National Park Service
U.S. Department of the Interior

State of the Park Report

Craters of the Moon National Monument and Preserve

Idaho

2016

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On the cover: Spatter cones. NPS photo by Dave Clark.

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

The mission of the National Park Service is to preserve unimpaired the natural and cultural resources and values of national parks for the enjoyment, education, and inspiration of this and future generations. 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 parks 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 park 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.

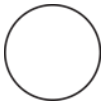
The purpose of Craters of the Moon National Monument and Preserve (CRMO) is to protect a vast "weird and scenic landscape" with remarkable and diverse volcanic features, sagebrush steppe ecosystems, and wilderness, which provides opportunities to explore, understand, and value the rugged and remote high desert landscape of the Great Rift Region.

The following significance statements have been identified for CRMO:

- Active as recently as 2,000 years ago, the Craters of the Moon lava field is the largest young basaltic lava field in the lower 48 states. The lava field contains a remarkable and unusual diversity of exquisitely preserved basaltic volcanic features.
- The Great Rift is the deepest known land-based open volcanic rift in the world, and is nearly all contained within the park. It is also one of the longest volcanic rifts in the continental United States.
- CRMO contains more than 500 kipukas, or isolated vegetation communities surrounded by lava, largely undisturbed by modern human activity. These communities are key benchmarks for scientific study of long-term ecological change in sagebrush steppe ecosystems.
- The combination of harsh, young volcanic terrain and extremes of a high desert climate have produced a diversity of habitats where plant succession is easily observed and where wildlife display remarkable adaptations that allow them to survive.
- As one of the first two simultaneously designated wilderness areas in the national park system, CRMO is also the largest remaining area within the Snake River Plain that retains wilderness character.
- There are three separate units that comprise Craters of the Moon: the NPS monument and preserve, and the BLM monument, encompassing more than 733,000 acres of undeveloped federal land. This State of the Park Report addresses the NPS lands.
- Clean air offers visitors expansive scenic views of the high desert and surrounding mountains, which change dramatically with the seasons and from day to the dark night skies.
- For thousands of years, many different people have explored, used, and pondered this vast "weird and scenic landscape." Some even avoided it. Members of the Shoshone-Bannock Tribe and the descendants of those who passed this way on Goodale's Cutoff on the Oregon Trail retain enduring human connections to the landscape. CRMO continues to inspire these lasting impressions.

The summary table, below, and the supporting information that follows, provide an overall assessment of the condition of priority resources and values at CRMO based on scientific and scholarly studies and expert opinion. The internet version of this report, available at http://www.nps.gov/stateoftheparks/crmo/, 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		For 2008–2012: ozone condition warrants moderate concern; sulfur and nitrogen wet deposition conditions are in good condition; mercury/toxics deposition warrants moderate concern; and visibility condition warrants moderate concern. Condition levels are based on NPS Air Resources Division benchmarks.
Geologic Features and Processes		Geological features and processes are generally considered to be in good condition with minimal threats. The remoteness and limited access to most of the park limits direct human impacts. Direct impacts (trampling and rock collection) are mostly limited to areas in the immediate vicinity of roads and trails. Indirect human impacts through changes in climate (increasing temperatures and decreased snow) may be affecting the existence of small water holes within the lava fields.
Water Quantity and Quality		Water quality monitoring data from 2010 and 2013 in Little Cottonwood Creek indicates good condition, as does results from studies in the 1990s. Results from studies of Leech Creek in the 1990s also indicate good condition. Given the small drainage area and upstream land use, threats to both of these streams are limited. Climate change is projected to result in decreased snow pack which would decrease runoff and the quantity of water in these streams and ultimately from the wells providing the park's potable water.
River Channel		According to a study conducted in 1992 and 1993, stream channel stability was "good" for both Leech and Little Cottonwood Creeks. Evaluation of each stream reach was using the Pfankuch method. This study also noted that each stream is in a steep canyon that prevents them from changing course.
Landscape Dynamics		Most of the lands surrounding the park are undeveloped and in public ownership. Only 12% of the lands within a 12km buffer around the park boundary are classified as developed or cultivated. There has been little change in land cover surrounding the park in recent decades.

Priority Resource or Value	Condition Status/Trend	Rationale
Wildlife		The overall condition of wildlife populations in the park seem to be stable but warrant moderate concern. The biggest concerns are for sagebrush steppe dependent species such as sage grouse and Brewer's sparrows. A combination of wildfires and invasive exotic plants has degraded or eliminated a significant amount of sagebrush steppe habitat in areas surrounding the park. Climate change threatens to reduce or eliminate a variety of wildlife species (pika, Clark's nutcracker, and red squirrels) already near the edge of their range.
Terrestrial Invasive and Nuisance Species		Cheat grass has infested much of the Monument and Preserve, particularly in recently burned areas and in the southern, lower elevation portion of the Preserve. Other noxious forbs including Rush skeletonweed pose a threat to resource condition in large portions of the Preserve. However, portions of sagebrush steppe in the northern portion of the Monument and Preserve are relatively free of non-native species. The exotic fungal pathogen white-pine blister rust has become established in one small area of limber pines, first documented in 2006. Spread of this fungus into the nearby limber pine woodlands on the lava fields could result in wide spread loss of limber pine.
Vegetation Communities		The health of native plant communities is generally good across much of the northern portion of the Monument and Preserve. Aspen stands appear to be in good condition in the Monument. The limber pine stands remain relatively free of pests and pathogens and no unusual mortality is being reported from monitoring. Sagebrush steppe in most of the higher elevation areas of the northern half of the park are in good condition but much of the southern portion of the park and in some burned areas in the north are heavily invaded by cheatgrass and other weeds. Recovery of these areas once cheat grass has invaded is unlikely as it perpetuates a cycle of more frequent wildfires favoring non-native invasive weeds over native plants.
Dark Night Sky		The modeled Anthropogenic Light Ratio (ALR), a measure of light pollution calculated as the ratio of Average Anthropogenic Sky Glow to Average Natural Sky Luminance, was 0.16, which is considered good condition. Trend is neutral based on slow population growth of proximal urban areas.
Acoustic Environment		The mean L_{50} Impact (L_{50} dBA), a measure of noise contributed to the existing acoustical environment by anthropogenic sources, is 1.5 dBA. Nationwide increases in ground-based and aircraft traffic indicate a downward trend in the quality of acoustic resources.
Cultural Resources		web ▸
Archeological Resources		Only about two-percent of the park has been surveyed to meet today's archeological survey standards. Sixty-three percent of sites listed in the NPS Archeological Sites Management Information System are assessed as being in Good condition.
Cultural Anthropology		No ethnographic studies have been conducted within the park.
Cultural Landscapes		No cultural landscape survey has been conducted within the park. Only one historic landscape is listed on the National Register of Historic Places but this listing needs to be updated.

Priority Resource or Value	Condition Status/Trend	Rationale
Historic Structures		All Mission 66 buildings and the two historic log structures have had a Historic Structures Overview report completed in 2009. Determinations of Eligibility have been completed for the two historic log structures. Eighty-eight percent of the buildings are in good condition with one being in fair condition.
History		Administrative history needs to be updated to reflect the significant events (e.g. establishment of the National Preserve) which have occurred since the existing Administrative history was completed in 1992.
Museum Collections		Collections and facility are in good condition. Park has a large backlog of archival materials that have been inventoried but need to be cataloged.
Visitor Experience		web ▸
Number of Visitors		Visitation to the park in 2013 was higher than 2011 and 2012 and also higher than the 10-year average for 2003–2012.
Visitor Satisfaction		The percentage of visitor satisfaction in FY13 was 99.0%, which is higher than the average for the previous ten years.
Interpretive and Education Programs – Talks, Tours, and Special Events		The total number of formal interpretive programs and education programs (I & E) in 2013 was higher than the 10-year average. The quality of I & E programs has been enhanced through goal setting (Long Range Interpretive Plan (2007), Education Plan (2014) and Annual Interpretive Plans) and by slight increases in staffing and a greater emphasis on training.
Interpretive Media – Brochures, Exhibits, Signs, and Website		Every aspect of interpretive media has been improved over the last 10 years. The quality of interpretive media has been enhanced by goal setting established in our Long Range Interpretive Plan (2007) and Annual Interpretive Plans.
Accessibility		Accommodations are provided for visitors with mobility, visual, and auditory impairments.
Safety		Although safety messages are included in park media, rangers are not staffed sufficiently to proactively patrol and detect unsafe actions.
Partnerships		Productive partnerships occur with a wide variety of stakeholders and organizations.

Priority Resource or Value	Condition Status/Trend	Rationale
Park Infrastructure		web ▸
Overall Facility Condition Index		Park FCI average is .074 "good." CRMO is currently funded with 52% of the required funding to maintain facilities using industry standards (RS Means) as the tool to gauge required funding. This has been recently documented in the 2014 Park Asset Management Plan (PAMP). At this funding level the FCI is predicted to drop quickly. Note: many FCI values are not accurate due to the fact CRMO has not recently conducted Comprehensive Condition Assessment's on facilities thus many deferred maintenance work orders on CRMO facilities have not been recorded. Once new deferred maintenance work orders are recorded, many FCI values will increase showing facilities are in fact in need of repair.
Park Carbon Footprint		CRMO belongs to a network of parks nationwide that are putting climate friendly behavior at the forefront of sustainability planning. The Park's climate action plan describes commitments to reduce emissions of greenhouse gases at the park by 2016. Combined emissions from park and operations and visitor activities within the Park during the 2007 baseline year were roughly equivalent to the emissions from the energy use of 29 households each year.
Wilderness Character		web ▸
Overall Wilderness Character		Overall the condition of wilderness character is good but warrants concern due to the continuing spread of exotic invasive plants, which negatively impact natural conditions by displacing native plants and degrading wildlife habitat. This leads to additional management interventions (fire suppression and weed control) to protect natural conditions which in turn negatively impact the untrammeled character of wilderness. The undeveloped character and opportunities for solitude/unconfined recreation remain largely unchanged since designation with some localized degradation of opportunities for solitude due to developments outside of wilderness and park boundaries, as well as noise from increased traffic on Highway 20/26/93.

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

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

- Monitored sagebrush steppe, limber pine, aspen, pika, bats, sage grouse, and water quality in conjunction with the Upper Columbia Basin Network I&M Program.
- Maintained cave resource inventory and survey cave resources for bat populations.
- Mapped invasive exotic weed infestations and cooperate with BLM, state and local entities to control invasive weeds.
- Reconstructed boundary fences to mitigate wildlife impacts while excluding trespass livestock.
- Participated in interagency and private citizen conservation planning with the regional Greater Sage-grouse working groups.
- Collaborating with NOAA on climate change monitoring as part of the nationwide Climate Reference Network, a network of identically equipped climate monitoring sites intended to operate for 50 years and provide highly accurate and reliable climate data.
- Monitoring air quality.

Cultural Resources

- Dedicated museum collection storage archive room.
- Completed Historic Structures Overview report.

- Completed Determination of Eligibility for two historic log structures.
- Maintained up-to-date national cultural resource databases (ASMIS, LCS, and ICMS).
- Completed digitization of the park's herbarium.

Visitor Experience – Interpretation & Education

- A half-time Education Specialist hired in 2010 has enhanced the quality and reach of our curriculum-based education programs including the completion of a new Education Plan in 2014. Funding provided by the National Park Foundation provided the seed money necessary to develop a popular new experiential/inquiry-based education program working with the College of Southern Idaho and area schools. Three teachers from adjoining school districts have participated in the Teacher-Ranger-Teacher program at the park. More than 5,000 school children visited the park and participated in curriculum-based education programs in 2013.
- Winter program was expanded to include snowshoe walks for school children (2007). More than 1,100 school children took part in these winter excursions in 2014.
- Monument Sign Plan completed in 2007 and most waysides were replaced with newly designed content by 2014 including 10 new wayside exhibits at highway overlooks that provide an interpretive experience for visitors as they drive through the Preserve into the Monument.
- New theater space at visitor center was outfitted with audio-visual equipment and new films shown on a regular basis beginning in 2007. Short introductory film in museum was updated with a new film in 2012.
- Website was upgraded and enhanced with new information and features. Educator's portal providing access to all CRMO lesson plans premiered in 2013. New Facebook page premiered in 2012. A free wildflower app was completed in 2012.
- A campground Junior Ranger program was initiated in 2004 and the "Lunar Ranger" program (2009) have provided enhanced opportunities for younger visitors to engage with the park. In 2013 the "Citizen Scientist" activity booklet was created to provide an opportunity for older children and adults to observe and document resource conditions during their visit to the park.

Visitor Experience – Visitor & Resource Protection (VRP)

- VRP Program was re-established in 2013 following a two-year hiatus without commissioned LE staff. Chief Ranger position was filled in 2013 (vacant since 1999) and a seasonal LE ranger was hired in 2014.
- Annual CPR and First Aid training has been provided to all staff. One to three EMTs have been on staff over the last 10 years. Wildland Fire Cache and engine were updated in 2014 in coordination with BLM Shoshone Field Office.
- Emergency Operation Cache was upgraded and improved in 2014.
- Fee program continues to enhance the visitor experience through a staffed entrance station and conveying visitor safety messages.

Park Infrastructure

- The park has maintained park facilities in Good Condition despite having only 52% of the funding required by industry standards. CRMO receives many visitor compliments on the quality and cleanliness of park facilities. CRMO is one of the only all Green parks in the PWR per the Green Parks scorecard. CRMO has one of the best safety records of any Facilities Maintenance crew in the Region. Maintenance staff has had only one lost time accident in the past 15 years while being continually engaged in potentially hazardous duties.
- The addition of two new fully accessible trails at Devil's Orchard (1/2 mile) and Spatter Cones (1/4 mile).
- Installed a fire alarm and sprinkler suppression system in all Mission 66 buildings, including residences.
- Numerous energy and water efficiency projects carried out since 2005.
    - Installation of 50K Photovoltaic system in 2011.
    - Installation of Energy Star appliances in most housing and office areas.
    - Installed solar power water well pump to provide backup for main electric water well pump.
    - Upgraded lighting in park buildings and areas to LED. Also, many timers and light sensors have been installed to limit lighting to only the time it is needed.
    - Upgraded water delivery system has reduced leaks and allowed metering and monitoring for a more efficient system.
    - Irrigated lawn area has been greatly reduced through xeriscaping with native plants, resulting in the park only using 1/4 of the water it did 15 years ago.

Key Issues and Challenges for Consideration in Management Planning

Craters of the Moon National Monument and Preserve is faced with many operational challenges. The large size of the park area, the remoteness of the park and the small number of staff prevents giving much attention to the more distant areas of the Preserve (also called the “expansion area”). Current management is focused on the original monument area where most facilities and visitors are located. By comparison, the expansion area, of which 88% is managed by the NPS, receives little attention. (The remaining 12% is managed by the BLM.) Long travel times on infrequently maintained secondary roads makes regular and routine patrols and monitoring difficult.

The Maintenance, Resource Management, Visitor and Resource Protection, and Interpretation and Education divisions are all understaffed for the amount of area and visitation the park receives. While the developed area within the original monument consistently averages approximately 200,000 annual visitors, the more remote Preserve is estimated to receive between 10,000 to 15,000 visitors as well, totals that are not included in the visitor number reports. Resource violations that have been recorded in the Preserve include illegal cave entry, trespass livestock grazing, off-road vehicle use, vandalism, target-shooting at park signs, littering, trash dumping, and taking of park resources.

Due to the remoteness of the monument and preserve, volunteers are few. Combined with the shortage of staff, it is an all hands on deck scenario whenever Craters of the Moon experiences an incident or hosts a special event. The lack of adequate funding and staffing for the park makes it difficult to care for all critical park resources. Travel for training for all but mandatory reasons has been severely restricted. Visitation is expected to increase with several on-going efforts to draw more tourism to this part of Idaho. The number of school children using CRMO as an outdoor classroom has mushroomed from 2,600 in 2004 to over 5,000 in 2013. With insufficient staff and increasing numbers of visitors it is becoming more difficult to manage for the preservation of park resources and continue to provide for visitor enjoyment.

Critical management actions to be considered include but are not limited to:

- Complete the Operations Review to identify what can be done in the short term given limited funding and staffing. Initial work indicates the need for 5 additional FTE and $500,000 in additional funding.
- Initiate a Strategic Plan with regional office support for CRMO to establish goals and analyze staffing and funding needs for the future.
- Prepare a Kings Bowl Area Development Concept Plan to provide a framework to manage one of the more popular and impacted areas within the Preserve.
- Retain contiguous hiring authority for local hires and help alleviate a housing shortage for seasonal employees and strengthen ties to local communities.
- Maintain and enhance relationships with park neighbors and partners.
- Continue to promote CRMO as a viable contribution to local and regional economies.
- Continue to encourage CRMO staff and their families to actively participate in community events.
- Develop a Resource Stewardship Strategy for CRMO.
- Complete a Wildland Fire Management Plan to cover the expansion area and allow for fuel treatments in forested areas of the park.
- Complete an Archeological Resources Condition Assessment for entire monument and preserve.
- Complete and implement the Wilderness Stewardship Plan.
- Update the Wilderness Character Assessment every five years.
- Continue to seek Congressional wilderness designation for the Presidentially-recommended Great Rift and Raven’s Eye areas.
- Complete a Cave Management Plan to guide protection of cave resources, including allowing visitor use of some of the caves while protecting bats and the other resources associated with the caves.
- Acquire increased internet speed and connectivity for both park users and park-sponsored digital broadcast media.
- Develop or hire for technical proficiency within staff or volunteers to launch and manage social media and digital platforms.
- Hire adequate staffing dedicated to manage youth education, volunteers, and internships.

Chapter 1. Introduction

The purpose of this State of the Park report for Craters of the Moon National Monument and Preserve (CRMO) 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 park 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.

CRMO is in south central Idaho in Blaine, Butte, Lincoln, Minidoka, and Power counties. It is within a one- to two-hour drive of Twin Falls, Idaho Falls, Pocatello, and other population centers along the Interstate 84 (I–84), I–86, and I–15 corridors. President Calvin Coolidge established Craters of the Moon National Monument on May 2, 1924, for the purpose of protecting the unusual landscapes of the Craters of the Moon Lava Field. This "lunar" landscape was thought to resemble that of the moon and was described in the presidential proclamation as "a weird and scenic landscape peculiar to itself."

Since 1924, the park boundary has been adjusted and expanded numerous times. A 2000 presidential proclamation expanded Craters of the Moon National Monument from roughly 54,000 acres to approximately 753,000 acres to ensure protection of the Great Rift volcanic rift zone and its associated features. The proclamation also placed the lands under the administration of both the National Park Service and the Bureau of Land Management (BLM), with each agency having primary management authority over separate portions. On August 2002, Public Law 107–213 designated the NPS portion of the expanded monument as a 410,000 acre national preserve within the National Park System.

The three administrative units at Craters of the Moon include the BLM national monument, the NPS national monument, and the NPS national preserve. Cooperative interagency management of these units enhances public service and protection of nationally significant resources, while retaining many traditional uses of the land. This document applies only to the two NPS-administered units.

The park contains the youngest and most geologically diverse section of basaltic lava terrain found on the Eastern Snake River Plain, an extensive area of volcanic formations that reaches across southern Idaho east to Yellowstone National Park, in Wyoming. It includes three distinct young lava fields: Craters of the Moon, Kings Bowl, and Wapi. The Craters of the Moon Lava Field is the largest basaltic lava field of predominantly Holocene age (less than 10,000 years old) in the conterminous United States.

The park also protects most of the Great Rift Region, which includes the numerous lava flows and other volcanic material from the Great Rift volcanic rift zone. It compares in significance to other volcanic rift zones such as those found in Hawaii and Iceland. The Great Rift varies in width between 1 and 5 miles, extends for more than 50 miles, and is the deepest known land-based volcanic rift in the world.

Many features and structures associated with basaltic volcanism are represented in the Great Rift region, including various kinds of lava flows, volcanic cones, and lava tubes. Other features include explosion pits, lava lakes, squeeze-ups, basalt mounds, an ash blanket, low shield volcanoes, and various lava tube cave features. Some lava flows within the Great Rift volcanic rift zone diverged around areas of older lava, whose surfaces have been weathered into soil, and rejoined downstream to form isolated islands of older terrain known as "kipukas." In many instances, the expanse of rugged lava surrounding these small pockets of soil has protected the kipukas from people, animals, and even nonnative plants. As a result, these kipukas represent some of the last undisturbed vegetation communities on the Snake River Plain.

Young (dominantly Holocene) lava flows and other features cover about 450,000 acres of the monument. The remaining 300,000 acres in the monument and preserve are also volcanic in origin, but older in age and covered with a thicker mantle of soil. This older terrain supports a sagebrush (*Artemisia* spp.) steppe ecosystem consisting of diverse communities of grasses, sagebrush, and other shrubs and provides habitat for a variety of wildlife. This area also includes lava tube caves, older volcanic formations, and volcanic buttes.

Approximately 95% of the park is a wilderness study area or designated wilderness. The Craters of the Moon National Wilderness Area, designated in 1970, is located south of U.S. Highway 20/26/93 (U.S. 20/26/93) within the monument. A substantial portion of each of four wilderness study areas within the park includes lava flows administered by the National Park Service. The Bureau of Land Management manages 96,600 acres of the wilderness study area adjacent to the NPS managed areas.

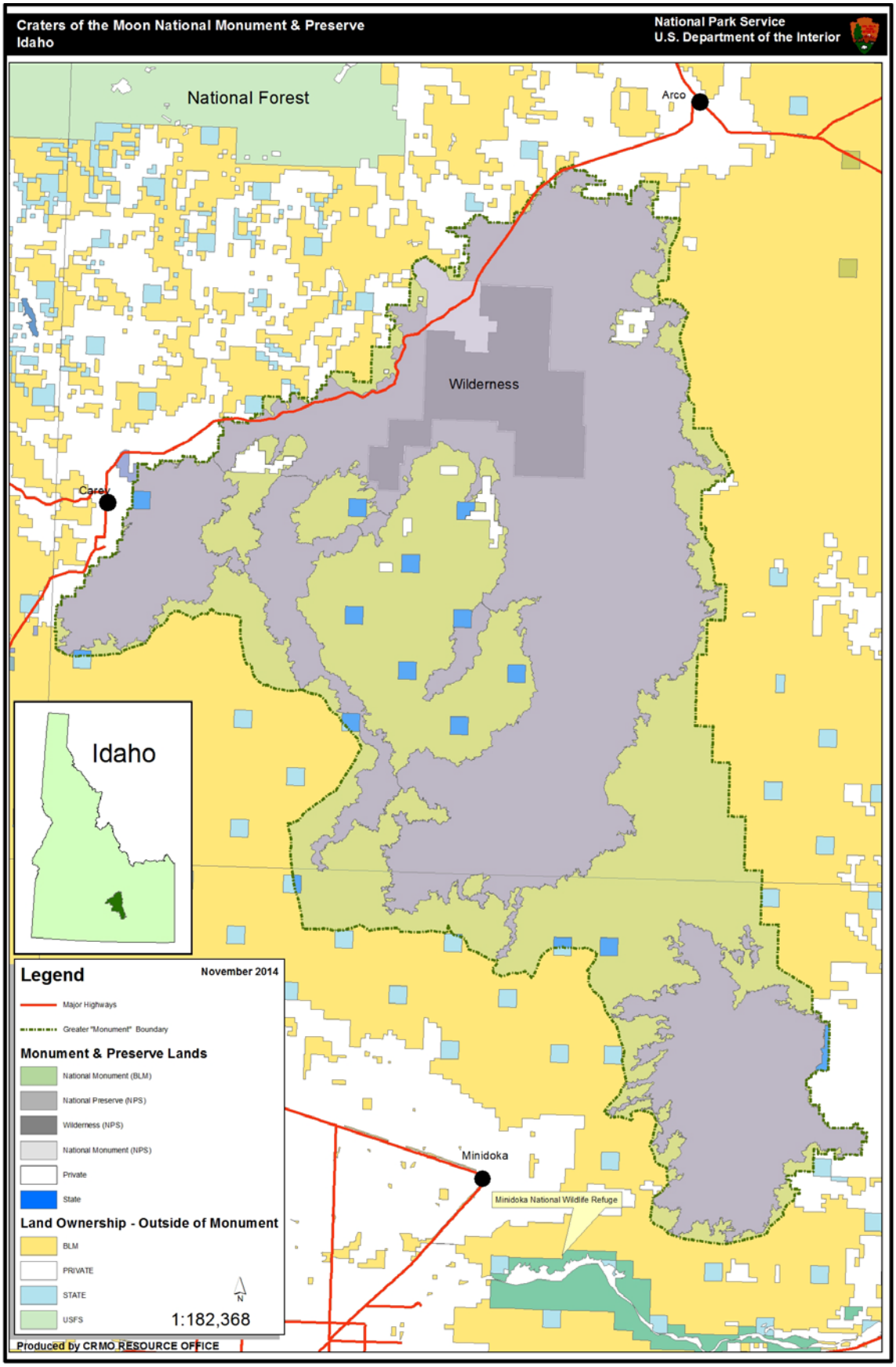
Both the Great Rift Region and sagebrush steppe ecosystems contain a wealth of cultural resources. Prehistoric hunting and plant gathering areas, along with food storage areas, date back to around 8,000 years ago, well before the last volcanic eruptions, which were probably witnessed by the Shoshone people. Resources from the more recent past represent the land's history of Basque sheepherding camps, cattle grazing, exploration, and recreation.

Most visitor and educational opportunities are located in the northern part of the park near U.S. 20/26/93 between the "gateway" communities of Carey and Arco, Idaho. In addition to guided walks and programs by NPS staff, the park has several self-guided trails with wayside exhibits and a seven-mile loop drive. Park facilities include a visitor center complex, which consists of a campground, museum, and bookstore, as well as the park headquarters.

The purpose of Craters of the Moon National Monument and Preserve (CRMO) is to protect a vast "weird and scenic landscape" with remarkable and diverse volcanic features, sagebrush steppe ecosystems, and wilderness, which provides opportunities to explore, understand, and value the rugged and remote high desert landscape of the Great Rift Region.

The following significance statements have been identified for CRMO:

- Active as recently as 2,000 years ago, the Craters of the Moon lava field is the largest young basaltic lava field in the lower 48 states. The lava field contains a remarkable and unusual diversity of exquisitely preserved basaltic volcanic features.
- The Great Rift is the deepest known land-based open volcanic rift in the world, and is nearly all contained within the park. It is also one of the longest volcanic rifts in the continental United States.
- CRMO contains more than 500 kipukas, or isolated vegetation communities surrounded by lava, largely undisturbed by modern human activity. These communities are key benchmarks for scientific study of long-term ecological change in sagebrush steppe ecosystems.
- The combination of harsh, young volcanic terrain and extremes of a high desert climate have produced a diversity of habitats where plant succession is easily observed and where wildlife display remarkable adaptations that allow them to survive.
- As one of the first two simultaneously designated wilderness areas in the national park system, CRMO is also the largest remaining area within the Snake River Plain that retains wilderness character. The monument and preserve, combined with the BLM-managed monument, encompasses more than one-half million acres of undeveloped federal land.
- Clean air offers visitors expansive scenic views of the high desert and surrounding mountains, which change dramatically with the seasons and from day to the dark night skies. CRMO is a Class I air shed, and is thus given the most protection under the clean air act.
- For thousands of years, people have explored, used, pondered, and even avoided this vast "weird and scenic landscape." Members of the Shoshone-Bannock Tribe and the descendants of those who passed this way on Goodale's Cutoff on the Oregon Trail retain enduring human connections to the landscape. CRMO continues to inspire these lasting impressions.



Map of the Park

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, and the associated workshop summary report available from the internet site, provide 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 involvement 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 ▸

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Ozone	Human Health: Annual 4th-highest 8-hour concentration		Human health risk from ground-level ozone warrants moderate concern. This condition is based on NPS Air Resources Division benchmarks and the 2008–2012 estimated ozone concentration of 65 parts per billion (ppb). For 2003–2012, the trend in ozone concentration at CRMO remained relatively unchanged (no statistically significant trend) (NPS ARD 2015).
	Vegetation Health: 3-month maximum 12-hour W126		Vegetation health risk from ground-level ozone warrants moderate concern. This condition is based on NPS Air Resources Division benchmarks and the 2008–2012 estimated W126 metric of 9.6 parts per million-hours (ppm-hrs). For 2003–2012, the trend in the W126 metric at CRMO remained relatively unchanged (no statistically significant trend) (NPS ARD 2015). List of ozone-sensitive plant species.

Deposition	Sulfur Wet Deposition		Wet sulfur deposition is in good condition. This condition is based on NPS Air Resources Division benchmarks and the 2008–2012 estimated wet sulfur deposition of 0.4 kilograms per hectare per year (kg/ha/yr). For 2003–2012, the trend in wet sulfur concentrations in rain and snow at CRMO remained relatively unchanged (no statistically significant trend) (NPS ARD 2015).
	Nitrogen Wet Deposition		Wet nitrogen deposition is in good condition. This condition is based on NPS Air Resources Division benchmarks and the 2008–2012 estimated wet nitrogen deposition of 0.9 kilograms per hectare per year (kg/ha/yr). For 2003–2012, the trend in total wet nitrogen concentrations in rain and snow at CRMO improved (NPS ARD 2015).
	Mercury/Toxics Deposition		Mercury/toxics deposition is rated as a moderate concern at the park. Studies indicate that mercury levels are elevated in snowpack sampled in Southeastern Idaho and the surrounding region (Susong et al. 2003, Ingersoll et al. 2011). No trend information is available because there are not sufficient on-site or nearby mercury wet deposition monitor data.
Visibility	Haze Index		Average visibility warrants moderate concern. This condition is based on NPS Air Resources Division benchmarks and the 2008–2012 estimated average visibility of 3.0 deciviews (dv) above estimated natural conditions. For 2003–2012, the trend in visibility on the 20% clearest days improved and remained relatively unchanged on the 20% haziest days (NPS ARD 2015). The Clean Air Act visibility goal requires visibility improvement on the 20% haziest days, with no degradation on the 20% clearest days.

Geologic Features and Processes

web ▸

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge of Cave Resources	Number of known caves, and percent of known caves with basic documentation		The CRMO cave inventory has 495 records with 92% having basic documentation (location, cave size, entrances, hazards, notable resources). The inventory consists of a spatial GIS layer and MS Access relational database, increasing the number of known caves and documentation. Confidence is moderate due to the large area of the Park that has not been systematically surveyed.
Waterholes (w/ perched water table)	Number of known waterholes, and percent still with water		There are 21 inventoried and studied waterholes, of which 6 that historically held water were dry. Waterholes within the lava flows are perched on top of ice in open pits and cracks. If winter precipitation decreases, ice floors supporting water holes can melt and any melt water drains into the fractured bedrock. Confidence is low due to lack of systematic survey.

Paleontological (Tree Molds)	Percent in Good Condition		CRMO's primary paleontological resource is tree molds (impressions made when lava flowed around trees) and the park's tree mold data base currently contains data on 163 tree molds. The first systematic study was conducted by the park geologist in 2001/2002 and documented 141 tree molds, 11 of which showed damage. Cause of damage is difficult to determine, and may be human caused. The second inventory and survey was conducted in 2012, which resurveyed, photographed, and assessed the condition of all previous sites and discovered 22 new tree molds. The 2012 survey found 17 tree molds showing damage, an increase of two percent. CRMO has a Tree Mold Inventory and Monitoring Protocol in place with the recommendation that it be conducted every ten years.
Knowledge of Geologic Resources	Geologic Resource Inventory Map and Report		Four USGS 7.5' digital geologic quads covering the original Monument (1999), USGS Great Rift (1988 – non-digital) and USGS Craters of Moon 100K geologic digital quad (2007) have been completed. A USGS Lake Walcott 100K covering the Wapi lava field is in progress. A Geologic Resource Inventory Map and Report has not been completed.

Resource Brief: Waterholes

In 2010 a waterhole inventory project, *2010 Waterhole Inventory*, was conducted to establish baseline data and compare waterhole characteristics. A waterhole priority list was compiled based on accessibility and also to target a variety of geologic settings, such as pit craters, lava tubes, fissures, craters, and thermal springs.

Twenty-one waterholes were documented. Six waterholes historically documented as containing water were dry. All of the dry waterholes occurred as surface waterholes and not as pools in caves. Many of these dry waterholes were shown on the 1957 topographic map, but their exclusion on the later maps suggests that they may have dried up long ago.

Nearly every waterhole had evidence for either historic human use, biologic use, or both as a water source. Animal bones, middens, and scat were common evidence of wildlife use found at waterholes. Sightings of squirrels, chipmunks, and birds at waterholes were common. Rusted tin cans and broken glass were found at many of the sites, as well as diffuse trails and rock cairns marking their locations. The majority of the waterholes surveyed are perched water tables over ice as evidenced either by visual confirmation of ice or by water temperatures near 0 °C. Ice was visible in 5 of the 21 waterholes.

Ice & Water in Lava Tube

Yellow-jacket Waterhole

Conclusions from 2010 Study:
The data collected from the 2010 study provides a baseline to monitor future changes to the waterholes. Two waterholes do not appear on topographic maps since 1957, which strongly suggests that they went dry over twenty five years ago. One waterhole shown on the 1972 map was absent from the 1983 map, suggesting that it disappeared in the period between the maps. Three waterholes that were shown on the 1957, 1972, and the 1983 topographic maps were dry at the time of visitation in 2010. As evidence for the ephemeral nature of some waterholes, Registration Waterhole was revisited a month after initial documentation and the water levels were already

significantly lower than earlier in the summer. The fact that six historic waterholes were found to be dry, even after a wet and cool spring, along with their absence from more recent topographic maps suggests the following:

1. Climatic conditions have changed significantly at these six historic waterholes to have lost their ice lenses and dried up.
2. Once an ice lens has been lost to melting, the climatic conditions no longer exist for it to reform.
3. Based on observations of the park geologist over a span of 15 years the ice level in Moonshine Cave largely remained constant until it started to drop several years prior to the 2010 survey. In 2010, the ice level had dropped by over a meter from previous static levels exposing a lower level of lava tubes previously unknown. This suggests that at least for Moonshine Cave, a tipping point for ice melting had been reached resulting in a net decline of the ice level, presumably as a result of climatic change.

Some inferences can be drawn to explain the prolonged existence of the extant waterholes based on observations made during the 2010 survey. Waterholes existing outside of caves were almost all shielded from direct sunlight throughout the day by either a large rock or pile of rocks, thus reducing direct solar heating and evaporation of the water and assisting the persistence of ice beneath the liquid water. These ice lenses are the only practical mechanism to allow a water table to be perched in the lavas hundreds of feet above the saturated zone of the aquifer in these permeable basalts. Every waterhole with the exception of the two thermal springs studied, had a recorded water temperature at or below 1.6 degrees Celsius with the exception of one waterhole that had a water temperature of 4 °C, which was believed to be caused by a more prolonged sun exposure. Waterholes exist in caves due to the optimal conditions provided by trapping cold air in winter and the accumulation of significant amounts of ice that very slowly melts over the course of the summer. The lack of any discernible high water marks at many of the waterholes suggests that either the water levels have been relatively stable over time or that no distinguishable high water mark was left. Conductivity and pH were measured to determine the general chemical characteristics of the water and to test the influence of basaltic interaction with the water. Measured pH's for all waterholes fell between the range of 7.0 and 8.0. While average rainwater is slightly acidic, all of these samples were neutral to slightly basic, which indicates interaction with the soil and rock.

Water Quantity and Quality

web

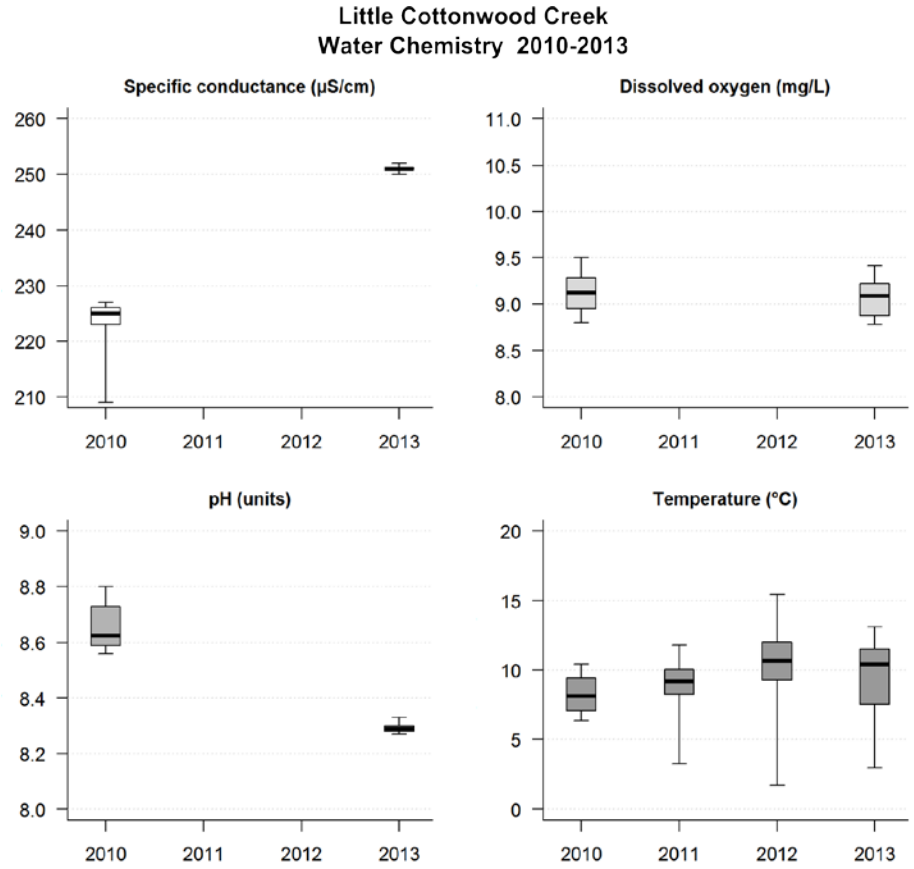
Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Water Chemistry	Maximum daily maximum water temperature		Water quality in Little Cottonwood and Leech Creeks are of special importance to CRMO because they are the source of water for park headquarters and provide unique riparian habitat. In Little Cottonwood Creek, water temperature measurements from 2010 to 2013 indicated that the maximum daily maximum (MDMT) water temperature never exceeded the Idaho criteria for cold water life designation (MDMT< 22 °C) (Starkey 2011 and 2014). The above findings are consistent with results of studies conducted in the 1990s (Falter and Freitag 1996, and NPS 1998). Temperature measurements in Leech Creek from 1992 and 1993 also did not exceed the Idaho criteria for cold water life designation (Falter and Freitag 1996). Leech Creek is not included in the current monitoring protocol.
	pH (mean daily minimum and maximum)		In Little Cottonwood Creek, water quality monitoring in 2010 and 2013 recorded pH values that were within the acceptable cold water aquatic life thresholds of 6.5–9.0 pH units (Starkey 2011 and 2014). These results were within the range of observations by Falter and Freitag 1996, and NPS 1998. Averaged pH measurements from 1992 and 1993 were also within the acceptable cold water aquatic life thresholds (Falter and Freitag 1996).

	Specific conductance (mean)		In Little Cottonwood Creek, water quality monitoring in 2010 and 2013 found mean specific conductance values of 223.97 µS/cm and 250.89 µS/cm, respectively. There is no established cold water aquatic life threshold for specific conductance. These results are consistent with measurements from the 1990s (Falter and Freitag 1996, and NPS 1998). In Leech Creek, studies in 1992 and 1993 found mean conductivity values of 148 µS/cm and 203 µS/cm, respectively (Falter and Freitag 1996).
	Dissolved Oxygen (mean daily minimum)		In Little Cottonwood Creek, water quality monitoring found mean daily minimum dissolved oxygen values of 8.80 mg/l and 8.94 mg/l, respectively, this is better than the cold water aquatic life criteria of 6.0 mg/l. In 1992 and 1993 Falter and Freitag (1996) found mean dissolved oxygen values in summer of 7.2 and 7.8 mg/l, respectively. In Leech Creek, studies in 1992 and 1993 found summer means of 8.3 mg/l and 8.9 mg/l, respectively (Falter and Freitag 1996).
Aquatic Macroinvertebrates	Hilsenhoff Biotic Index [HBI] and U.S. Forest Service (USFS) community tolerance quotient		In Little Cottonwood Creek, water quality monitoring in 2010 and 2013 included collection of aquatic macroinvertebrates for lab analysis. Hilsenhoff Biotic Index (HBI) values, which indicate pollution tolerances of the macroinvertebrate taxa within the sample, were 3.05 and 2.75, respectively. These values indicate that water quality is “excellent” with “organic pollution unlikely” (Hilsenhoff 1988). The 2013 lab analysis included the U.S. Forest Service (USFS) community tolerance quotient, which ranges from 20 to just over 100, with lower values indicating better water quality; the 2013 value was 55.

Resource Brief: Water Quality

Water quality in Little Cottonwood Creek is of special importance to CRMO because its headwater springs served as the source of water for park headquarters until 2004. Since then, the park water supply has come from shallow wells along the downstream end of the creek (figure below). As a result, water quality in Little Cottonwood Creek has a direct impact on water use within the park. In addition, Little Cottonwood and Leech Creeks represent the only perennial streams within CRMO and thereby are a unique resource/habitat within the monument and preserve. The primary concern in Little Cottonwood Creek is impacts caused by the historic Martin Mine. This mine was most active during the mid-1920s and mid 1930s with some limited use in the 1950s. In 1967 NPS acquired the claim. Subsequently, in the early 1980s, CRMO filled in the mine shaft and tunnels. In 1994 remediation/restoration of the hillside occurred (NPS 1995). The 1998 NPS Water Resource Division report on baseline water quality data and Falter and Freitag (1996) describes water quality in detail relative to the Martin Mine. Falter and Freitag (1996) stated that the "Martin Mine is minimally influencing the metals content of Little Cottonwood Creek" and that lead and arsenic levels fall "well below the EPA's criteria for domestic and irrigation water supplies."

Water chemistry and aquatic macroinvertebrate monitoring data from 2010 and 2013 indicate that conditions in Little Cottonwood Creek were well within acceptable ranges relative to criteria for cold water aquatic life (Starkey 2011 and 2014) and that the overall condition of water quality is good. These findings are consistent with those of the 1998 NPS Water Resources Division report on baseline water quality data and Falter and Freitag (1996).



Core water chemistry parameters in Little Cottonwood Creek 2010–2013. The whisker ends for these boxplots represent the min/max values. Note that specific conductance, dissolved oxygen, pH, and temperature were monitored for 24-hours in June 2010 and 2013. In addition, temperature data was collected hourly June–October 2011–2013.

River Channel

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
River Channel Characteristics	Pfankuch channel stability rating		According to a study conducted in 1992 and 1993, stream channel stability was “good” for both Leech and Little Cottonwood Creeks. Evaluation of each stream reach was using the Pfankuch method. This study also noted that each stream is in a steep canyon, which prevents them from changing course (Falter and Freitag 1996).

Landscape Dynamics

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Landscape Dynamics	Land Converted (Percent Natural and Converted Land Cover)		For the land converted the NPScape National Land Cover 2001 and 2011 products were clipped out to a 25 km buffer around CRMO. Subsequently a classification giving the following four classes: Barren, Cultivated, Natural, and Developed. Cultivated and developed lands account for 12% of the 13.3 million acre area. The change from 2001 to 2011 in all classes was minimal with cultivated land decreasing slightly.

Wildlife

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Pronghorn	Numbers of pronghorn migrating in spring and fall		Pronghorn migrate through CRMO while traveling over 100 miles between winter and summer ranges. Pronghorn populations are influenced by the condition of their summer and winter ranges, as well as the condition of their migration corridor in between. As such pronghorn can be considered as an indicator of regional landscape health. Monitoring began in 2012 and the limited years of data have ranged from less than 300 in the fall of 2012, to 451 pronghorn in the fall of 2013 and back down to 357 in the fall of 2014. This considerable annual variation results in a flat trend. The monitoring camera was deployed for a shorter time period in 2012, which may account for some of the increase.

Birds	Species Richness (number of species detected)		Bird species, as recorded through CRMO breeding bird surveys, offer an indication of overall habitat condition. In 2002 ten survey routes became established for annual surveys. Since 2002, the trend line shows an increase in both measures; however, a large drop in both of these in 2014 warrants concern.
	Number of birds detected		
	Number of Brewer's sparrow		The number of Brewer's sparrow, the most common sagebrush obligate bird species, detected through breeding bird surveys offer an indication of sagebrush steppe habitat condition. The surveys show a sharp decline in the number of Brewer's sparrow since 2009. This decline could represent the effects of 3 years of drought, seasonal variation (timing of surveys with differences in phenology) and/or surveyor bias.
American Pika	Site occupancy (%)		American pika is a species of concern thought to be vulnerable to accelerated climate change. Since monitoring began in 2007, site occupancy has varied widely from year to year, with a high of 31% to a low of 7% in 2011 (Rodhouse et al. 2010, Jeffress et al. 2013). This considerable annual variation results in a flat trend.
Greater Sage Grouse	Lek counts, sagebrush habitat loss (acres burned)		Range-wide, greater sage grouse are in decline. U.S. Fish and Wildlife Service, in 2010, determined that listing of sage grouse under the Endangered Species Act was warranted. Long-term trends across Idaho also show sustained declines. In the adjacent sage grouse Planning Areas (Big Desert and North Magic Valley) approximately 70% of sage grouse habitat has burned since the early 90s. Since 2008, 127,596 acres (about 9%) of key sage grouse habitat has burned across the two planning areas. However, recent population trends (based on lek count data) are stable or slightly increasing. Loss of habitat due to wildfires may not be reflected in lek count numbers in the short term. For this reason, although lek count numbers in the park and the two planning areas have been relatively stable; our confidence regarding the trend is low.
Bats	Winter hibernacula counts		Bats are facing novel threats including disease and wind energy development. Recent park surveys have documented several previously unknown hibernacula and monitoring is beginning to collect baseline data on hibernating bats (Stefanic and Rodhouse 2013).

Resource Brief: Bats

Eleven species of bats have been documented at CRMO, and as many as 6 other species may occur here (Stefanic et al. 2014, Madison et al. 2009, Stefanic and Rodhouse 2013). The numerous caves provide habitat for roosting and rearing pups during summer and hibernation in winter. Populations of most of these species are believed to reside in the park, especially during summer. Obtaining reliable population estimates is currently out of reach due to the great difficulty in accessing a majority of the park lands. However, efforts are underway to gather baseline data prior to the anticipated arrival of the exotic fungal disease white-nose syndrome and other threats, including, the rapidly expanding footprint of the wind power industry (bats are frequently killed in collisions with wind turbines) and climate change.

Up until 2012, Arco Tunnel was the only known hibernacula in the park (bats have been known to hibernate in Arco Tunnel since 1985) and was the only cave visited in the winter to look for hibernating bats. In the winter of 2012 an effort began to gather baseline data on hibernating bats and suitable caves in the park. Through the winter of 2015, fifty-three caves have been surveyed for hibernating bats. About 30% of caves visited were deemed to be unsuitable for hibernation. Of those caves deemed suitable, bats were found hibernating in 38% of them. This effort has added thirteen new caves to the list of known hibernacula at CRMO. Additionally,-a new high count of 41 bats was recorded in Arco Tunnel in 2015, likely including the first CRMO record of hibernating Yuma myotis (*Myotis yumanensis)* and potentially long-eared myotis (*Myotis evotis*). *Myotis* species are difficult to identify with high confidence given the height of ceilings where bats are often found and the inability to gather diagnostic measurements (i.e., current protocols do not allow handling of bats in order to minimize disturbance). A protocol documenting methods and data management strategies is currently in development and will ensure that the program will persist into the future and provide resource management staff with information necessary to better manage cave resources.

Winter surveys of lava tubes in CRMO began in 2012 in an effort to establish baselines trends prior to the anticipated arrival of the exotic fungal disease white-nose syndrome (Maher et al. 2012), which has wiped out many bat populations in eastern North American since 2007.

Resource Brief: Pronghorn

Across the western U.S. it was once common for deer, elk and pronghorn to move long distances between summer and winter ranges each year in search of suitable forage and favorable weather. Developments, such as roads, agriculture, fences and housing along migration routes have cut off migration entirely or made such trips much more hazardous to animals. Pronghorn migration in some areas of the Rocky Mountain West still occurs, including a migration corridor passing through Craters of the Moon National Monument and Preserve, which spans 100 miles in each direction. Along the 100 mile route pronghorn encounter obstacles to passage including fences. Pronghorn rarely jump over fences and will instead try to crawl underneath. Some fences, including those erected decades ago by the NPS to prevent livestock trespass, made pronghorn passage difficult and potentially dangerous.

Example of images from an automated camera used to count numbers of migrating pronghorn.

Studies in 2008 and 2009 tracked the movement of two dozen migrating pronghorn using GPS collars. The results showed the pronghorn following a consistent route through the park each year. As a result, in 2009 the NPS began removing or modifying its boundary fences to minimize these impediments to pronghorn migration. The new fences leave a larger gap on the bottom for pronghorn to crawl under and use smooth rather than barbed wire on the bottom and top strands.

Just north of Sunset Cone a narrow gap, now known as Pronghorn Pass, exists between the lava fields and the mountains. This landscape feature funnels most migrating pronghorn along a single path making it possible to monitor their numbers using automated cameras. In spring of 2013 (mid-March to May) 496 pronghorn were counted headed west and in the fall of 2013 (September through October) 459 pronghorn were observed moving east towards their winter range. Counts were much lower in 2012 (219 in spring and 287 in the fall), when the cameras were deployed for a shorter period of time during both seasons.

A group of pronghorn crossing Pronghorn Pass.

Small numbers of pronghorn are also found in scattered areas of the park during the summer months.

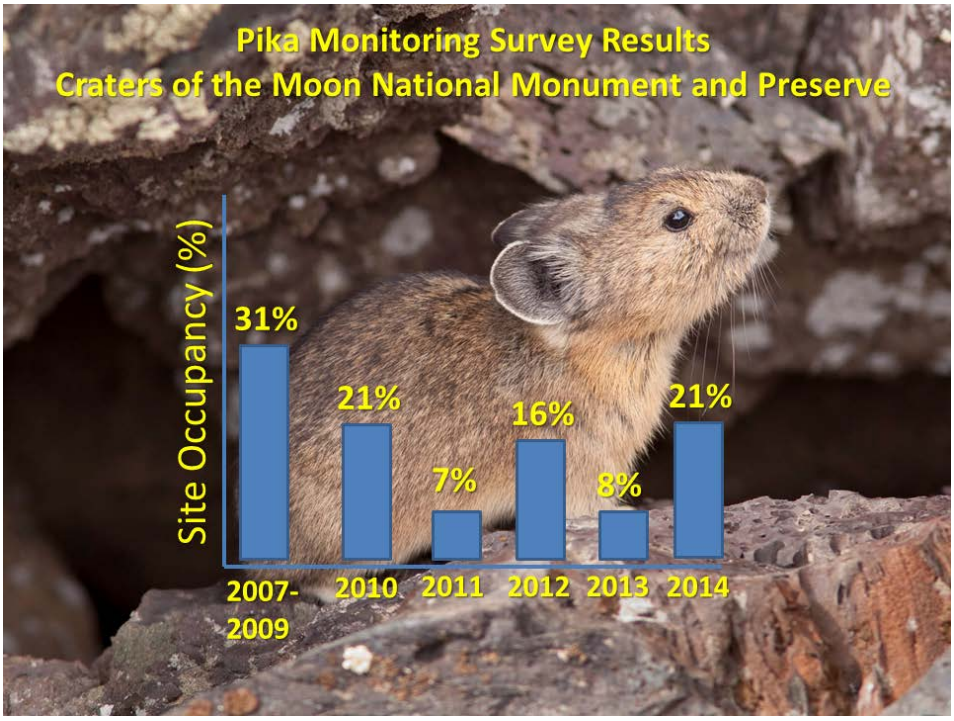
The continued health of this migratory herd requires the collaboration of public and private entities along the migration corridor and across the winter and summer ranges. Pronghorn illustrate the importance of continued NPS involvement in landscape conservation efforts far beyond its boundaries.

Resource Brief: American Pika and Climate Change

The American pika, a small relative of rabbits and hares that resides in montane boulder fields and lava flows, has become an important harbinger of accelerated climate change in western North America (Rodhouse et al. 2010, Jeffress et al. 2013). The species is vulnerable to extreme heat, and increasingly also appears to be vulnerable to cold winter temperatures in the absence of insulating snow cover. Craters of the Moon National Monument and Preserve is a unique place for pikas to persist because it is relatively low elevation habitat for pikas and can become quite hot out on the lava flows during summer. Snow pack is also increasingly ephemeral, adding to the vulnerability of the park's pika population.

Surveys of pika site occupancy began in 2007 across portions of the lava flow habitat in the northern portion of the Monument and Preserve (Rodhouse et al. 2010). Initial results from the first three years of surveys ending in 2009 provided strong evidence that pikas are persisting in the park by selecting lava flow habitat in the highest elevations of the Monument that also have highly complex rocky surfaces, presumably because these provide the most protection from harsh summer weather.

Beginning in 2010, focused monitoring began in the park in cooperation with other parks in the region including Lava Beds National Monument in Northern California, which also has pikas persisting in harsh lava habitat. This collaboration has facilitated ecological learning and communication of climate science findings within the National Park Service and with outside collaborating scientists (Jeffress et al. 2013). Since that time it appears as though the proportion of occupied sites has declined slightly, although considerable year-to-year variation in site occupancy has also been recorded. An approximately flat (≈ 0% per year) trend is revealed when all survey data from 2007 to 2014 are evaluated in relation to the elevation and vegetation cover of monitoring sites, and when potentially confounding factors such as imperfect detection of pika presence are accounted for. Ongoing investigations are beginning to uncover possible reasons for the high year-to-year variation, which include variation in snow pack in combination with cold winter temperatures. Understanding these relationships between climate and weather and the dynamics of American pika distribution across the park will add meaningfully to a broader scientific understanding of climate change impacts on park resources.



The American pika lives in the lava flows of CRMO. Monitoring over the period from 2007–2014 has found some evidence that the population may be declining, although this trend is highly variable with large fluctuations in site occupancy over the period of study. Fluctuations in site occupancy may be related to external forces such as drought or other climatic factors. Photo reproduced with permission from Michael Durham (durmphoto.com).

Terrestrial Invasive and Nuisance Species

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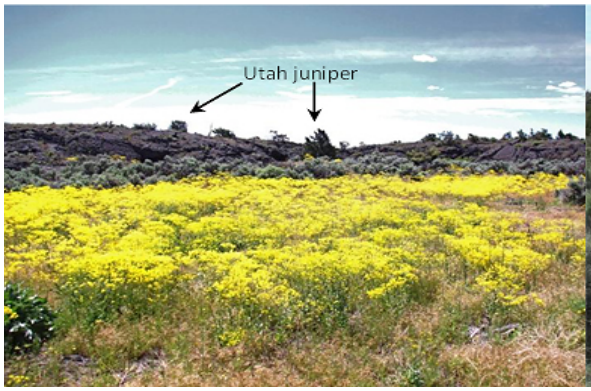
Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Invasive/Exotic Plants	Distribution and abundance of invasive annual grasses and broad-leaved flowering plants (forbs)		Cheatgrass poses a substantial threat to the integrity of park sagebrush steppe communities. The southern portion of the park is inundated with cheatgrass, most notably in the Wapi Flow. The 2009 CRMO Vegetation Inventory described and mapped 21,996 acres (5% of CRMO) of heavy cheatgrass (>25% cover) infestation. Recently burned areas are vulnerable to cheatgrass conversion (Rodhouse 2011, Esposito et al. 2014). Other broad-leaved invaders including Dyer's woad, leafy spurge, and rush skeletonweed are threatening sagebrush steppe health.
White-pine Blister Rust	Incidence in limber pine population		White-pine blister rust was first discovered in the park in one isolated outbreak in 2006. The fungal-borne disease does not appear to have spread beyond this initial site of infection. No infected trees have been found in surveys of 90 monitoring plots during 2011–2014 (Stucki and Rodhouse 2013).

Resource Brief: Noxious Weed Management

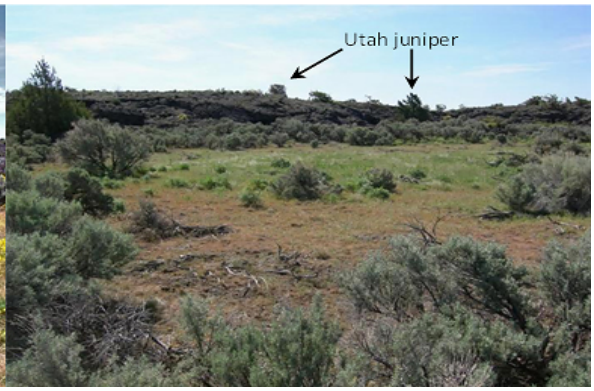
At CRMO, the National Park Service first began investing resources into weed management in the mid-1990s when the park unit was a fraction of its current size. Given its seemingly inhospitable conditions, management priorities then were simple; hand remove weeds along all local roads, facilities, and trails. With park expansion in 2000, park staff began more aggressively and systematically treating nonnative and noxious weeds across an expanded road network and large lava fields. The current program is driven by decisions formalized in a Multipark Invasive Plant Management Plan and Environmental Assessment (2011) and annual work plans and priorities. Treatment strategies vary depending on the area of interest (park roads, backcountry areas, etc.), park resources at risk, the weeds that are currently present, an area's past treatment history, an area's topography and isolation, and the number and type of land designations (research natural area, wilderness, etc.). Generally the park focuses on eradicating small isolated populations within lava fields and kipukas while suppressing larger infestations (primarily along roads) to prevent them from invading other areas.

The park's highest priorities for noxious weed treatment currently include spotted and diffuse knapweed, leafy spurge, rush skeletonweed, Dyer's woad, field bindweed, scotch thistle, and Canada thistle. In addition, other nonnatives including mullein, bull thistle, smooth brome, and sweet clover are also treated opportunistically. Cheatgrass is chemically and mechanically treated around park facilities and hiking trails where local eradication is still possible. Controlling cheatgrass on a large scale is limited because of the park's wilderness designations, rocky terrain, and other logistical challenges but it continues to be a consideration for post wildfire rehabilitation efforts. The park maps and tracks all treated noxious weed patches in a large geodatabase (CRMO 2013).

Dyer's Woad Eradication:
For eight years, CRMO has been aggressively treating Dyer's woad (*Isatis tinctoria* L.), a state-listed noxious short-lived perennial weed in the mustard family. It is believed that this weed invaded from the railroad along the park's southern boundary. To date, 320 acres are infested across several thousand acres of the Wapi Lava Field. No other populations are known within 50 miles of this infestation making regional eradication a workable goal. Some sites have shown dramatic reductions in just a few years of treatment (comparison photos below). Moreover, Dyer's woad across the entire lava field has been reduced to one-sixth of its largest size in 2009. Distinctive yellow flowers make Dyer's woad easy to detect across the lava fields and aerial mapping and treatment by helicopter has been conducted annually by the park's management partner, the Shoshone Field Office of the Bureau of Land Management.



Dyer's woad 2010



Dyer's woad 2013

Vegetation Communities

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Sagebrush Steppe	Abundance (% cover) of bluebunch wheatgrass, Idaho fescue, big sagebrush, and other native perennial species		In 2010 and 2013, monitoring indicated that sagebrush steppe in the north end of the park was in good condition, dominated by robust stands of native vegetation. The Sunset Cone and Brass Cap kipuka areas were particularly notable. However, the majority of areas monitored are compromised by invasive cheatgrass and are lacking in native vegetation cover. The Wapi Flow in the southern portion of the park is noteworthy in this regard, as are recently burned areas (Rodhouse 2011, Esposito et al. 2014).
Limber Pine	Regeneration, mortality, survival		From 2011–2014, surveys of 90 woodland monitoring plots indicated the park limber pine population is in good condition, with no evidence of spreading white-pine blister rust, or elevated mortality from dwarf mistletoe and mountain pine beetles. Regeneration in these pine stands is low, but cone production was relatively high (≈ 70%) (Stucki and Rodhouse 2013).
Aspen	Stem density, regeneration, mortality		Aspen monitoring shows an increase in regeneration from 2007 to 2010 and a decline in mature and dead aspen (Strand et al. 2014).

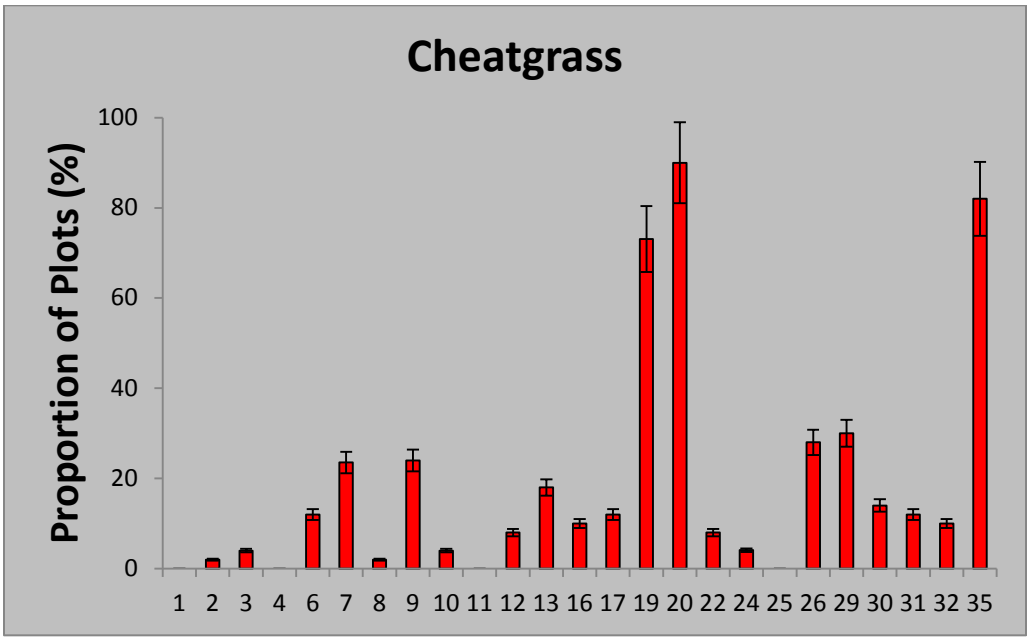
Resource Brief: Sagebrush Steppe Vegetation Communities

Sagebrush steppe was once prevalent, but now is one of the most threatened ecosystems in the Intermountain West. Extensive areas of sagebrush steppe vegetation have been degraded by overgrazing by livestock and conversion for agriculture. Major threats, such as altered fire regimes and the invasion of noxious weeds, in particular cheatgrass, continue to threaten remaining sagebrush steppe vegetation. If nitrogen deposition increases, this could further threaten sagebrush steppe communities as research shows added nitrogen favors invasive over native species (Allen 2013). Historic land practices within the park, as well as current land use practices surrounding the park continue to divide and alter the residual sagebrush steppe communities. Predicted changes in climate will likely exacerbate these problems in the future.

The Upper Columbia Basin Network (UCBN) Inventory and Monitoring Program began monitoring sagebrush steppe vegetation in CRMO in 2010. Monitoring objectives focus on determining the status and trends in the composition and abundance (% cover) of principal native and non-native invasive indicator plant species, as well as the amount of exposed bare soil, in UCBN sagebrush steppe communities. Principal species include bluebunch wheatgrass (*Pseudoroegneria spicata*), Idaho fescue (*Festuca idahoensis*), big sagebrush (*Artemesia tridentata*), and other persistent annual and perennial native plant species. Cheatgrass (*Bromus tectorum*), another principal species, is a widespread non-native invasive annual grass of particular importance.

Results of sagebrush steppe monitoring in 2010 and 2013 indicate that several of the 11-hectare sampling frames in the north end of the Monument and Preserve were dominated by robust stands of native vegetation. The area around Sunset Cone and Brass Cap Kipuka were particularly notable for the intact native vegetation found there. However, the majority of the 25 monitored sampling frames were compromised by invasive cheatgrass and were depauperate in native vegetation cover. The Wapi Flow in the southern portion of the frame is noteworthy in this regard, as are recently burned areas (Rodhouse 2011, Esposito et al. 2014).

Kipukas are islands of vegetation that have been surrounded by more recent lava flows but not completely covered. Kipukas are geologically significant, and of ecological interest because of the presence of existing intact native vegetation. Some kipukas within CRMO, in particular Brass Cap Kipuka, contain native vegetation that has been protected from grazing and noxious weed invasion by the rugged lava flows that surround them. These islands of vegetation represent vegetation types that have remained untouched throughout the years. Other kipukas, including Sand Kipuka in the Wapi Flow, have been seriously impacted by grazing, fire, and invasive species. Monitoring sagebrush steppe vegetation within kipukas is essential to learning more about a declining resource.



Proportion of plots containing >5% cheatgrass cover in 25 monitoring areas (sampling frames, shown on X axis) in 2014. This illustrates the wide variation in ecological condition among these frames. Frames 1, 4, 11, and 25, in the Northern tier of the Preserve and in one isolated kipuka (Brass Cap Kipuka), are mostly free of cheatgrass. Conversely, frames 19, 20, and 35, on the Wapi Flow in the southern portion of the Preserve, are overwhelmed by cheatgrass. Frame 32 is located along Hwy 93 in the Golden Chariot Fire which burned in 2000. This frame is adjacent to frames 1 and 4, which are in good condition, and illustrates the threat that wildfire presents to the dynamic of cheatgrass invasion in the region.

Brass Cap Kipuka, an exceptional example of intact native sagebrush steppe vegetation. This kipuka has been identified as a candidate National Natural Landmark site.

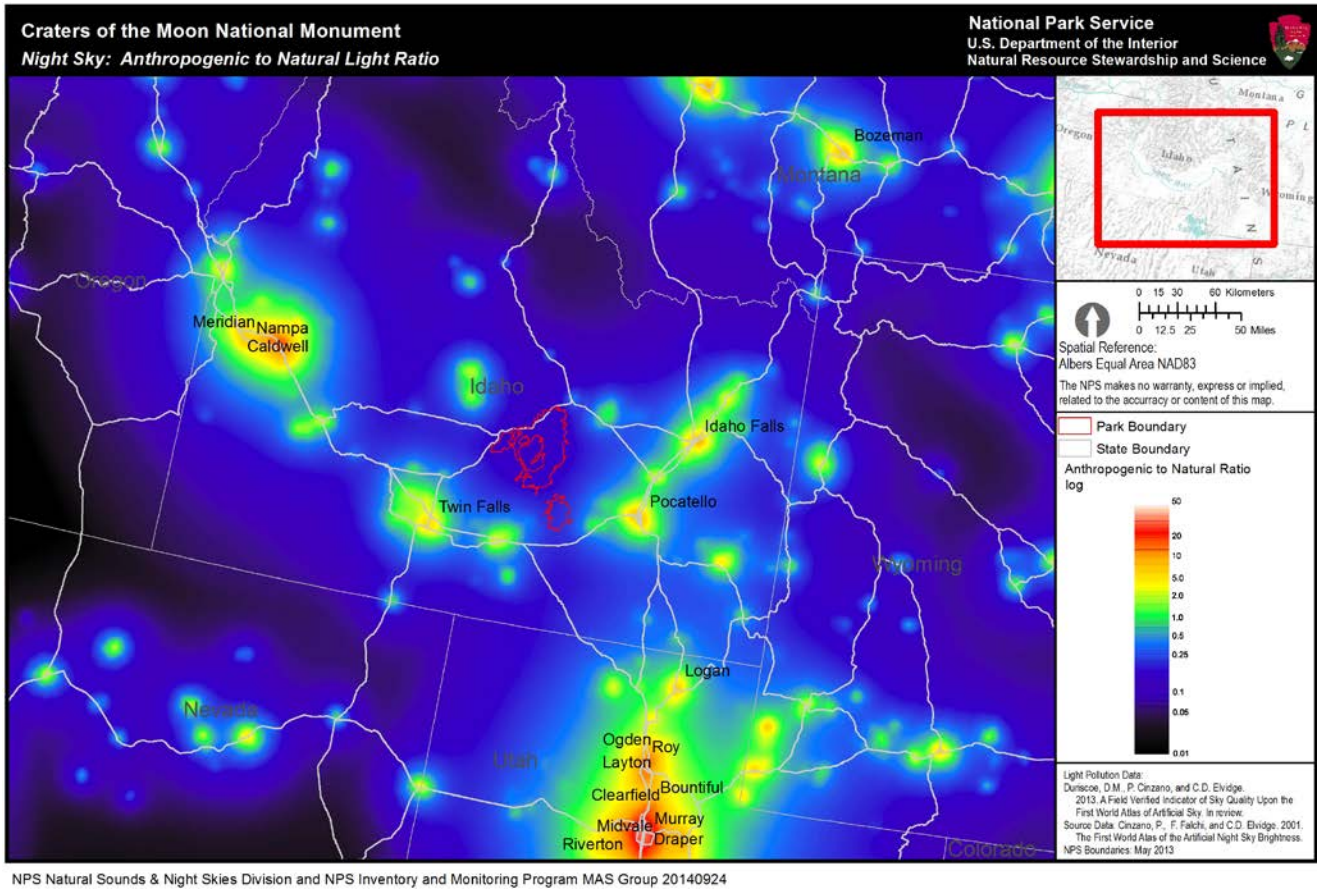
Aerial view of Carey Kipuka, surrounded by lava flows.

Dark Night Sky

web

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 CRMO be categorized as Level 1 (most sensitive). 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		The modeled Anthropogenic Light Ratio (ALR), a measure of light pollution, was 0.16, which is considered of good condition. The park is adjacent to the cities of Twin Falls, Pocatello and Idaho Falls. Population growth in each city has been low (<5%) therefore trend is neutral (U.S. Census Bureau).



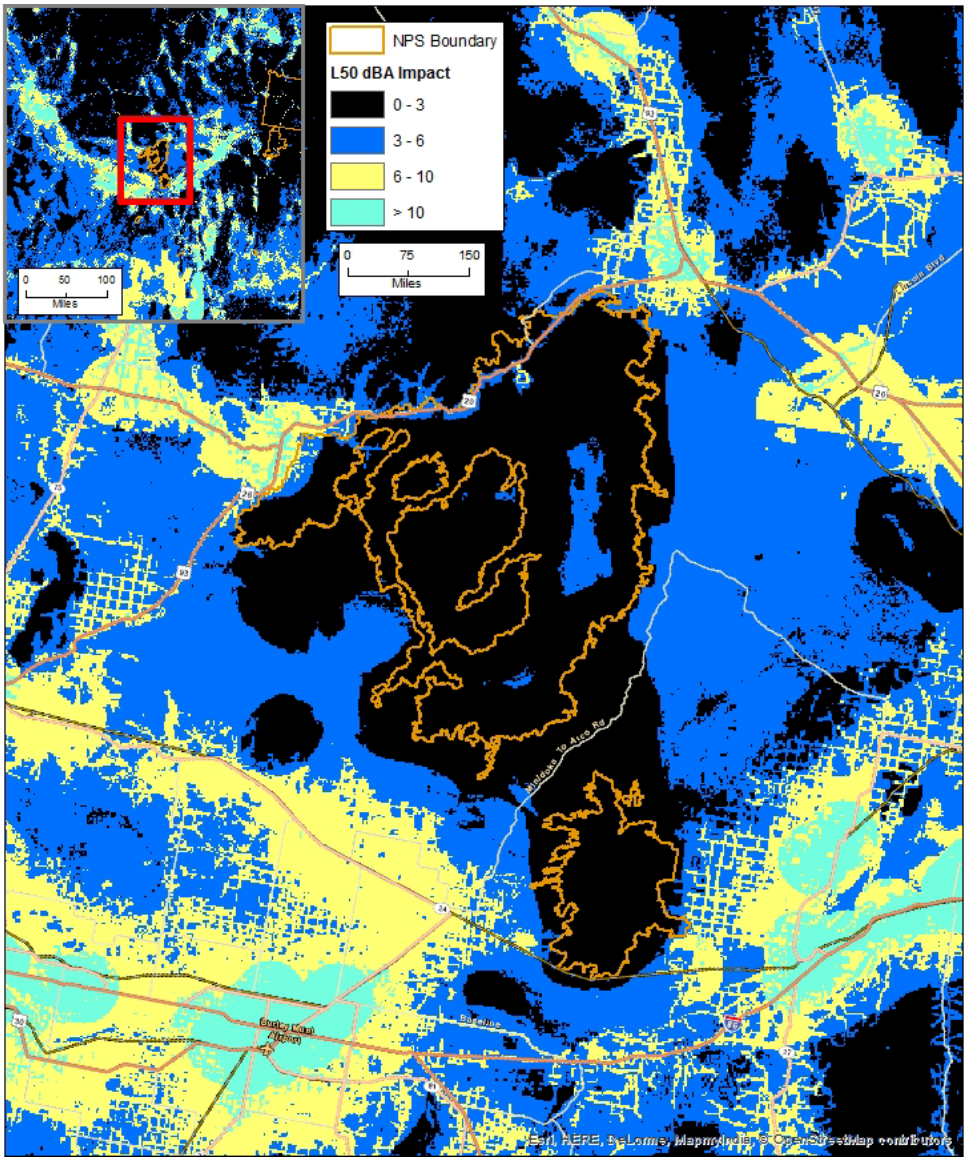
Regional map illustrating main sources of anthropogenic light in relation to CRMO

Acoustic Environment

web

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 CRMO are in good condition under non-urban criteria. 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 difference between existing ambient and natural ambient models, is 1.5 dBA. This indicates that the acoustic resources are in good condition under non-urban criteria. Trend is deteriorating due to nationwide increases in ground-based (Federal Highway Administration 2013) and aircraft traffic in recent decades (Federal Aviation Administration 2010).



Park-specific L_{50} dBA impact map for urban section of park, as generated by ver. 2.31 of geospatial model

Resource Brief: Recent Climate Change Exposure

To understand recent "climate change exposure" of national parks—that is, the magnitude and direction of ongoing changes in climate, we investigated how recent climate compares to historical conditions. This recently published research (Monahan & Fisichelli 2014) updates the basic climate inventories for 289 national park units. Here, we summarize results for CRMO, including areas within 30-km (18.6-mi) of the park's boundary. We evaluated climate-change exposure by asking which of 25 biologically relevant climate variables recently (past 10–30 years) experienced "extreme" average values relative to the 1901–2012 historical range of variability. We define "extreme" conditions (e.g., extreme warm, extreme wet) as exceeding 95% of the historical range of conditions.

Methods

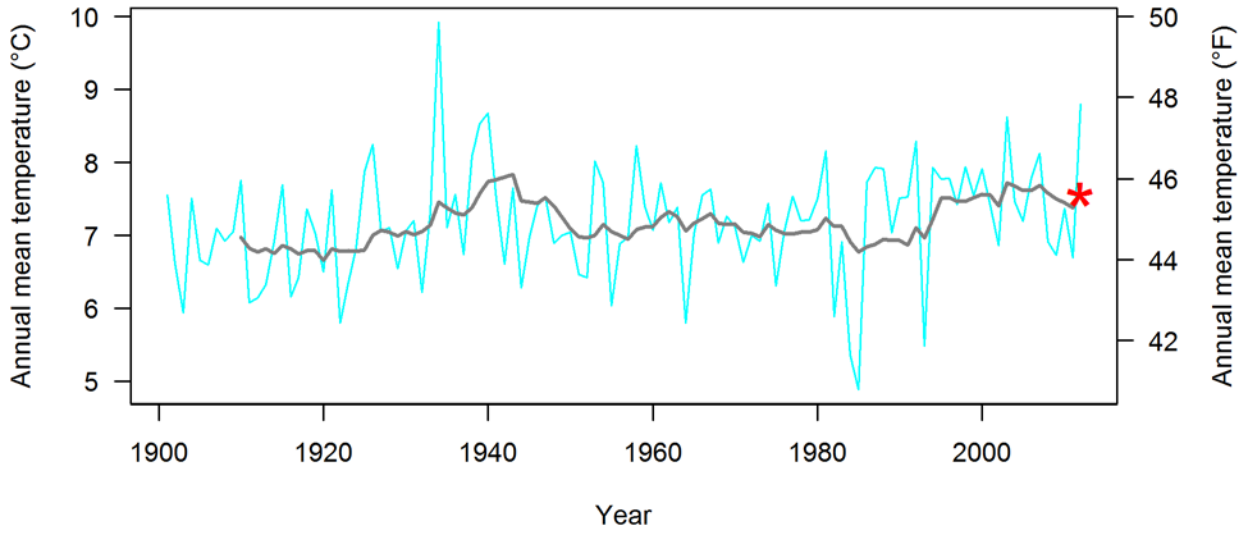
To evaluate recent climate values within the context of historical conditions at CRMO, we used the following methods (also illustrated in figure below):

- For each temperature and precipitation variable, we analyzed data within three progressive time intervals, or "moving windows," of 10, 20, and 30 years to calculate a series of averages over the entire period of analysis (1901–2012). For example, in progressive 10-year intervals, we calculated averages of temperature and precipitation for 103 blocks of time (1901–1910, 1902–1911 . . . 2003–2012), and repeated this approach for the 20 and 30-year "windows." This type of analysis helps to smooth year-to-year fluctuations in order to identify longer-term trends that characterize the park's historical range of variability (HRV). The three windows encompass both near- and long-term management and planning horizons, as well as important climatic periods and cycles.

- We compared the average temperature and precipitation values for each of the most recent 10, 20, and 30 year intervals (2003–2012; 1993–2012; and 1983–2012) to those of all corresponding intervals across the entire period of 1901–2012. These results (expressed as percentiles) describe "recent" conditions relative to historical conditions. For example, a 90th percentile for annual average temperature over the most recent 10-year interval (2003–2012) means that the annual average temperature during this time exceeded 90% of annual average temperatures for all 10-year periods from 1901 to 2012.

- We then averaged the percentiles of the most recent 10, 20, and 30-year time periods and computed the maximum difference in recent percentile. For each park and climate variable, this resulted in both an overall measure of recent climate change exposure with respect to HRV (dots in second figure below), and an estimate of sensitivity to moving-window size (length of bars in second figure).

See Monahan & Fisichelli (2014) for a detailed explanation of methods, and the figure for an example analysis applied to annual mean temperature at the park.

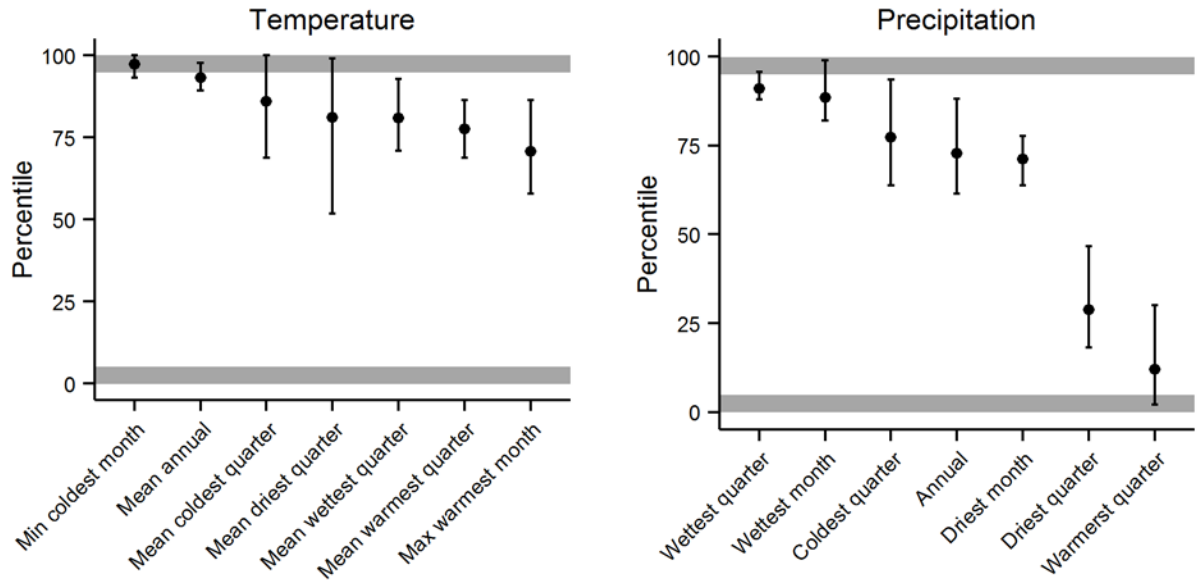


Time series used to characterize the historical range of variability and most recent percentile for annual mean temperature at CRMO (including areas within 30-km [18.6-mi] of the park's boundary). The blue line shows temperature for each year, the gray line shows temperature averaged over progressive 10-year intervals (10-year moving windows), and the red asterisk shows the average temperature of the most recent 10-year moving window (2003–2012). The most recent percentile is calculated as the percentage of values on the gray line that fall below the red asterisk (see results of most recent percentiles for all temperature and precipitation variables in the figure below).

Results

Recent percentiles for 14 temperature and precipitation variables at CRMO appear in figure below. Results for "extreme" variables at the park were as follows:

- One temperature variable was "extreme warm" (minimum temperature of the coldest month).
- No temperature variables were "extreme cold."
- No precipitation variables were "extreme dry."
- No precipitation variables were "extreme wet."



Recent temperature and precipitation percentiles at CRMO (including areas within 30-km [18.6-mi] of the park's boundary). Black dots indicate average recent percentiles across the 10, 20, and 30-year intervals (moving windows). Variables are considered "extreme" if the mean percentiles are <5th percentile or >95th percentile (i.e., the gray zones, where recent climate is pushing the limits of all observed climates since the year 1901). Black bars indicate the range of recent percentiles across 10, 20, and 30-year moving windows (larger bars indicate higher sensitivity to moving window size).

<u>Key points for interpreting these results in the context of park resources include:</u>

- 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.

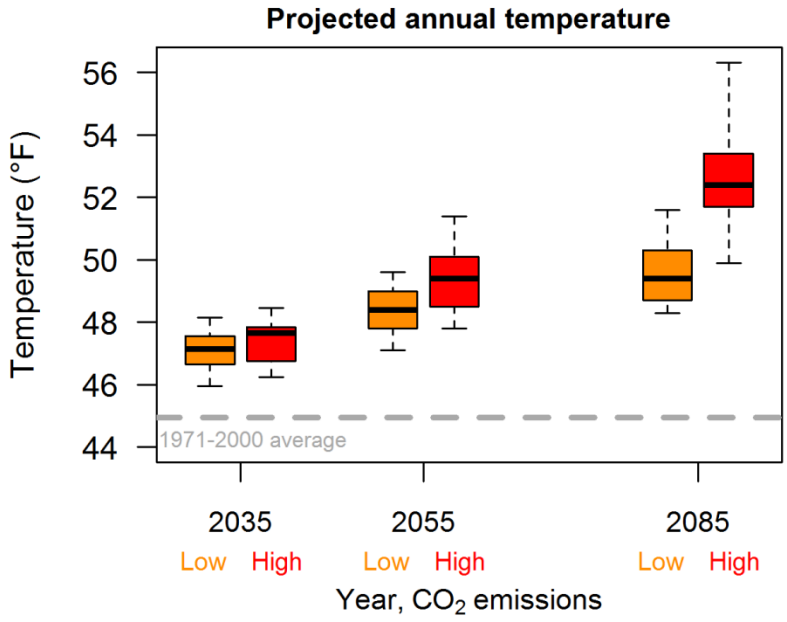
Climate Change Adaptation

These findings can inform climate change adaptation at CRMO by helping park managers, planners, and interpreters to understand how recent climates compare to past conditions. For example, these findings may be used to:

- Characterize park exposure to recent climate change in a vulnerability assessment.
- Develop plausible and divergent futures for use in a climate-change scenario planning workshop.
- Synthesize desired future conditions (i.e., reference conditions) for use in a Resource Stewardship Strategy or other National Park Service management plan.
- Create interpretive materials for communicating with local communities and park visitors.

Resource Brief: Future Climate Projections

Climate change impacts all aspects of park management from natural and cultural resource protection to park operations and visitor experience. Effective planning and management must be grounded in our comprehension of past dynamics as well as the realization that future conditions may shift beyond the historical range of variability. For example, at CRMO average annual temperature (30 year mean) is projected to be higher than the 1971–2000 average under all future time periods and greenhouse gas emissions projections (see figure below). Climate change will manifest itself not only as shifts in mean conditions but also as changes in climate variability (e.g., more intense storms and flooding). At CRMO, these changes may alter local landscapes, e.g., some species may increase in abundance while others will decline. The relatively undisturbed natural landscape in the park may provide an ideal "laboratory" to examine and monitor the response of natural systems to climate change. These areas within the park will provide a valuable baseline against which to compare responses in areas that have been more heavily disturbed by human use. Understanding climate change projections and associated levels of uncertainty will facilitate planning actions that are successful under a range of plausible future conditions.



Historical and projected mean annual temperature for CRMO. Historical data (1971–2000 average) are from Monahan and Fisichelli (2014). Projected climate change (30 year means) for the region including the park are for three future time periods centered on 2035 (2021–2050), 2055 (2041–2070), and 2085 (2070–2099) (Kunkel et al. 2013). Two greenhouse gas emissions scenarios are presented, the low (B1) and high (A2) scenarios (IPCC 2007). Projected climate boxplots indicate the variability in future projections among 15 CMIP3 climate models. Values for the area including the park are based on the mean model output for that location and the range of climate model projections for the region: the bold horizontal black line represents the mean among all models, the upper and lower bounds of the boxes indicate the 25th and 75th percentile model output values and the whiskers show the minimum and maximum values.

2.2. Cultural Resources

Archeological Resources

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Archeological resources are identified and evaluated using appropriate anthropological and historical contexts.		Half of the known archeological resources have been updated using appropriate contexts. The remaining 50-percent of cultural resources that need to be updated have been evaluated using past standards and do not meet today's standards.
	Scope of archeological resources in the park is understood and a determination has been made whether or not they are a fundamental or other important resource.		This is in the park's Foundation Document, 2014
	Percentage of archeology baseline documents with current and complete information.		Of the four archeological baseline documents listed in the NPS Cultural Resource Condition Assessment: Procedural Guidance, two (75%) of the reports are completed (Archeological Overview and Assessment and Cultural Resource Base Map). An Archeological Data Recovery Studies Plan needs to be assessed.
	The distribution and types of archeology sites is understood.		Of the documented sites, the site types are clearly understood. The distribution of these site types throughout the park is unknown due to a small percentage (2% max) of the park being surveyed.
	Percentage of sites with known date ranges associated with a research theme.		Of the 60 sites in Archeological Sites Management Information Systems (ASMIS), only one has a date range based on carbon dating. Five sites are dated based on diagnostic tool assemblages such as projectile points. An Archeological Overview, completed in 2006, focused on the sagebrush–lava flow interface within the BLM portion of the preserve. This was a surface survey only.
Inventory	Percentage of park intensively surveyed.		Only about two percent of park has been surveyed, mainly in the developed areas and the northern portion of the park. Very few kipukas have been surveyed. Inventory information on the distribution and types of archeological sites within the park is lacking.
	Percentage of survey data included in the Geographic Information System (GIS) meeting current cultural resource standards.		Though all known sites are on the park's Cultural GIS Base Map and lists site conditions, threats, management, locations, and types, the information has not been cross checked with the current GIS standards for cultural resources.

	Percentage of archeological resources with complete, accurate, and reliable State site forms.		Of the 46 sites in ASMIS, 20 (2%) have updated state site forms.
	Percentage of archeological resources with complete, accurate, and reliable data in the Archeological Sites Management Information System (ASMIS).		Of the 46 sites in ASMIS, 50-percent have updated and accurate information.
Documentation	Percentage of known sites with adequate National Register documentation.		Goodale's Cutoff is the only site that has National Register documentation though this is out of date. ASMIS has 19 sites recommended to be eligible or determined eligible (32%) while 23 sites are unevaluated. Testing of these sites needs to be conducted to determine eligibility.
	Percentage of archeological materials cleaned, conserved, studied, cataloged, and properly stored.		90-percent of the archeological materials meet this measure. The remaining 10-percent needs to be cataloged and properly housed, some conservation work done, or the collection studied. The Seed Collection is an example of a collection that needs to be studied.
	Park base maps are prepared showing the location and distribution of archeological resources, the nature and extent of archeological identification activities, and the types and degree of threats and damages.		Cultural resource base map in GIS is updated and lists management procedures along with threats and site type(s).
	Percentage or number of sites without assessed and defined threats and damages.		Of the 46 site listed in ASMIS only one (2%) has not been assessed for threats and/or damages. Though 23 sites need to have updated site condition assessments conducted.
	Percentage of archeological reports and publications entered in the Integrated Resource Management Applications (IRMA) database with appropriate restrictions for access to sensitive information.		All CR material listed in IRMA has appropriate restrictions.

	Research results are disseminated to park managers, planners, interpreters, and other NPS specialists and incorporated into appropriate park planning documents.		Reports that are available to the public are posted on the park's web site where managers have access to them. Reports that are not available to the public but are needed by managers for planning purposes are made available to them.
Certified Condition	Percentage of archeological resources certified as complete, accurate, and reliable in the Archeological Sites Management Information System (ASMIS) in good condition.		Sixty-three percent of sites are listed in good condition.

Cultural Anthropology

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research is conducted to understand the relationship of the park's ethnographic resources to the historic context(s) for the park.		No site specific ethnographic studies have been conducted; however, regional information is available and considered representative.
Inventory	Appropriate studies and consultations document resources and uses, traditionally associated people, and other affected groups, and cultural affiliations.		No ethnographic inventories have been conducted to identify places of importance to contemporary Native Americans.
Documentation	Planning documents contain current information on traditional resource users and uses, the status of ethnographic data, and the legislative, regulatory, policy, or other bases for use.		No ethnographic inventories have been conducted to identify places of importance to contemporary Native Americans. However, regional information is available and considered representative.

Cultural Landscapes

web

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.		Historic Overview report provides adequate historic context pertaining to the landscape of the park and the historic connections.
	Scope of cultural landscapes in the park is understood and a determination has been made whether or not they are a fundamental or other important resource.		Cultural landscape inventories need to be completed. The Goodale's cutoff and Mission 66 areas are treated as historic landscapes.
Inventory	Percentage of landscapes eligible for the National Register in the Cultural Landscapes Inventory (CLI) with certified complete, accurate, and reliable data.		No cultural landscapes have been evaluated or placed on the CLI.
Documentation	Percentage of cultural landscapes with adequate National Register documentation.		Goodale's cutoff is the only site with National Register documentation, though it needs to be updated. The Mission 66 buildings do not have NR documentation.
Certified Condition	Percentage of cultural landscapes certified as complete, accurate, and reliable in the Cultural Landscapes Inventory (CLI) in good condition.		No cultural landscapes have been evaluated.

Historic Structures

web

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.		All Mission 66 buildings and the two historic log structures have had a Historic Structures Overview report completed in 2009.
	Historic Structures are identified and evaluated using historical contexts.		Historic structures were fully evaluated during the Historic Structures Overview using all known historical information.
Inventory	Percentage of historic structures eligible for the National Register in the List of Classified Structures (LCS) with accurate, complete, and reliable data.		Information on all of the historic structures that are eligible to the National Register, that are listed in the LCS is up to date as of 2013.
	Percentage of List of Classified Structures (LCS) data included in the Geographic Information System (GIS) meeting current cultural resource standards.		One-hundred percent of the historic structures listed on the LCS are listed in the park's CR GIS.
Documentation	Percentage of historic structures with adequate National Register documentation.		None of the structures are listed to the National Register though Determination of Eligibility reports have been completed for the two historic log structures that were found to be eligible to the National Register. Official documentation for listing to the National Register needs to be completed. Mission 66 buildings need National Register documentation.
	Percentage of historic structures with Determination of Eligibility (DOE) documentation.		Twenty-five-percent of the park's historic structures have completed DOE's. A Historic Structures Overview, completed in 2009, states the history of the buildings and their significance. No DOE's have been conducted for the six Mission 66 buildings nor has National Register forms been conducted for these sites.
Certified Condition	Percentage of historic structures certified as complete, accurate, and reliable in the List of Classified Structures (LCS) in good condition.		Information on all of the historic structures that are eligible to the National Register, that are listed in the LCS is up to date as of 2013. Ninety-two percent of the historic structures are in good condition.

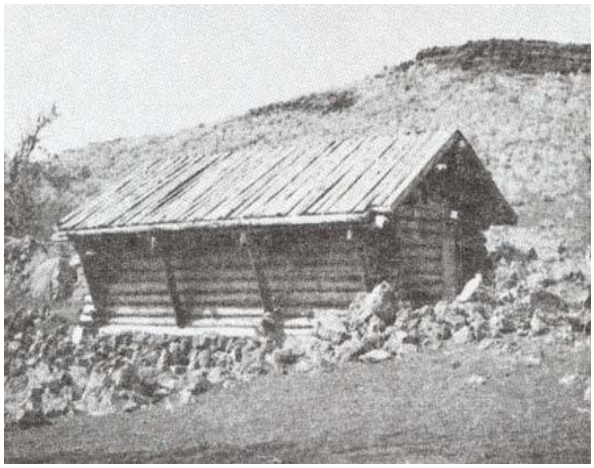
	Percentage of historic structures in the Facility Management Software System (FMSS) with a Facility Condition Index (FCI) indicating good condition.		Ninety-percent of the park's historic buildings (9) have an FCI of Good.

Resource Brief: Historic Log Structures and Mission 66

Historic structures at CRMO have two time periods. The earliest of these structures are the log storage/warehouse (1932) and the log comfort station (1934). This type of building, known as rustic architecture, was a common style of construction in the National Parks during the 1920s and 1930s that was designed to "blend" with the natural environment in which the structures were built by using natural materials. This did not occur at CRMO; instead of building the structures out of lava rocks or incorporating this material into the structures, the construction utilized only logs that made them stand out more from the lava flows around them.

Log storage shed, 1932

Log storage shed, 2007



Log comfort station, 1934

Log comfort station, 2008

The second time period for buildings at CRMO, is known as Mission 66. This Mission 66 program, initiated between 1955 and 1966 was the developmental phase of the park service in response to the increase of visitor use of national parks after World War II and in anticipation for the upcoming 50th anniversary of the National Park Service in 1966. CRMO was one of the first parks, in what was then known as Region 4, to receive funding for development. Between 1957 and 1958 the park built eight buildings (visitor center, maintenance facility, a comfort station, a four-unit apartment building, a duplex, and three three-bedroom homes) along with water

and sewer systems, paved loop road, and improvements to the existing Lava Flow Campground. All previous structures were removed except for the above mentioned log storage/warehouse and log comfort station.

The construction of the Mission 66 buildings was strikingly different from the previous rustic architecture that the Park Service had adopted in the past. The Mission 66 buildings are constructed with concrete masonry with exterior finishes designed to blend into the surrounding landscape. At CRMO, split-faced pumice blocks of earth tone color were used. Though this was standard Mission 66 construction throughout the Park Service, it was soon realized that this type of construction was unsuited to the harsh environment at the park. Over the years park staff has added insulation to the structures, which originally had none, and replaced single pane windows with energy efficient ones. Though the Mission 66 buildings in the park are not unique examples of the overall Mission 66 architecture on their own, the complex of buildings as a whole is significant. It is one of the earliest examples of Mission 66 complexes in the Park Service and is the only one within the state of Idaho.

Visitor Center, 1957

Visitor Center, 2008

Single Family Residence, 1957

Single Family Residence, 2007

History

web

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.		Administrative History completed in 1992 and Historic Context Statements completed in 1995. Administrative history needs to be updated since information has been added since the expansion in 2000.
	Sufficient research is conducted to establish the reasons for park establishment and a history of the NPS management of the site.		Administrative History needs to be updated.
	Percentage of history baseline documents with current and complete information.		Administrative History completed in 1992 and Historic Context Statements completed in 1995. Administrative History needs to be updated since information has been added since the expansion in 2000.
	Research at the appropriate level of investigation (exhaustive, thorough, or limited) precedes planning decisions involving cultural resources.		Historic research is conducted as part of the compliance procedure prior to management planning decisions.
Inventory	Cultural resources are inventoried and evaluated in consultation with State Historic Preservation Officers (SHPOs).		All projects are reported to the Idaho SHPO.
	Percentage of cultural resources listed in appropriate Service-wide inventories, including the National Register.		All known cultural resources are listed in ASMIS and/or List of Classified Structures (LCS).
	Research data are accessioned as part of the park's museum collection.		Research data has been accessioned and archived. There is 14-LF of archives yet to be catalogued, this will be started in 2015.
Documentation	Percentage of historic properties with adequate National Register documentation.		Only one National Register (Goodale's Cutoff) has been completed although needs to be updated.

	Percentage of historic properties with adequate Determinations of Eligibility (DOE) documentation.		Twenty-five-percent of the historic buildings have completed DOE's that include the setting of the structures.

Museum Collections

web

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.		Collections have been surveyed to ensure appropriate inclusion into the collections. Scope of Collections is accurate and will be updated in 2015, following the 5-year cycle.
	Percentage of museum collection baseline documents with current and complete information.		Park has a current Scope of Collections Statement; Collections Conditions Survey (Conservation Assessment); Integrated Pest Management Plan. Park needs a Housekeeping Plan, Collection Management and Collection Storage Plan, and Museum Emergency Response Plan.
	Museum curator is included in permit review and informed about park resource projects that may affect collections.		Museum Curator is listed as being notified through the Research Permit and Reporting System notification.
Inventory	Archival and manuscript collections are surveyed and described in the Interior Collections Management System (ICMS) and finding aids are produced.		Archives are being worked on in 2015. 14-LF are to be catalogued and placed into ICMS.
	Percentage of existing collection that is accessioned and cataloged.		About 50-percent of collections have been catalogued into the NPS Interior Collection Management System (ICMS). Majority of the uncatalogued materials are archives (22,400) and 312 plants needing catalogued. A PMIS project is in the system and will be updated for the next Servicewide Call.

	Scope of Collection is consistently implemented; items or objects are researched to determine their appropriateness for inclusion in the museum/archive collection.		Scope of Collections is due to be reviewed in 2015. Context is appropriate for park's collection.
Documentation	Accession and deaccession files are complete with all appropriate signatures.		Accession files are being corrected. Past record keeping was not consistent and a lot of information was not obtained. Obtaining the correct and appropriate information is time consuming and at times information is not obtainable.
	Percentage of cataloged records with completed descriptive fields (beyond required fields).		Forty-three percent of catalog records in ICMS have fields beyond the required fields.
Certified Condition	Percentage of museum collection reported in CMR and checklist report in good condition.		Collections and facility are in good condition and meets 77-percent of NPS museum standards.

Resource Brief: Museum Collections

The Monument has over 4,666 museum collections, ranging from archeological artifacts and natural history collections to photographs and administrative archives. Among these items are: historic artifacts that are directly connected to Robert Limbert, one of the key players in getting CRMO established; the Paul Sneed archeological collection which was the first systematic archeological survey conducted within the monument; an extensive geological collection showcasing the various types of lava found within the monument; and the extensive herbarium that includes native and non-native species.

The park archives include documents dating back to the 1920s pertaining to the establishment of the Monument along with photographs from early exploration of the monument through the present. The park's collection is housed in a dedicated room within the visitor center specifically built for the collections in 2005–2006.

Geologic specimens

Part of the Paul Sneed archeological collection

2.3. Visitor Experience

Visitor Numbers and Visitor Satisfaction

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Number of Visitors	Number of visitors per year		The total of 200,525 visitors to the park in 2013 is higher than that of 2011 (198,545) and 2012 (197,529) and also higher than the 10-year average of 199,693 visitors for 2003–2012.
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 (97.8%) and ten years (97.6%). Source: 2013 Visitor Survey Card Data Report

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

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Education Programs	Number and quality of programs, and number of participants		The total number of education programs (121) and the total number of participants (5,175) in 2013 is higher than 2011 (103/3,864), and 2012 (90/3,235) as well as the 10-year average (91/4,018). The hiring of a half-time Education Specialist in 2010 has enhanced the quality and reach of these programs.
Ranger Programs	Number and quality of programs and attendance		The total number of formal interpretive programs (1,006) and the total number of participants (13,853) in 2013 are higher than the 10-year averages (667/9,105). The quality of programs has been enhanced with increased seasonal staff and coaching/participation in the Interpretive Development Program training program.
Junior Ranger Programs	Number of programs and attendance		The number of Junior Ranger badges/patches awarded has risen annually since 2007 (826). The number of participants has also been greater than the 10-year average (1,918) since 2010 (2,400). There were 3,211 badges/patches awarded in 2013. The quality and variety of programs has been enhanced with the introduction of a campground Junior Ranger program in 2004 and the introduction of our “Lunar Ranger” program in 2009.
Special Events	Variety and longevity of events, community involvement		The number of special events (1–2) and participation varies from year to year with no clear trend.

Resource Brief: Education Program

Since 2010 the park education program has grown both in the breadth of programming offered and in terms of formal planning and direction. For over a decade educational programs were limited to brief windows of time: on-site visits by several thousand schoolchildren in the fall and spring, and three accredited teacher workshops spread throughout the year. These opportunities continue along with other offerings that have made the education program a year-round endeavor.

SnowSchool, a curriculum-based winter ecology program, has expanded in recent years and provides K–12 students the chance to explore the park on snowshoes while learning about plant and animal adaptations for winter survival. Nearly 1,000 students now participate annually in this program. Other expanded programs include participation in local schools' enrichment programming and development of curriculum- and STEM (Science, Technology, Engineering, and Math) based materials available on-site and through the park website. The park also completed its Education Plan in 2014. Based on input from a panel of local educators, this document will guide further development of educational offerings. To assist in this and build partnerships with area schools, the park has filled one Teacher-Ranger-Teacher position annually since 2012, drawn from the ranks of school districts in counties adjoining the park. It is anticipated that establishment of a full-time education specialist position would further engage teachers and students, leading to additional development of curriculum-based programming.

Interpretive Media – Brochures, Exhibits, Signs, and Website

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Wayside Signs	Condition and currency of signs		In the last 10 years almost every wayside exhibit has been replaced with newly designed panels and bases. In addition, 10 new wayside exhibits were installed at highway overlooks in 2013, providing an interpretive experience for visitors as they travel through the National Preserve into the Monument.
Park Directional Signs (off-site)	Usefulness, quantity, and placement		New gateway and directional signs were installed on the highway approaching the visitor center in 2008 and new entrance signs were installed in 2014. Working with Idaho Transportation Department to improve directional signage outside of this corridor.
Exhibits	Visitor Center museum		New exhibits were installed in 1997. Since that time exhibits have been upgraded several times. A portion of the exhibit has recently been redesigned and was installed in 2015.
	Visitor Center breezeway/theater		New exhibits, bulletin boards, and art works are on display in the breezeway and the theater room providing additional interpretive opportunities throughout the building.

Print Media	Accuracy and availability of primary park publications		The official National Monument map and guide was expanded and redesigned in 2006. BLM completed a travel map of roads located in all 3 units of Craters of the Moon in 2012. A park newspaper was introduced in 2011 and is available in the visitor center and on the website each summer. A new park handbook was completed in 2010 and is offered as a sales item by our cooperating association.
Audio-visual Media	Orientation Films		Our new introductory film premiered in the museum in 2012. In addition, 2 longer films have been shown on a rotating basis in the visitor center theater since 2008. A new park orientation film is scheduled to begin production in 2015.
Websites	Currency and scope of website; number of website visitors		Website features a broad and increasing array of information about cultural and natural resources that is frequently updated. Statistics regarding website visitors are inconclusive but comments/questions from visitors regarding website content appear to be on the increase.
	Social media: Facebook updates and "likes," overall activity		Our Facebook page premiered in 2012. We currently have about 4,000 "likes" and we continue to accrue more.

Accessibility

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Mobility	ADA compliance		There are 3 fully accessible trails in the Monument. Planning has been completed to upgrade a fourth trail (North Crater Flow) to a fully accessible route. All public facilities are ADA accessible. There is an accessible campsite with more planned.
Visual Accommodation	ADA compliance		All films in the visitor center include optional audio description tracks for people with visual impairment.
Auditory Accommodation	ADA compliance		All films display sub-titles for people with auditory impairment.
Public Transportation	Access to park via public transportation		Few options for public transport are available at this remote park.
Multi-lingual Resources	Audio and print materials in multiple languages Bi-lingual staff		We have offered an orientation brochure in 10 languages in the visitor center and on our website since 2010. In addition, our website has an introductory page in Spanish. Individual staff members frequently have some foreign language skills.

Safety

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Visitor Safety	# of Case incident reports involving visitor safety (injuries or accidents)		The safety of visitors is a park priority. The park works to quickly identify and mitigate potential hazards. Proactive patrols are minimal or lacking and therefore rangers are not able to detect, intervene and stop unsafe behavior. Over the last 10 years there have been approximately 13 documented EMS events annually.
Staff Safety	# of employee injuries, accidents, or near misses		There were 8 cases over the past 5 years, 4 involving slips, trips and falls, 2 involving insect stings and 2 involving contusion or laceration to a finger (compared to 11 cases in the 5 years (2006–2010) prior). None in the past 5 years have resulted in time loss. Department of Interior Safety Indicators Recordable Rate: 5 cases, rate = 6.79 DART Rate: (days away, restricted or Transfer) 0.00 Fatalities: 0 COP Paid: (continuation of pay) 1 case / Amount paid: $205.59 Property Damage: 1 case, Cost: $250.00 OWCP Power Goal Reports Lost Time Rate: 0.00 Incident Rate: 1.36 Source: SMIS Data Reports for the 5 year period (fiscal year) Oct 1, 2010–Sept 30, 2014: (21,658 volunteer hours)

Partnerships

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Volunteers	Number and hours contributed		The total number of volunteer hours in 2013 (5,739) was higher than the previous 2 years (3,411 and 3,597). The total number of hours in 2013 (5,739) was also higher than the 6 year average (4,136). The scope of the volunteer program has been broadened to include more regular service projects, an astronomy program volunteer, and an Artist-in-Residence program.
Partnerships	Number of official and unofficial partnerships		The park has received support from our cooperating association, the Craters of the Moon Natural History Association, since 1959. NPS staff members have worked closely with BLM staff since the expansion of the Monument in 2000 as well as regional national park units and programs. In addition, park staff partner with a wide variety of organizations and stakeholders including local fire and law enforcement agencies, regional schools and universities, and various conservation organizations.

Resource Brief: Night Skies and Astronomy Program

The park is home to some of the clearest air and darkest night skies remaining in the continental United States, due largely to the park's remoteness from major population centers. The park has collaborated with a number of partners to provide the public with opportunities to enjoy the night sky and clear views at the park.

For over 15 years members of the Idaho Falls Astronomical Society have staffed twice-annual Star Parties that are open to the public. IFAS members gain free admission to the park for stargazing by making their telescopes and expertise on the night sky available to the public. Since 2008 the park has also hosted a Night Skies Volunteer Ranger each September through the NPS Natural Sounds and Night Skies Division. These trained volunteers provide multiple avenues for the public to learn more about the importance of the park's naturally dark skies and clean air, including formal campground presentations at night and safe viewing of the sun with a solarscope by day. Through these efforts thousands of casual visitors have experienced one of the park's key resources and learned about connections between the park, the Moon, and other celestial bodies.

2.4. Park Infrastructure

Overall Facility Condition Index

web

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	28 / 30	0.056 / 0.042		57% of required funding using industry standards from 2014 Park Assessment Management Plan (PAMP). Park buildings have some of the highest Asset Priority Index (API) scores in the park and the majority of park facility funding is targeted to maintain these high API assets.
Campgrounds	3 / 3	0.035 / 0.000		78% of required funding using industry standards from 2014 PAMP. FCI score for 2014 does not accurately reflect current condition due to no recent Comprehensive Condition Assessment completed on this asset category. The park has a construction project planned to address the largest campground's inadequate facilities but once constructed maintaining the updated facilities in good condition will be challenging given the park's current maintenance budget. The Lava Flow campground is scored and banded as one the most important park facilities. The park does not feel that the FCI data for this category represents the actual condition that they see locally; therefore the park has modified this rating to reflect their professional view of the condition. This is an exception to the State of the Parks model.

Trails	12 / 13	0.126 / 0.123		32% of required funding using industry standards from 2014 PAMP. Many trails do not have high API scores and thus are not in a high Optimizer Band so they will not be able to be maintained in Good condition in order that limited available funding can be targeted to higher banded assets. Again, the current FCI score does not reflect all deferred maintenance on these assets due to no recent Comprehensive Condition Assessment being completed on these assets. The park does not feel that the FCI data for this category represents the actual condition that they see locally; therefore the park has modified this rating to reflect their professional view of the condition. This is an exception to the State of the Parks model.
Waste Water Systems	4 / 4	0.289 / 0.193		66% of required funding using industry standards from 2014 PAMP. All of the park waste water systems are over 50 years old and are inadequately sized for the current visitor use. The FCI score for 2014 does not accurately reflect this condition since no recent Comprehensive Condition Assessment has been completed for this asset category. Much of the required funding for waste water systems is used to pump and clean these antiquated systems. CRMO has a project in PMIS that once completed will update the worst of these systems but once constructed maintaining the new system will become a challenge given the park's very limited funding for infrastructure maintenance. The park does not feel that the FCI data for this category represents the actual condition that they see locally; therefore the park has modified this rating to reflect their professional view of the condition. This is an exception to the State of the Parks model.

Water Systems	1 / 1	0.646 / 0.025		78% of required funding using industry standards from 2014 PAMP. The park has focused much of its base funding for facilities and project construction funds over the past 15 years towards upgrading the park water system. Many upgrades have been completed. CRMO now has a very efficient potable water delivery system, which has reduced water needs to 1/5 of the water needs of just 15 years ago. Now maintaining a very complex and technically challenging water system will become harder as the increased need for more routine maintenance to maintain this system becomes necessary to keep the system functioning as designed with very limited park base funding. The park does not feel that the FCI data for this category represents the actual condition that they see locally; therefore the park has modified this rating to reflect their professional view of the condition. This is an exception to the State of the Parks model.
Unpaved Roads	3 / 13	0.001 / 0.002		38% of required funding using industry standards from 2014 PAMP. Unpaved roads are in good condition and CRMO hopes to maintain them in this condition even with very limited funding in this relatively low banded asset category. The park does not feel that the FCI data for this category represents the actual condition that they see locally; therefore the park has modified this rating to reflect their professional view of the condition. This is an exception to the State of the Parks model.
Paved Roads, Parking Areas, Bridges, Tunnels	31 / 22	0.116 / 0.164		56% of required funding using industry standards from 2014 PAMP. Most paved road and parking areas are maintained in good condition using project funding even with only having 56% of the industry standard. Recent major road projects have greatly improved park roads and parking areas. If funding for this asset type remains steady CRMO should maintain these high banded assets in good condition. If project funding in this category drops off park roads will quickly deteriorate as park base funding to maintain this expensive asset type is not currently available. The park does not feel that the FCI data for this category represents the actual condition that they see locally; therefore the park has modified this rating to reflect their professional view of the condition. This is an exception to the State of the Parks model.

All Others	8 / 23	0.100 / 0.030		52% of required funding using industry standards from 2014 PAMP. Many of these lower banded assets have and will continue to degrade and limited funding is targeted toward higher priority assets. Again, the FCI does not show all deferred maintenance on this asset category as CRMO has not recently completed a Comprehensive Condition Assessment for these assets. The park does not feel that the FCI data for this category represents the actual condition that they see locally; therefore the park has modified this rating to reflect their professional view of the condition. This is an exception to the State of the Parks model.

Resource Brief: Green Parks Plan

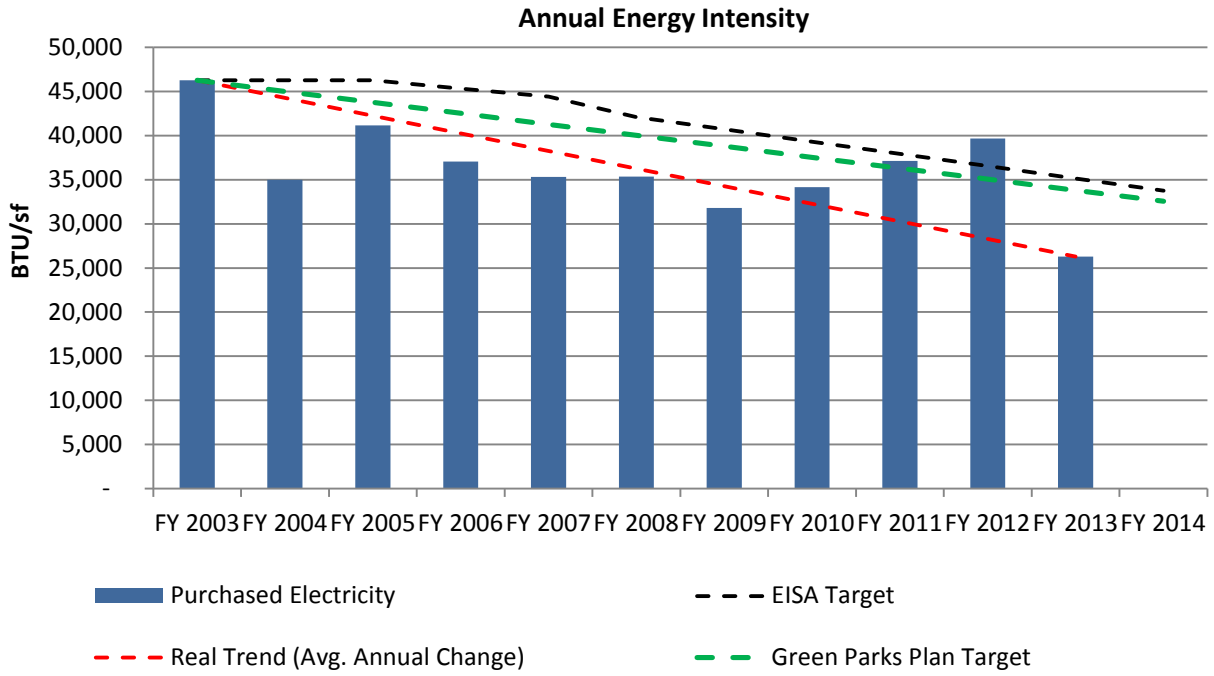
The NPS manages the largest number of constructed assets of any civilian agency in the Federal Government. It operates more than 67,000 structures that account for more than 50 million square feet of constructed space such as visitor centers and historic structures. The Green Parks Plan (GPP) defines 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.

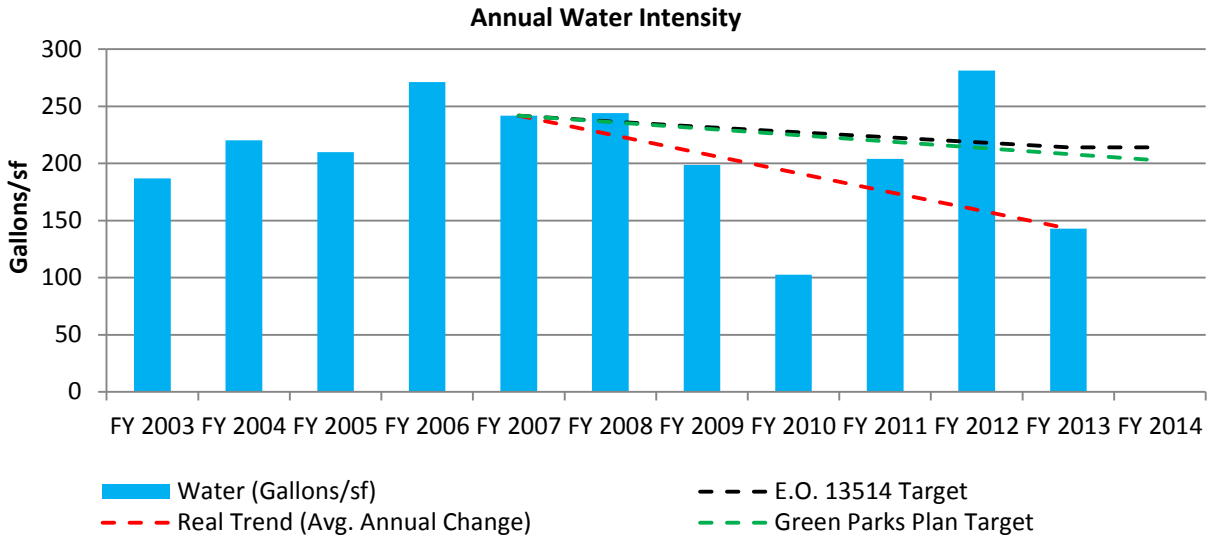
The Vision defined in the GPP plan is, "The NPS will preserve park resources unimpaired for the enjoyment of current and future generations by reducing its environmental impact through sustainable operations, design, decisions, and management at every level of the organization." The plan is based on 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 CRMO and available in the Energy Data Reporting Tool (EDRT) is shown below.





Highlights for CRMO include:

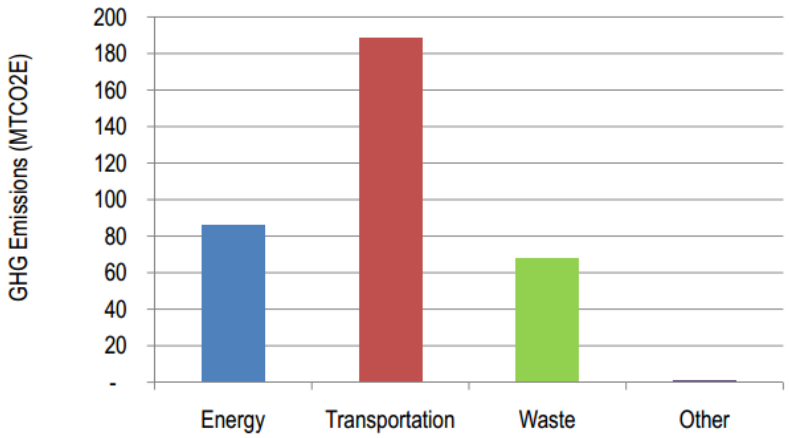
- Electricity is the only power used in the park to heat and cool buildings with the exception of a few wood stoves in housing, making it easy to track energy use.
- Electricity use park-wide in 2005 was 259 Mega Watt Hours (MWHs).
- Electricity use in 2013 was 211 Mega Watt Hours. Of this total park-wide electricity used, 73 MWHs was produced with the park owned photovoltaic system. Given that CRMO produced 73 MWHs with solar, the park only used 138 MWHs of "Brown" or grid power for a reduction of 46 percent. CRMO has more than doubled the 20 percent reduction goal (2005 Energy Act). A combination of many conservation projects including insulation and lighting upgrades combined with the addition of a 50K photovoltaic system has allowed CRMO to exceed the NPS Green Parks Plan Target.
- Water use in 2005 was 4.1 million gallons.
- Water use in 2013 was 3.95 million gallons (all the years between these years were even higher).
- CRMO fully expects that in 2015 there will be a drastic reduction in water use due to the fact that in FY14 a leak was repaired in the water system equal to almost 3 million gallons per year or 3/4s of the total park water use.
- Many infrastructure upgrades to reduce water consumption have taken place over the past 15 years, which will have a very positive impact on water conservation at CRMO effectively reducing water consumption to about 1 million gallons per year.

Park Carbon Footprint

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Greenhouse Gas Emissions	Metric tons of CO_2 equivalent ($MTCO_2E$)		Green and getting better as far as park operations go but CRMO has little control of vehicle emissions from visitors which accounts for more than 80% of total park greenhouse emissions. There are ongoing efforts to encourage more visitors to come and visit the park so emissions from park visitor vehicle traffic will likely increase over time unless limits are placed on vehicle traffic on park roads or alternative clean energy transportation methods are utilized.

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 climate change through mitigation efforts. In 2007 the baseline GHG emissions were set within CRMO totaled 344 metric tons of carbon dioxide equivalent ($MTCO_2E$). 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 $MTCO_2$ per year (U.S. EPA 2011). Thus, the emissions from CRMO park operations are roughly equivalent to the emissions from the energy use of 29 households each year. The largest emission sector for CRMO is transportation, totaling 189 $MTCO_2E$ in 2007. Purchased electricity comprises 100 percent of emissions from energy and 25 percent of total park emissions.

To read more about what is being done about climate change at Craters of the Moon National Monument and Preserve, check out the park Action Plan!

Resource Brief: Sustainability Measures

Most conversations about sustainability begin with energy use, and with good reason. Fuel to power vehicles and electricity to heat and light buildings typically comes from fossil fuels that pollute air and damage ecosystems.

Conserving energy is one solution. A renovation of the visitor center in 2005 doubled the square footage of the building, yet total energy use *declined*. How? Better insulation equals less electricity needed to heat the building in winter and cool it in summer. The use of temporary storm windows in winter boosts efficiency, too. And ultra-efficient LED bulbs now light the visitor center and some park housing units. As a result, CRMO uses the least energy per square foot of any park in the Pacific West region.

Beyond reducing demand, the park has also diversified its energy sources to take advantage of Idaho's clear blue skies. A new photovoltaic array installed in 2010 converts sunlight into electricity, offsetting as much as 50% of the park's overall energy use, further reducing the park's reliance on fossil fuels.

Recently, CRMO has created an award-winning short video highlighting some of the park's projects to conserve energy and become more sustainable. Follow this link to view the video "Greening the Moon."

2.5. Wilderness Character

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." **Craters of the Moon became the first national park with designated wilderness in 1970.** A summary of wilderness character for the park is summarized below. Craters of the Moon Foundation Document, Appendix D

Overall Wilderness Character 		web ▸
Wilderness Quality	**Condition Status/Trend**	**Rationale**
Natural		While the overall natural component of wilderness character remains good, a number of negative factors result in at least a moderate level of concern. The primary factors are the largely uncontrolled spread of some exotic invasive plants (particularly cheatgrass and Rush skeleton weed) which transform native sagebrush steppe to annual grasslands by altering fire cycles. Of even more concern, changes in climate are projected to result in significant changes to native plant communities and associated wildlife. Several iconic species (limber pine and pika) are already at the edge of their ecological range and could be extirpated by changes in temperature and precipitation.
Undeveloped		The Craters of the Moon Wilderness and wilderness study areas remain almost entirely undeveloped with only four miles of trails, a handful of signs and monitoring plot tags. Use of motorized equipment and mechanized transport are very infrequent (occasional helicopter landings to support fire and weed suppression activities) rarely exceeding 1–2 times per year.
Untrammeled		While the condition of the untrammeled component of wilderness character remains good, management response to degrading natural conditions have increasingly impacted the untrammeled character of wilderness. Intervening to suppress exotic invasive plants to protect or restore natural conditions may be warranted when the long-term benefits to natural conditions are clear and the "trammeling" is short-term. The extent of management activities influencing the untrammeled part of wilderness character is consistently recorded.
Solitude or Primitive and Unconfined Recreation Opportunity		The overall condition of the solitude or primitive and unconfined recreation opportunities is good in the Craters of the Moon Wilderness Area and wilderness study areas. Limited recreational use results in outstanding opportunities for solitude and few management restrictions inhibit the unconfined aspect of wilderness recreation. Solitude is impacted in some areas by activities outside wilderness boundaries (sights and sounds of highway and rail road traffic, visible private irrigated agricultural lands, power lines and wind turbines). While the impact of future development poses a concern, the majority of lands directly adjacent to wilderness or WSA are in some type of protected status, which should limit the type and scale of development. Confidence in this assessment is only moderate since quantitative data on noise and viewshed impacts are not available.
Other Features and Values		Preserved because of its geological significance, CRMO and its wilderness, provides a unique opportunity to study a volcanic landscape and thus includes features of scientific value that contribute to its wilderness character. The scope of this element of wilderness character is by definition very broad and therefore difficult to provide comprehensive indicators.

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

- Monitored sagebrush steppe, limber pine, aspen, pika, bats, sage grouse and water quality in conjunction with the Upper Columbia Basin Network I&M Program.
- In conjunction with the NPS Air Resources Division, monitored key aspects of air resources (ozone, visibility, and nitrogen deposition) as part of our responsibilities as a Class I area under the Clean Air Act.
- Maintained cave resource inventory and survey cave resources for bat populations.
- Conducted comprehensive bat inventory using acoustic monitoring.
- Mapped invasive exotic weed infestations and cooperate with BLM, state and local entities to control invasive weeds.
- Reconstructed boundary fences to mitigate wildlife impacts while excluding trespass livestock.
- Monitored numbers and timing of pronghorn migrating through CRMO using wildlife trail cameras.
- Monitored highway impacts on wildlife by recording "road kill" incidents.
- Improved information availability by expanding the utility of NPS "IRMA" records from CRMO with digital copies of records.
- In response to an increase in black bear sightings, installed bear-proof trash cans and food storage lockers throughout the park.
- Participated in interagency and private citizen conservation planning with the regional Greater Sage-grouse working groups.
- Monitored breeding bird populations on ten routes in representative habitats across CRMO.
- Cooperated with state and federal agencies in monitoring of Greater Sage-grouse at breeding lek sites within and adjacent to CRMO.
- Cooperated with BLM, Forest Service, NGOs, and local communities in the Pioneer Alliance—a collaborative effort to manage landscapes across boundaries.
- Collaborating with NOAA on climate change monitoring as part of the nationwide Climate Reference Network, a network of identically equipped climate monitoring sites intended to operate for 50 years and provide highly accurate and reliable climate data.

Cultural Resources

- Dedicated museum collection storage room.
- Completed Historic Structures Overview report.
- Completed Determination of Eligibility for two historic log structures.
- Completed Scope of Collections.
- Inventoried 14 linear feet of archives.
- Completed digitization of the park's herbarium.
- Maintained up-to-date national cultural resource databases (ASMIS, LCS, and ICMS).

Visitor Experience – Interpretation & Education

- Long Range Interpretive Plan completed (2007). Annual Interpretive Plan meetings held with BLM help staff focus on strategic goals. Number of seasonal and permanent staff has gradually increased as the Interpretation and Education programs have expanded.
- A half-time Education Specialist hired in 2010 has enhanced the quality and reach of our curriculum-based education programs including the completion of a new Education Plan in 2014. College credit has been provided through regional universities for 2–3 teachers' workshops offered on an annual basis. Funding provided by the National Park Foundation provided the seed money necessary to start a popular new experiential/inquiry-based education working with the College of Southern Idaho and area schools. Three teachers from adjoining school districts have participated in the Teacher-Ranger-Teacher program at the park. More than 5,000 school children visited the park and participated in curriculum-based education programs in 2013.
- The official National Monument map and guide was expanded and redesigned in 2006. BLM completed a travel map of roads located in all 3 units of Craters of the Moon in 2012. A park newspaper was introduced in 2011 and is available in the visitor center and on the website each summer. A new park handbook was completed in 2010 and is offered as a sales item by our cooperating association.

- Winter program was expanded to include snowshoe walks for school children (2007). More than 1,100 school children took part in these winter excursions in 2014.
- Monument Sign Plan was completed in 2007 and most waysides were replaced with newly designed content by 2014 including 10 new wayside exhibits at highway overlooks that provide an interpretive experience for visitors as they drive through the Preserve into the Monument.
- New theater space at visitor center was outfitted with audio-visual equipment and new films shown on a regular basis beginning in 2007. Short introductory film in museum was updated with a new film in 2012.
- Website was upgraded and enhanced with new information and features. Educator's portal providing access to all CRMO lesson plans premiered in 2013. New Facebook page premiered in 2012. A free wildflower app was completed in 2012.
- A campground Junior Ranger program was initiated in 2004 and the "Lunar Ranger" program (2009) have provided enhanced opportunities for younger visitors to engage with the park. In 2013 the "Citizen Scientist" activity booklet was created to provide an opportunity for older children and adults to observe and document resource conditions during their visit to the park.

Visitor Experience – Visitor & Resource Protection (VRP)

- VRP Program was re-established in 2013 following a two-year hiatus without commissioned LE staff. Chief Ranger position was filled in 2013 (vacant since 1999) and a seasonal LE ranger was hired in 2014.
- In 2013 park staff was involved in a month-long SAR operation that resulted in the recovery of two missing hikers who perished in remote, less-traveled areas of the park.
- Annual CPR and First Aid training has been provided to all staff. One to three EMTs have been on staff over the last 10 years. Wildland Fire Cache and engine were updated in 2014 in coordination with BLM Shoshone Field Office.
- Emergency Operation Cache was upgraded and improved in 2014.
- Fee program continues to enhance the visitor experience through a staffed entrance station and conveying visitor safety messages.

Visitor Experience – Recreational Opportunities

- Winter recreational opportunities continue through a marked snowshoe trail and a regularly groomed ski trail.
- Year round recreational opportunities including hiking, caving, night sky viewing and camping continue to be promoted.
- A 5K/10K Fun Run was initiated on National Public Lands Day in 2014 with plans to continue this as an annual event.
- Planning for a mountain bike trail on the historic Jeffrey-Goodale Cut-off of the Oregon Trail was started in 2014.

Park Infrastructure

- The park has maintained park facilities in Good Condition despite having only 52% of the funding required by industry standards. CRMO receives many visitor compliments on the quality and cleanliness of park facilities. CRMO is one of the only all Green parks in the PWR per the Green Parks scorecard. CRMO has one of the best safety records of any Facilities Maintenance crew in the Region and have had only one lost time accident in the past 15 years while being continually engaged in potentially hazardous duties.
- Numerous energy efficiency projects carried out since 2005.
    - Installation of 50K Photovoltaic system in 2011.
    - Insulation added to walls, roofs, upgraded windows, sealing and caulking etc. for all park buildings.
    - Installation of Energy Star appliances in most housing and office areas.
    - Installed solar power water well pump to provide backup for main electric water well pump.
    - Upgraded lighting in many park buildings and areas to LED and more such upgrades are planned. Also, many timers and light sensors have been installed to limit lighting to only the time it is needed.
    - Snow guards installed on roofs to hold snow for increased insulation.
- Numerous water efficiency projects carried out since 2005.
    - Upgraded water delivery system has reduced leaks and allowed metering and monitoring for a more efficient system.
    - Installed new water distributing systems in park housing so it is no longer necessary to leave water running in housing/office spaces to prevent freezing. CRMO is also able to greatly reduce heating in these buildings when not occupied in winter months.
    - Low flow water fixtures installed in many visitor and employee use areas.
    - Irrigated lawn area has been greatly reduced through xeriscaping, resulting in the park only using 1/4 of the water it did 15 years ago.
    - Waterless urinals installed in men's restroom areas.
- Other significant infrastructure accomplishments include;
    - The addition of two fully accessible trails at Devil's Orchard and Spatter Cones.
    - Continue to maintain the historic integrity of the Work Project Administration and Mission 66 park buildings.
    - Doubled the size of the park visitor center in addition to remodel of the existing structure.
    - Constructed a fully compliant and efficient potable water delivery system.

- Installed a fire alarm and sprinkler suppression system in all Mission 66 buildings, including residences.
- Reconstructed all paved spur roads and parking areas throughout the park.
- Installed new sustainable roofs and remodeled many park buildings.
- Installed new vault toilets in campgrounds and parking areas.
- Installed new parking areas in congested areas.
- Replaced signs throughout the park with more sustainable materials and designs as well as the addition of waysides, signs and kiosks throughout the park.
- Designed and implemented a new more efficient trash container, recycling program and collection system throughout the park.
- Upgraded existing trail signs.

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

The National Park Service completed a Foundation Document (July 2014) for CRMO. Along with the 2006 Monument Management Plan, the Foundation Document helps guide management to ensure fundamental and other important resource values are preserved for future generations. The identification of the resources and values also included an assessment of the conditions, trends, threats and opportunities. Based on this assessment there are several areas that will require management attention.

Park Operations
CRMO is faced with many operational challenges. The large size of the park area, the remoteness of the park and the small number of staff prevents giving much attention to the more distant areas of the Preserve. It has also been a source of disappointment for communities around the Preserve who believed the expansion would create an increased tourism draw to their newfound "gateway" status. Current management is focused on the original monument area where most facilities and visitors are located. By comparison, the expansion area, which comprises 88% of NPS land, receives little attention. Long travel times on lightly maintained secondary roads makes regular and routine patrols and monitoring difficult.

Among the management problems that exist within the expanded portions of the park are resource issues and safety concerns at Kings Bowl Lava Field. The Kings Bowl area contains significant geologic features, including Crystal Ice Cave, Kings Bowl, and South Grotto. Prior to being transferred to the National Park Service in 2000, Crystal Ice Cave was operated briefly during the 1970s as a commercial cave under a BLM lease. Since 2011, the cave has been officially closed to visitor use; however, monitoring data suggests illegal access continues. In addition to potential safety hazards posed by entry into the cave, area resources have been degraded by numerous all-terrain vehicle (ATV) social trails and vandalism to signs and interpretive exhibits. These public safety and resource threats are compounded by the distance of the area from NPS administrative facilities—a minimum four-hour round trip is required to reach the site from park headquarters. To improve protection and management of the Crystal Ice Cave and Kings Bowl area a development concept plan is needed, as noted in the 2006 monument management plan. The remainder of the expansion area would continue to be addressed by the 2006 monument management plan, and could be addressed in greater detail in the wilderness stewardship plan and other implementation-level plans.

The Maintenance, Resource Management, Visitor and Resource Protection, and Interpretation and Education divisions are all understaffed for the amount of area and visitation the park receives. Maintenance is lacking a WS–9 Maintenance Supervisor and a WG–7 Maintenance Worker. Current maintenance staffing and operating funds do not allow for critical operation and maintenance practices nor do they fund mandated safety/compliance practices. Interpretation and Education lacks a GS–9 Education Specialist to manage the ever-growing number of school children on field trips coming to the park. Resource Management lacks a career seasonal GS–7 lead bio tech to provide continuity to the invasive weed control crew. While the developed area within the original monument consistently averages approximately 200,000 annual visitors, the more remote Preserve is estimated to receive between 10,000 to 15,000 visitors as well, totals which are not included in the visitor number reports. As stated in Chapter three the VRP program was re-established in 2013. Although strides have been made in regard to visitor and resource protection, a permanent full performance law enforcement ranger is a key position to be filled. Resource violations that have been recorded in the Preserve include illegal cave entry, trespass livestock grazing, off-road vehicle use, vandalism, target-shooting at park signs, littering, garbage dumping, and taking of park resources.

Due to the remoteness of the monument and preserve, volunteers are few. Combined with the shortage of staff, it is an all hands on deck scenario whenever CRMO experiences an incident or hosts a special event. The lack of adequate funding and staffing for the park makes it difficult to care for all critical park resources. Travel for training for all but mandatory reasons has been severely restricted. Visitation is expected to increase with several on-going efforts to draw more tourism to this part of Idaho. The number of schoolchildren using CRMO as an outdoor classroom has mushroomed from 2,600 in 2004 to over 5,000 in 2013. With insufficient staff and increasing numbers of visitors it is becoming more difficult to manage for the preservation of park resources and continue to provide for visitor enjoyment. This will likely keep the park from being fully successful in accomplishing one of the objectives for which the original monument was created—to provide for "great educational value." Critical management actions to be considered include:

- Initiate a Strategic Plan for CRMO with regional office support to establish goals and analyze staffing and funding needs for the future.
- Complete the Operations Review to identify what can be done in the short term given limited funding and staffing. Initial work on this indicates the need for 4 additional FTE and $500,000 in additional base funding.
- Develop a Kings Bowl Area Development Concept Plan to provide framework to manage one of the more popular and impacted areas within the Preserve.

Volcanic Hazard Potential
The recurrence interval of volcanic activity at CRMO averages an eruption every 2,000 years. The last eruption was 2,100 years ago. This makes the park due for another eruption. Based on recent studies, the park might expect lava flows covering from a few hundredths of a square mile to more than 150 square miles, including flows that travel as much as 25 miles from the vent. Fissuring and faulting could extend for miles and there could be broad uplift or collapse of the land surface covering tens of square miles. Hazardous gas releases, such as carbon dioxide and hydrogen sulfide, could affect areas greater than a square mile and be potentially lethal close to the vent or in low areas where the dense gases could accumulate. Tephra fall, such as cinders and ash, could impact areas of more than a square mile. Critical management actions to be completed include:

- Complete a Volcanic Hazard Assessment to help understand the potential damage that could be caused by an eruption.
- Complete the Emergency Operations Plan to address the responses to a volcanic eruption, including the direct impacts of the volcanic activity and the secondary impacts on local residents and visitors.
- Develop a Continuity of Operations Plan for park staff should the main headquarters building or transportation corridors become unavailable.

Local Communities Appreciation of CRMO
The value of having a nearby unit of the National Park Service is not fully appreciated by all local communities. A 2014 economic benefits analysis shows CRMO generated $7.2 million dollars resulting in 112 jobs for the local economy. CRMO consistently draws 200,000 annual visitors. The impact of economic benefits to the local economy will continue to be shared with the park's neighboring communities and partners with the intent of the park being valued by its neighbors. Opportunities to engage local communities and other stakeholders who rely on the tourism industry are being explored as a way to strengthen community relationships. One example is the Twin Falls Interagency Visitor Center, sponsored by the Twin Falls Chamber of Commerce, which opened in April 2014 and includes exhibits on all of the Southern Idaho Parks (Hagerman Fossil Beds National Monument, Minidoka National Historic Park, City of Rocks National Reserve, and CRMO).

Community relationships are also strengthened through the park's ability to use contiguous hiring authority. For over 15 years the park has received and used local contiguous hiring authority, opening a window of opportunity for residents of the Lost Rivers Area to be hired into park jobs. Many members of the park staff and their family members have integrated into the local communities through their involvement in community programs such as the Atomic Days Parade, athletic leagues, school programs, Teacher-Ranger-Teacher program, and other community events. This has gone a long way towards cultivating local acceptance of the park, but there still remains more work to ensure local residents and communities value the park.

Another community-related key challenge is working with multiple land owners under proprietary law enforcement jurisdiction within the park boundaries. Land owners include the Bureau of Land Management, the State of Idaho, private landowners, and Blaine, Butte, Minidoka, Lincoln and Power counties. In addition, Shoshone-Bannock tribal interests are of paramount importance since their history is integrally linked to the land, considering it a "place of sacred power and ancestral ground crossed during seasonal migrations." Establishing and maintaining Memorandums of Understanding and General Agreements with all the key partners for invasive species control, educational partnerships, law enforcement, aviation management, wildland fire, structural fire, search and rescue, among others, is an ongoing and exhaustive workload for a park with a limited number of staff.

The north part of the original monument and the entire preserve is bordered on all sides by livestock grazing which occasionally leads to livestock intrusions into the park. These are often resolved quickly, but they have potential to escalate into increased tensions. For the past two years, recent cattle pasturing on lands northwest of the monument have been problematic for trespass grazing and will require construction of a fence to protect park resources. Critical management actions to be considered include:

- Retain contiguous hiring authority for local hires to help alleviate housing shortage for seasonal employees and develop stronger ties to local communities.
- Maintain and enhance relationships with park neighbors and partners.
- Continue to promote CRMO as a viable contribution to local and regional economies.
- Continue to encourage CRMO staff and their families to actively participate in community events.
- Construct new fence and repair existing fence on northwest corner of the monument to halt trespass cattle.

Comprehensive Cultural and Natural Resources Management
CRMO needs a comprehensive strategy to protect, preserve, and prioritize management of cultural and natural resources due to limited funding and staffing for resource management activities. Currently, the park has significant cultural resource management deficiencies (regarding archeology, information about historic periods, and impacts on cultural resources) including lack of documentation and inventory, data collection, and monitoring. Moreover, cultural and natural resource stewardship actions such as implementing restoration and updating plans are needed. Many existing plans do not apply to the expansion area. The need for comprehensive guidance includes identifying strategies to improve ecological resiliency within native plant and animal communities as the climate changes. Several recent and older reports, including the natural resource condition assessment (2012), provide some of the information needs for park management. Other information still needs to be collected.

A wide variety of cultural resources are found in the park; however there is limited understanding of which are most significant. Analysis of these areas through inventory and assessment would enable the park to improve its management by identifying character-defining features and by recommending management actions to ensure these are preserved. Additionally, few management actions and current documents directly address cultural resource protection, especially in the expansion area. In addition to identifying priorities, known cultural resources need to be evaluated regularly, and National Historic Protection Act (NHPA) section 110 surveys need to be conducted. Less than 5% of the park has been intensively surveyed for cultural resources. Critical management actions to be considered include:

- Develop a Resource Stewardship Strategy for CRMO that addresses climate change scenarios.
- Continue monitoring and treatment of invasive plant species.
- Develop a Wildland Fire Management Plan to cover expansion area and allow for fuel treatments on forested lands.
- Complete an Archeological Resources Condition Assessment for entire monument and preserve.
- Complete the Emergency Operations Plan for the museum.

Continued Protection for Wilderness and Wilderness Study Areas

More than 90% of the park is designated wilderness or wilderness study area. Natural vegetation conditions are a fundamental component of wilderness character. Critical threats to these natural conditions include nonnative invasive plants, which are transforming native plant communities (particularly following wildfires), and climate change impacts on iconic species such as the American pika and limber pine. The Class I designation of the Craters of the Moon National Wilderness Area under the Clean Air Act also makes air quality a fundamental resource. Air quality in the park remained relatively unchanged (no statistically significant trend) for ozone, visibility and sulfur deposition for the most recent 10-year period analyzed (2003–2012). However, both ozone and visibility are a moderate concern at the park.

Concurrent with overall wilderness planning is the need for a wilderness viewshed analysis. Proposed energy project towers near the park would be visible from some wilderness viewsheds and pose a potential threat to the park's wilderness character. A viewshed analysis would determine which wilderness and wilderness study area viewsheds are currently impacted and which are most vulnerable to viewshed impacts from actions on adjacent lands. Critical management actions to be considered include:

- Complete and implement the Wilderness Stewardship Plan.
- Update the Wilderness Character Assessment every five years.
- Continue to seek Congressional wilderness designation for the Presidentially-recommended Great Rift and Raven's Eye areas.

Protection of Caves and Associated Cave Features

CRMO contains outstanding cave resources, including fissures and lava tubes. Over 495 caves have been located, with more being discovered each year. With the discovery of more caves comes the discovery of additional bat hibernacula. The main threat to bats is the potential introduction of White-nose syndrome, a fungus jeopardizing bat populations nationwide as it moves westward across the country. Critical management actions to be considered include:

- Complete a Cave Management Plan to guide protection of cave resources, including allowing visitor use of some of the caves while protecting bats and the other resources associated with the caves.
- Continue with surveys of bat hibernacula and monitoring of bat populations.

New Visitor Opportunities

Continually staying up to date and expanding digital media programs is also a key component in offering new visitor opportunities to a public who may or may not set foot within the park boundaries. This is essential to remain relevant, especially for a park as remote as CRMO. Social media presence, distance learning programs, and web access to the events and undertakings of the park will be instrumental for increasing visitor knowledge of basaltic volcanism and understanding scientific and scholarly research related to park resources. The park has already developed a well-received wildflower application for iPhone and Android platforms and will complete a geology app during the winter of 2014–2015.

The park is also reaching out to youth through the Geologist-in-the-Park and Student Conservation Association (SCA) internships and Volunteer-in-Parks (VIP) programs. The goal is to provide work experiences and educational opportunities for youth. Critical management actions to be considered include:

- Acquire increased internet speed and connectivity for both park users and park-sponsored digital broadcast media.
- Develop or import technical proficiency within staff or volunteers to manage social media and digital platforms.
- Continue to dedicate staffing to manage youth education and internships.

Park Infrastructure

The park has worked to improve sustainable practices for many years. During 2013, the park exceeded the goals of the NPS Green Parks Plan and won an award from the Environmental Protection Agency for water conservation and was a co-winner of the 2014 NPS Green Parks video contest. CRMO produces 40% of its electricity from solar power that does not emit greenhouse gasses.

Reduction in electrical consumption in the entire park is a continual focus. The park has reduced energy consumption by replacing all traditional light bulbs in park facilities with LED lights, installing energy-efficient windows, doors, insulation and appliances. The park, along with assistance from the Natural History Association, manages a recycling program that is enthusiastically used by staff and visitors.

There is approximately $44 million dollars of infrastructure assets at CRMO, being maintained by a staff of two permanent employees, three permanent less than full-time employees, and, depending on project funding, 3–5 seasonal employees. The entire ONPS budget for the Facilities Maintenance staff is $320,000. CRMO is one of the lowest funded maintenance staffs in the Pacific West Region. Still, the visitor comments about the appearance and condition of the facilities are overwhelmingly positive. It is not certain how long this success can be maintained. Any unexpected absence by one or more of the employees puts a hardship on the daily operations, and it is nearly impossible to send employees away from the park for employee development opportunities due to the shortage of back-up staff. Critical management actions to be considered include:

- Shortage of Office Space and Housing. The 2012 housing needs assessment documents a shortage of housing (needs an additional 14 beds). A duplex housing unit, capable of housing 8 people, is currently being used as office space for the Resource Management and Visitor and Resource Protection divisions. Housing options for seasonal employees outside the park are extremely limited. If more staff is added, additional office space will also be needed.
- Shortage of Water. A projected decrease in annual snow pack in the park's watershed may result in a shortage of potable water, especially during July and August. If the trends of more visitors and critical water levels continue, additional water supply and/or more efficient water conservation measures will be needed. Any future plans for increased water use by visitors or park operations (such as additional park housing) would need to address potential declines in water yields. Data needs to help address this issue include a better assessment of water yield, flow, and use in the park, as well as projections of changes in annual and seasonal precipitation.
- Waste water treatment system improvements are needed to the existing septic systems. The current system was designed for less visitation and use than what Craters is experiencing now and projected to experience in the future.
- The Lava Campground was designed for automobile and tent camping. Currently 60% of overnight visitors are in a recreational vehicle or trailer, and an increase in the number of sites that can accommodate these larger size vehicles is needed.

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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.
Exotic Plant Management Team (EPMT)	One of the ways the NPS is combating invasive plants is through the Exotic Plant Management Team Program. The program supports 16 Exotic Plant Management Teams working in more than 225 park units. EPMTs are led by individuals with specialized knowledge and experience in invasive plant management and control. Each field-based team operates over a wide geographic area and serves multiple parks.
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.

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? NRCAs provide a mix of new insights and useful scientific data about current park resource conditions and factors influencing those conditions. NRCAs 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.
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.
Upper Columbia Basin Network (UCBN)	One of 32 I&M networks established as part of the NPS Inventory and Monitoring Program. The Upper Columbia Basin Network provides scientific data and expertise for natural resources in 8 parks located in Idaho, Oregon, Washington, and Montana.
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.
Volunteers In Parks Program (VIP)	The Volunteers In Parks Program was authorized by Public Law 91–357 enacted 1970. The primary purpose of the VIP program is to provide a vehicle through which the National Park Service can accept and utilize voluntary help and services from the public. The major objective of the program is to utilize this voluntary help in such a way that is mutually beneficial to the National Park Service and the volunteer. Volunteers are accepted from the public without regard to race, creed, religion, age, sex, sexual orientation, national origin, or disability.
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.