve the condition of priority park resources and values for this and future generations:

Natural Resources

Completed

- Established a stream gage on the Middle Fork of the San Joaquin River in the monument in collaboration with the United States Geological Survey (USGS) and NPS Sierra Nevada Inventory and Monitoring Network (SIEN), (2009).
- Established a weather station at the monument in collaboration with the USGS, SIEN, Scripps Institution of Oceanography (SIO), and California Department of Water Resources (CDWR) to monitor temperature, precipitation, snow cover, wind speed and direction, and soil moisture (2009).
- Completed research on the age of the Postpile formation (2012).
- Completed a wetland inventory and condition assessment.
- Completed a soundscape assessment at different locations in the monument.
- Developed fire and fuels management plan to address reducing fire risk and restoring the natural fire regime.
- Completed a fire history study (2006).
- Completed fuel treatments and prescribed fire to reduce fire risk and restore fire as an ecosystem process (2015).
- Completed an assessment of the effects of the Devils Windstorm on monument forests (2011).
- Completed riverbank restoration to reduce erosion and re-establish riparian vegetation (2010).
- Completed a visitor use assessment focusing on riverbank condition, informal trails in meadows, water quality and visitor experience (2010).
- Completed baseline condition assessments and implemented a monitoring program to assess visitor use and resource protection (2013).
- Reduced human impacts in Soda Springs Meadow through ecological restoration, removing informal trails, fencing, and trail delineation (2010).
- Completed and implemented an invasive plant management plan to limit the establishment and spread of invasive species in the monument through regular survey and treatment.

Ongoing

- Measure air quality conditions at the monument.
- Continuing research on the dynamics of cold air pooling at the monument to help inform climate change adaptation strategies.
- Continue fire effects monitoring of Rainbow Fire with Sequoia & Kings Canyon NP Fire Ecologist.
- Continue research on the geologic history of the monument.
- Continue to implement the invasive plant management plan to limit the establishment and spread of invasive species in the monument through regular survey and treatment.
- Monitor water quality and quantity in conjunction with SIEN.
- Monitor birds in conjunction with SIEN.
- Monitor wetlands in conjunction with SIEN.
- Monitor stream flow of the Middle Fork of the San Joaquin River in conjunction with the USGS and SIEN.
- Monitor weather in conjunction with the USGS, SIEN, SIO, and CDWR.

Cultural Resources

Completed

- Completed the Historic Resource and Administrative History Study (*Nature and History on the Sierra Crest: Devils Postpile and the Mammoth Lakes Sierra*).
- Stabilized the historic Devils Postpile Cabin Remains site after a 2011 windstorm uprooted two large lodgepole pines and exposed artifacts.
- Completed two condition assessments of cultural resource sites; in 2007, and 2013 following the 2011 windstorm.
- Nominated two sites for listing on the National Register of Historic Places.

Planned/Ongoing

- Collaboration between the NPS and USFS to find support for stabilization of the Reds Meadow Guard Station and Bathhouse.
- Implementation of a long term strategy, outlined in the General Management Plan, for consolidating and managing collections to provide better control and access for monument staff, researchers, and other partners.

Visitor Experience

- Engaged with Firstbloom, an environmental education program in partnership with the Bishop Paiute tribe focused on environmental stewardship for youth in 4th and 5th grades.
- Developed a climate change curriculum utilizing a combination of classroom, virtual, and field-based methods to provide students with hands-on opportunities to explore climate change through the lens of the National Park Service.
- Provided an additional daily ranger-led Devils Postpile walk in the afternoon and reached over 1,700 visitors.
- Updated, replaced, or in some cases added, nearly all wayside panels and directional signs between 2008 and 2015 to improve visitor experience and orientation.
- Developed a partnership with the Outdoor Experiences program sponsored by Los Angeles Department of Water and Power and managed by the Mono Lake Committee to bring underrepresented urban youth to public lands in the Sierra including the monument.
- Updated website to better communicate the significant cultural and natural history of the monument. *Plan your visit* pages have also been updated.
- Improved community outreach includes new programs such as library story hour and a continued presence at the Mammoth Lakes Welcome Center.
- Participated in social media including maintaining a Facebook Page and Twitter feed to reach visitors digitally.

Park Infrastructure

Energy Conservation, Waste Reduction, and Sustainability

- Replaced all electric tanks water heaters with propane on-demand water heaters to conserve overall energy use.
- Installed motion-detecting and night-sky friendly exterior and restroom lighting monument wide.
- Upgraded the electrical system in 2014 to provide safer, more reliable and energy-efficient delivery of electricity to monument buildings.
- Installed recycling containers in every location where there is a trash can.
- Implemented a program to collect and divert recycling away from landfills.
- Purchased and installed a larger capacity bear-proof dumpster to reduce the number of trash pick-ups needed each year, saving costs of trash collection and reducing carbon dioxide emissions from garbage trucks.
- Ensured that all new construction (e.g., employee facility, maintenance building, and office buildings) is outfitted with energy efficient appliances, high quality insulation, double paned windows, and low flow toilets and shower heads to reduce energy and water consumption.
- Added a hybrid vehicle through GSA to reduce gas consumption.
- Replaced wood shingle roofs with metal on all monument housing, offices and the ranger station to reduce fire hazards.
- Removed vegetation and burnable material around all of the buildings to reduce fire risk.
- Constructed a new employee facility in 2012 to provide a kitchen, showers, and restrooms for employees in a clean and energy efficient environment.
- Improved the primary hiking trail to the Postpile formation for better accessibility.

Fire Hazard Risk Reduction

- Replaced wood shingle roofs with metal on all monument housing, offices and the ranger station to reduce fire hazards.
- Installed an interior sprinkler system in the new employee facility.
- Removed vegetation and burnable material around all of the buildings.
- Implemented a fuel reduction project to cut and pile dead and downed wood to reduce fire risk.
- Completed an interagency prescribed fire around the administrative area.

Improvements to infrastructure and safety

- Constructed a new employee facility in 2012 to provide common space for employees, kitchen, shower, and restrooms in a clean and energy efficient environment.
- Improved the primary trail to the postpile formation for better accessibility.
 - Removal of rocks and tree roots to smooth the trail surface and reduce tripping hazards.
 - Addition of an overlook at the top of the rock stairs that descend to the base of the postpile formation so that visitors could view the postpile formation without descending the stone steps.

- Construction of a graded switchback adjacent to the stone steps to provide easier and safer access to the viewing area at the base of the postpile formation. The ramp has handrails down one side and is much easier for visitors to navigate than the stairs.
- Remodeled the maintenance building in 2012 to address health hazards and to provide more square footage for storage, a small office, and workshop space. Installation of R25 bat insulation to improve energy efficiency.
- Widened critical areas on the access road to the monument to improve visibility and to provide turnouts for passing traffic on the narrow road.
- Constructed a new visitor trail connecting the overflow parking lot to the postpile trail to provide safe access and encourage visitors to avoid walking on the road.

Chapter 4. Key Issues and Challenges for Consideration in Management Planning

Devils Postpile National Monument is dedicated to fulfilling the NPS mission of natural and cultural resource preservation and providing a quality visitor experience connected to the monument's purpose and significance. This is accomplished with our professional staff and efforts to improve our capacity through partnerships and interagency collaboration, as well as engaging youth, tribes, and visitors through traditional and innovative ways. An ongoing challenge for the monument is building capacity and garnering support to respond to the multiple challenges in the face of increasing visitation and declining budgets. For example, a warming climate, prolonged drought, and lack of snow are increasing pressure to extend the open season to contribute to the economic sustainability of gateway communities while still safeguarding resources and providing adequate visitor services and recreational opportunities. These pressures present operational and carrying capacity challenges that will require collaborative solutions. As the monument engages in the Centennial celebration and looks forward to the second century, we must consider the effects of past history, current demands, and future uncertainties.

In Chapter 4, we highlight some of the most significant challenges that Devils Postpile National Monument faces, we provide an overview of our recently approved General Management Plan that provides a framework for how we will manage the monument in the coming decades, and follow with a list of positive management actions that can help address these challenges in the future.

CHALLENGES

CONIFER FORESTS AND LANDSCAPE PROCESSES

In preparing the assessment of key indicators of natural resource conditions, the “red” or “significant concern” ratings for conifer forests and landscape and ecosystem processes represent the consequence of over a century of fire exclusion that has greatly altered the fire regime, and resulted in high severity fires due to high fuel loads. Large disturbance events such as the 1992 Rainbow Fire and the 2011 Devils Windstorm blowdown impacted forests dramatically, and will influence stand structure and species composition for decades. These past events combined with drought, a higher proportion of rain versus snow, and a warming climate are likely to have profound effects on conifer forests, plant communities, and associated wildlife and is of significant concern. For example, the combination of a warming climate and high fuel loads increase the risk of catastrophic fires and subsequent adverse impacts on ecosystems and public safety. The monument is responding to this heightened risk with a robust hazard fuel reduction effort, and coordination with the neighboring Inyo National Forest to implement both pile and broadcast burning in the non-wilderness portion of the monument. Reintroduction of fire and fuel reduction projects in the wilderness areas of the monument are limited and will require continued coordination with the Inyo National Forest.

AIR QUALITY

Although most visitors would probably anticipate that Devils Postpile National Monument is a clean or remote site with excellent air quality, the monument can sometimes experience high levels of photochemical smog more typical of urban areas. Pollutants like ground level ozone (O_3) are of particular concern; when present in high concentrations they can have a negative impact on the local plants and wildlife, and can also be unhealthy for monument visitors and staff. Ongoing research indicates that polluted air is transported up the river canyon from more populated regions of California such as the Central Valley and Bay area. Although the monument is limited in ways to improve local air quality, supporting research and providing real-time information on air quality conditions provides baseline information and indications of changing conditions, while also allowing managers to inform visitors so that they can plan their visit accordingly.

CLIMATE CHANGE

The monument recognizes that global climate change presents unprecedented challenges and will have direct and indirect impacts on natural and cultural resources, visitor use, facilities, administration, and operations at Devils Postpile NM. The effects of global climate change will almost certainly include changes in:

- Local weather patterns (increasing temperature, decreasing snowpack and earlier melt dates, less precipitation falling as snow)
- Hydrology (longer periods of low flow, changes in timing and magnitude of peak flows, periodic extreme flood events)
- Fire regime (higher frequency and greater severity of wildfires and longer fire seasons)
- Air pollution (warming temperatures and more frequent fires are likely to exacerbate existing air quality issues)
- Distribution of plants and animals (the ranges of some plants and animals will shift in response to a warming climate and some species will likely be lost entirely)
- Vulnerability of local ecosystems to invasive species (likely to increase with changes in climate and fire regimes)
- Insect and pathogen infestations (frequency and severity increase with warming temperatures, drought stress in trees, and more frequent disturbances)

VISITOR AND OPERATIONAL CAPACITY

The NPS defines visitor capacity as the type and level of visitor use that can be accommodated while sustaining desired park resource conditions and achieving desired visitor experiences consistent with the purpose and significance of the national park unit. Visitor capacity management is linked to indicators and standards established in the General Management Plan (2014) and by reviewing general information collected with respect to visitor trends, parking problems, emergency response needs, comfort station capacity, accessibility improvements, and visitor complaints. Managers strive to maintain this balance through monitoring and management zone prescriptions but by also recognizing that some level of impact may be acceptable. Rather than just tracking and controlling numbers, monument staff manages the levels, types, and patterns of visitor use and other public uses as needed to protect the condition of the resources and quality of the visitor experiences.

Congestion at the Postpile, Rainbow Falls, wilderness trails and parking lots, is a key indicator of the quality of the visitor experience. For example, 2015 visitation levels (148,000) increased over 50% from 2013 levels (91,794). A mandatory shuttle bus provides access to these sites and can be managed to reduce crowding. However, visitation is increasing in the shoulder seasons when the shuttle bus is not running resulting in overfull parking lots, traffic congestion, and the need for monument staff to be pulled from other duties. A recent review of comparable peer parks shows that Devils Postpile NM receives 25–30% less in average funding, which greatly impacts the number of staff available for resource protection and visitor services. The park is working with partners and stakeholders to maintain a quality visitor experience and protect resources and must consider both the present and future trends in developing collaborative solutions.

MANAGEMENT

GENERAL MANAGEMENT PLAN

Based on recognition of growing needs, the monument's General Management Plan (GMP) completed on January 26, 2015, recommends increasing staffing by 40% to adequately and efficiently implement the selected alternative, "Connecting People to Nature and Heritage." Building the professional NPS capacity at the monument is an investment in implementing the preferred alternative and recommends an increase in staff for resource protection and to provide quality services to our visitors. The primary focus of the GMP is to emphasize key features with national significance for resource protection and to connect visitors with natural and cultural resources. Many visitors return year after year to the monument, where they value having a traditional park experiences in a natural setting.

Proposed improvements focus on key areas of visitor and resource protection including; providing expanded visitor services, interpretive programs and resource education; and engaging youth, gateway communities, diverse populations, and tribal groups in education programs and stewardship projects. Visitor experiences will continue to include a range of low impact recreational opportunities that have traditionally been available within the monument such as camping, fishing, hiking, sightseeing, and wildlife viewing. Key components of the selected management alternative in the GMP that address these challenges, are as follows:

- As budgets provide, the monument will increase its presence in the Town of Mammoth for public contact and operational space, enhancing its current presence and relationship with Inyo National Forest staff and the operation at the Mammoth Welcome Center.
 - The monument can reach a wider range of visitors and members of the local community, including school groups, by extending its operation into the shoulder seasons and winter months, when the monument is closed to vehicular traffic. The challenging road access to the monument generally supports the official "operating season" of mid-June to mid-October.
 - Increasing staff in the gateway community of Mammoth Lakes and at the monument, as budgets allow, will expand visitor services and interpretive programs as well as outreach for engaging youth, gateway communities, diverse populations, next generation stewards, and tribal groups through education programs and stewardship projects.
- Natural and cultural resources will continue to receive a high degree of protection with an increased emphasis on engaging visitors in a range of resource management techniques such as inventory and monitoring, invasive plant removal, historic preservation, and archeological investigations.
- The monument will explore opportunities for increased trail connections within the Reds Meadow Valley, and promote opportunities to connect with nature.
- Interpretation and education programs and media will emphasize themes related to corridors and connectivity as well as the role of the area as a gateway to a broader wilderness.

PLANNING FOR THE FUTURE

Pro-active planning and management will help the monument adapt to these changes and their effects on monument resources, operations, and visitors. The NPS Climate Change Response Strategy focuses on the importance of targeted actions by NPS managers, and the monument's response includes efforts to minimize its carbon footprint. The monument will refer to the climate change strategy and utilize the following to improve understanding and develop no-regret responses to climate change.

SCIENCE

The monument will continue to provide and foster state-of-the art science to better understand the impacts of climate change, past disturbance events, air pollution and invasive species, and to develop science-based adaptive management strategies for natural and cultural resource management.

ADAPTATION

Devils Postpile NM considers and analyzes potential climate change impacts when undertaking long-range planning exercises, setting priorities for scientific research and investigations, and/or when making major decisions affecting natural and cultural resources. The monument's Resource Stewardship Strategy (RSS), currently in progress, will identify conservation objectives and potential activities for managing resources, as well as implementation strategies, consistent with the General Management Plan. The RSS will include plans and strategies for physical and biological resources that identify and protect wildlife and vegetation linkages, habitat connectivity, and migration corridors to help mitigate climate change impacts and other stressors to monument resources. The monument will work with other federal, state, tribal, and local governments, and partners to develop strategies at multiple scales, including at the landscape scale, for understanding and responding to climate change impacts.

MITIGATION

Devils Postpile NM continues to reduce the monument's contributions to climate change, and the monument's Climate Friendly Park Action Plan (2010) identifies steps that the monument is taking to minimize and reduce greenhouse gas emissions. This includes strategies to improve sustainability and energy efficiency to decrease the monument's consumption of resources and carbon footprint.

COMMUNICATION

Devils Postpile NM is an ideal location to teach visitors, park staff, and community members about climate change and potential impacts. The monument vividly displays evidence of powerful physical changes due to past ice ages and warming periods across the landscape, and provides results from ongoing scientific climate studies that investigate the causes and effects of natural and anthropogenic climate change. Education and interpretive programs help visitors and students to understand the climate change impacts at the monument and beyond, and how they can respond. The monument will continue to communicate the benefits of stewardship actions that contribute to protecting the monument's significance and enhancing visitors' enjoyment, appreciation, and inspiration.

CONCLUSION

In the second century of the National Park Service we acknowledge all of the protected areas, including Devils Postpile National Monument, and celebrate the natural and cultural heritage that sustain and inspire us. Although we face many challenges in the upcoming century, the NPS recognition of the relationship of Healthy Parks and Healthy People embodies our mission of resource protection and quality visitor experiences connected to park purpose and significance.

During the NPS Centennial Celebration, the NPS, the citizens of our nation, and the world share in the celebration of the value of parks and protected areas for natural and cultural resources, visitor enjoyment and inspiration, and the contributions to the biodiversity and health of our planet. Healthy ecosystems, including the monument's forests, riparian corridors, and wetlands, make a critical contribution by absorbing and storing carbon, moderating temperatures, and providing critical habitat.

Parks are natural solutions to responding to climate change, as nature itself is instrumental in addressing mitigation and adaptation. Well-managed parks maintain life support systems of watersheds and air sheds that are essential for life on earth and for human survival.

The challenges of sustaining Devils Postpile National Monument and all park units reveal the interconnections of all of the efforts of the NPS employees, our partners, our gateway communities, and our visitors. Parks provide insights to our shared legacy for providing stewardship for this and future generations.

References

See the [State of the Park Report for the Park website](#) for a more complete list of references to documents and data sets upon which the assessments in this State of the Park report are based. References for several of the key documents cited in this report are as follows:

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See Also:

[Collection of Natural Resource-Related References](#)

[Collection of Cultural Resource-Related References](#)

[Collection of Visitor Experience-Related References](#)

Glossary

See the [State of the Parks home page](#) for a link to a complete glossary of terms used in State of the Park reports. Definitions of key terms used in this report are as follows:

Americans with Disabilities Act (ADA)	Law enacted by the federal government that includes provisions to remove barriers that limit a disabled person's ability to engage in normal daily activity in the physical, public environment.
Archeological Sites Management Information System (ASMIS)	The National Park Service's standardized database for the basic registration and management of park prehistoric and historical archeological resources. ASMIS site records contain data on condition, threats and disturbances, site location, date of site discovery and documentation, description, proposed treatments, and management actions for known park archeological sites. It serves as a tool to support improved archeological resources preservation, protection, planning, and decision-making by parks, centers, regional offices, and the national program offices.
Baseline Documentation	Baseline documentation records the physical condition of a structure, object, or landscape at a specific point in time. A baseline provides a starting point against which future changes can be measured.
Carbon Footprint	Carbon footprint is generally defined as the total set of greenhouse gas emissions caused by an organization, event, product, or person.
Climate Friendly Park	The NPS Climate Friendly Park designation requires meeting three milestones: completing an application; completing a comprehensive greenhouse gas (GHG) inventory; and completing a Climate Action Plan, which is the actions, policies, programs, and measures a park will put into place to reduce its GHG emissions.
Cultural Landscapes Inventory (CLI)	A Cultural Landscapes Inventory describes historically significant landscapes within a park. The inventory identifies and documents each landscape's location, size, physical development, condition, characteristics, and features, as well as other information useful to park management.
Cultural Landscape Report (CLR)	A Cultural Landscape Report is the principal treatment document for cultural landscapes and the primary tool for long-term management of those landscapes. It guides management and treatment decisions about a landscape's physical attributes, biotic systems, and use when that use contributes to historical significance.
Curation	National parks are the stewards of numerous types of objects, field notes, publications, maps, artifacts, photographs, and more. The assemblage of these materials comprises a museum collection. Curation is the process of managing, preserving, and safeguarding a collection according to professional museum and archival practices.
Facility Condition Index (FCI)	FCI is the cost of repairing an asset (e.g., a building, road, bridge, or trail) divided by the cost of replacing it. The lower the FCI number, the better the condition of the resource.
Foundation Document	A park Foundation Document summarizes a park's purpose, significance, resources and values, primary interpretive themes, and special mandates. The document identifies a park's unique characteristics and what is most important about a park. The Foundation Document is fundamental to guiding park management and is an important component of a park's General Management Plan.

Fundamental and Other Important Resources and Values	Fundamental resources and values are the particular systems, processes, experiences, scenery, sounds, and other features that are key to achieving the park's purposes and maintaining its significance. Other important resources and values are those attributes that are determined to be particularly important to park management and planning, although they are not central to the park's purpose and significance. These priority resources are identified in the Park Foundation Document and/or General Management Plan. The short-cut name that will be used for this will be Priority Resources.
General Management Plan (GMP)	A General Management Plan is a strategic planning document that outlines the future management of a National Park Service site for the next 15 to 20 years. The plan will set the basic philosophy and broad guidance for management decisions that affect the park's resources and the visitor's experience.
Green Parks Plan (GPP)	The Green Parks Plan defines a collective vision and a long-term strategic plan for sustainable management of NPS operations. A critical component of the implementation of the GPP will be informing and engaging park staff, visitors, and community partners about climate change and sustainability to broaden opportunities to foster change.
Historic Integrity	Historic Integrity is the assemblage of physical values of a site, building, structure, or object and is a key element in assessing historical value and significance. The assessment of integrity is required to determine the eligibility of a property for listing in the National Register.
Historic Resource Study (HRS)	The historic resource study is the primary document used to identify and manage the historic resources in a park. It is the basis for understanding their significance and interrelationships, a point of departure for development of interpretive plans, and the framework within which additional research should be initiated.
Historic Structures Report (HSR)	The historic structure report is the primary guide to treatment and use of a historic structure and may also be used in managing a prehistoric structure.
Indicator of Condition	A selected subset of components or elements of a Priority Resource that are particularly "information rich" and that represent or "indicate" the overall condition of the Priority Resource. There may be one or several Indicators of Condition for a particular Priority Resource.
Integrated Resource Management Applications (IRMA)	The NPS-wide repository for documents, publications, and data sets that are related to NPS natural and cultural resources.
Interpretation	Interpretation is the explanation of the major features and significance of a park to visitors. Interpretation can include field trips, presentations, exhibits, and publications, as well as informal conversations with park visitors. A key feature of successful interpretation is allowing a person to form his or her own personal connection with the meaning and significance inherent in a resource.
Invasive Species	Invasive species are non-indigenous (or non-native) plants or animals that can spread widely and cause harm to an area, habitat, or bioregion. Invasive species can dominate a region or habitat, out-compete native or beneficial species, and threaten biological diversity.
List of Classified Structures (LCS)	LCS is an inventory system that records and tracks the condition of the approximately 27,000 historic structures listed in the National Register of Historic Places that are the responsibility of NPS.
Museum Collection	NPS is the steward of the largest network of museums in the United States. NPS museum collections document American, tribal, and ethnic histories; park cultural and natural resources; park histories; and other aspects of human experience. Collections are managed by professionally-trained NPS staff, who ensure long-term maintenance of collections in specialized facilities.

National Register of Historic Places (NRHP)	The National Register of Historic Places is the official list of the Nation's historic properties worthy of preservation. Authorized by the National Historic Preservation Act of 1966, the National Park Service's National Register of Historic Places is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect America's historic and archeological resources. Listing in the National Register of Historic Places provides formal recognition of a property's historical, architectural, or archeological significance based on national standards used by every state. The National Register is a public, searchable database about the places.
Native American Graves Protection and Repatriation Act (NAGPRA)	A federal law passed in 1990. NAGPRA provides a process for museums and federal agencies to return certain Native American cultural items (e.g., human remains, funerary objects, sacred objects, objects of cultural patrimony) to lineal descendants and culturally-affiliated Indian tribes and Native Hawaiian organizations.
Natural Resource Condition Assessment (NRCA)	A synthesis of existing scientific data and knowledge, from multiple sources, that helps answer the question: what are current conditions of important park natural resources? NRCAAs provide a mix of new insights and useful scientific data about current park resource conditions and factors influencing those conditions. NRCAAs have practical value to park managers and help them conduct formal planning and develop strategies on how to best protect or restore park resources.
Priority Resource or Value	This term refers to the Fundamental and Other Important Resources and Values of a park. These can include natural, cultural, and historic resources as well as opportunities for learning, discovery, and enjoyment. Priority Resources or Values include features that have been identified in park Foundation Documents, as well as other park assets or values that have been developed or recognized over the course of park operations. Priority Resources or Values warrant primary consideration during park planning and management because they are critical to a park's purpose and significance.
Project Management Information System (PMIS)	A servicewide intranet application within the National Park Service to manage information about requests for project funding. It enables parks and NPS offices to submit project proposals to be reviewed, approved, and prioritized at park units, regional directorates, and the Washington Office.
Resource Management	The term "resources" in NPS encompasses the many natural, cultural, historical, or sociological features and assets associated with parks. Resource management includes the knowledge, understanding, and long-term stewardship and preservation of these resources.
Sierra Nevada Network (SIEN)	One of 32 I&M networks established as part of the NPS Inventory and Monitoring Program . The Sierra Nevada Network provides scientific data and expertise for natural resources in 3 parks located in California.
Specific Measure of Condition	One or more specific measurements used to quantify or qualitatively evaluate the condition of an Indicator at a particular place and time. There may be one or more Specific Measures of Condition for each Indicator of Condition.
Visitor and Resource Protection (VRP)	VRP includes, among other responsibilities, protecting and preserving park natural and cultural resources, enforcing laws that protect people and the parks, fire management, search and rescue, managing large-scale incidents, and on-the-ground customer service.
Wilderness	A designation applied to certain federal lands set aside for preservation and protection in their natural condition, in accordance with the Wilderness Act of 1964.