



Cedar Breaks National Monument International Dark Sky Park (Silver Tier) 2018 Annual Report

General Info

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Site Visitation:

Official recreation visitors:

- 2017: 909,199
- 2018 (through Aug): 469,325

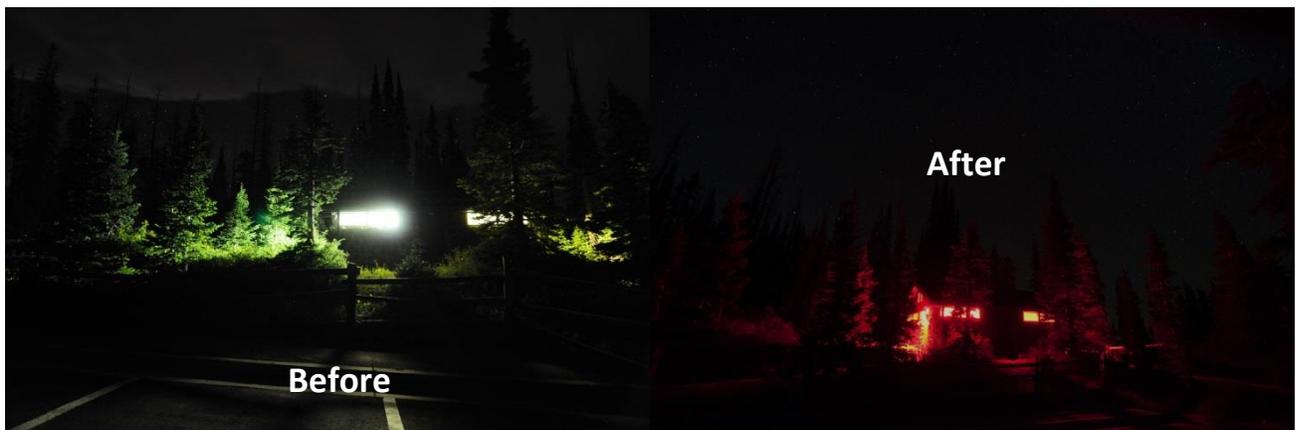
See "Outreach" section below for dark-sky programming statistics.

Lighting

No new outdoor lighting fixtures have been installed at Cedar Breaks since designation. However, four of the six light fixtures that were non-complaint with the lighting management plan (LMP) detailed in our IDSP application have been retrofitted and are now complaint. The two remaining non-compliant fixtures are not in use at this time, and as such the monument does not have plans or funding to retrofit them in the immediate future.

As of September 2018, 94% of all fixtures, and 100% of in-use fixtures, are now complaint with our LMP, well above the 90% target within five years of designation. An updated lighting inventory for Cedar Breaks (Sept 2018) is appended at the end of this document.

Cedar Breaks has also made several changes to indoor lighting in order to minimize light trespass. Previously, light spillage from the two park restroom facilities was significant. The visitor center restroom facilities have been retrofitted with red LED lights that minimize the intensity of light trespass and improve visitor safety during astronomy events (see photos below). A similar problem existed at the campground restrooms. Earlier this summer, maintenance staff temporarily covered most of the restroom windows with black plastic to minimize light trespass into the campground. This made the campground a much darker place and improved the quality of the dark-skies programs hosted there by our astronomy volunteers. The park is now exploring more permanent solutions to minimize light trespass at the campground.



Long-exposure photos showing light trespass at the Visitor Center restrooms facility, before and after installing red LED lights.

Sky Quality Data

Cedar Breaks continues to conduct periodic measurements of night sky quality using a Sky Quality Meter (SQM) and DSLR photography.

SQM data

SQM measurements are taken regularly through the summer season on clear nights when the moon is not present. Winter measurements are also taken when weather and road conditions allow.

SQM Measurements since IDSP Designation (March 2017)				
Local Date & Time	Location	Temp (°C)	Average SQM reading (mags/arcsec ²)	Comments/sky conditions
8/19/2017 22:25	Point Supreme Overlook	16	21.51	Clear, Milky Way nearly overhead
9/18/2017 23:20	Ranger Station	13	21.47	Clear, Milky Way overhead
1/12/2018 20:45	Junction of Hwy 143/148	Not recorded (very cold)	20.22	Clear, lots of airglow in photographs from this evening. Pronounced skyglow from Brian Head
6/7/2018 22:52	Ranger Station	20	21.71	Clear, some haze and high clouds near horizon. Somewhat hazy overall
8/4/2018	Ranger Station	Not recorded	21.70	
9/1/2018	Ranger Station	10	21.66	A few clouds, especially near horizon. Milky way nearly overhead

In addition, we conduct an annual SQM survey where we take a series of SQM measurements at nine locations throughout the park on the same evening. This survey is held at the same time of year (late-Sept or early Oct) in order to minimize the effect of the position of the Milky Way on our measurements. The 2018 survey is scheduled to take place on October 4th.

Location:	2016 Survey 9/26/16 Avg SQM	2017 Survey 10/9/17 Avg SQM	2018 Survey Oct 2018 Avg SQM
UT 148, South Monument Boundary	21.42	21.42	
Visitor Center/Point Supreme	21.48	21.47	

Picnic Area/Campground	21.50	21.51	
Sunset View	21.46	21.47	
Chessman Ridge Overlook	21.47	21.48	
Winter Ranger Station (Yurt)	21.44	21.45	
UT 143, Monument East Boundary	21.46	21.46	
North View	21.45	21.44	
Brian Head Peak Turnoff	21.36	21.38	

Despite the limitations of the SQM, these data suggest that change in sky brightness at Cedar Breaks since designation has been minimal or non-existent.

Cedar Breaks has explored the possibility of installing a permanently mounted SQM in order to capture more detailed data, especially during the winter when heavy snowfall limits access and our ability to take measurements. However, the logistics of this are difficult given the monument's remote location and copious winter snowfall (average 15-16 feet annually). No funding is currently available for this but may be pursued in the future.

DSLR Photos

In addition to the SQM measurements, we also take 360° panoramic DSLR images of the horizon from Point Supreme once per year, using the same camera and exposure/aperture/ISO settings. The photos from 2016 and 2017 are shown below. 2018 photos will be taken on October 4th.



Skyglow conditions from Point Supreme, Cedar Breaks National Monument. (Nikon D90, 11mm, f/2.8, 30 sec, ISO 2500)

Conservation and Research

To our knowledge, there are no conservation or research projects related to dark skies currently taking place at Cedar Breaks.

Funding

Cedar Breaks has minimal base (congressionally-allocated) funding to support dark sky programming. For the past several years, entrance fee dollars have been used to support a dark skies coordinator and dark sky intern or seasonal ranger. This funding expires at the end of 2018. Requests for 2019 funding have been submitted and future funding via entrance fee dollars may be granted.

Beginning in 2018, the park's official non-profit partner, the Zion National Park Forever Project, has begun supporting the dark skies program. This support is likely to continue in future years, providing a reliable source of funding for our dark sky outreach efforts.

Arts & Culture

In August 2017, the Utah Symphony visited Cedar Breaks as part of their "Great American Road Trip Tour." In addition to playing musical selections inspired by the night sky, the event was preceded and followed by dark sky-themed activities. Nearly 400 people attended the event.

Several events for the Southwest Astronomy Festival (coordinated by Cedar Breaks and described below) also blend arts and dark skies. Many of these programs have been offered in partnership with the Southern Utah Museum of Art in Cedar City.

Outreach

Cedar Breaks continues to take a leading role in dark sky outreach by developing and offering a variety of programs focused on communicating the importance of dark sky preservation to both park visitors and residents of local communities. As a result, area residents are increasingly aware of the ecologic, economic, and aesthetic benefits of preserving dark skies.

Astronomy and Dark Sky Programming Attendance		
Program	2017	2018 (thru Sept)
Saturday Star Parties	1088	2065
Campground Stargazing Programs (volunteer led)	513	326
Private Group Star Parties (scouts, school groups, etc.)	46	113
Solar telescope viewing	9336	8112

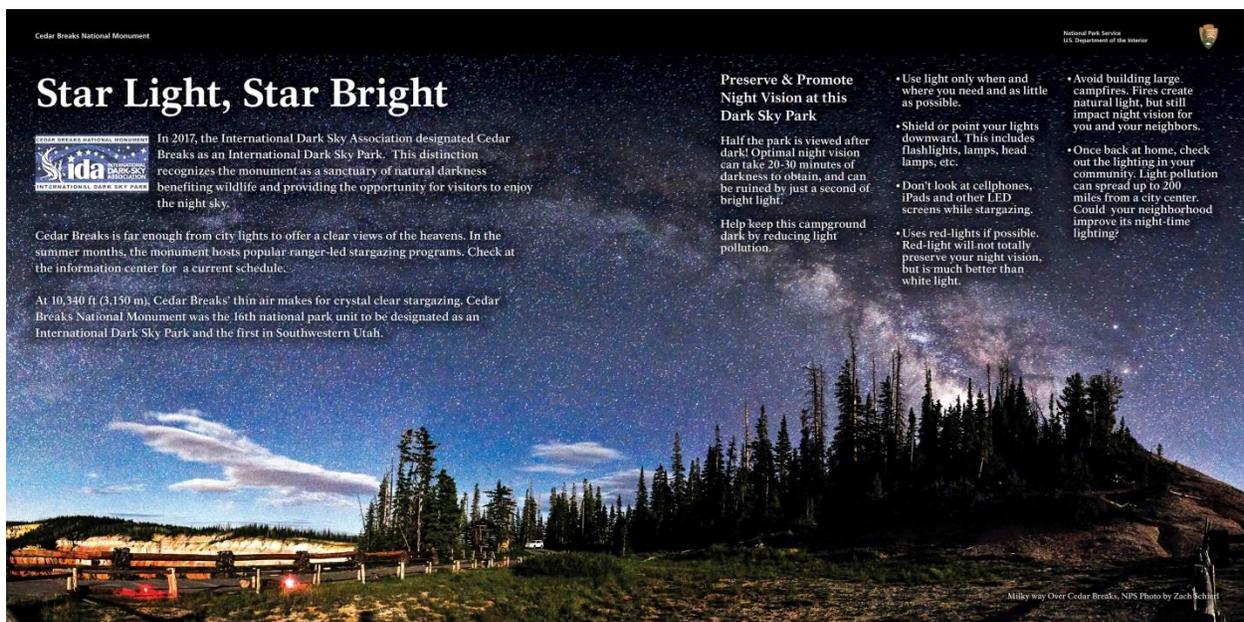
Master Astronomer Program	35	10
Southwest Astronomy Festival (coordinated by Cedar Breaks)	975	2891
Southern Utah Univ. STEAM Festival Dark-Sky Booth	1500	--
Other Astronomy Outreach	--	220
Summer and Winter (snowshoe) Full Moon Hikes	--	164

On Site Interpretive Programming

Cedar Breaks continues to offer interpretive astronomy & dark sky programs (star parties) every Saturday night throughout the summer season. These events are consistently the most attended interpretive programs at Cedar Breaks. Additionally, a cadre of park astronomy volunteers (Astro VIPs) offer informal telescope viewing to campground visitors on several other nights each week as weather permits. Cedar Breaks also periodically offers private astronomy programs for scout troops, schools, an annual Paiute youth camp, and other educational groups.

Media Products

In 2018, Cedar Breaks installed an interpretive panel at the Point Supreme Campground highlighting our international dark sky park status and suggesting actions campers can take to promote a dark sky experience in the campground:



Interpretive Panel on IDSP Status installed at Point Supreme Campground (NPS/Shannon Eberhard)

Social Media

Cedar Breaks has a large and active following on social media. Our web and social media manager frequently uses these platforms to highlight the dark skies of Cedar Breaks. Since designation in 2017, Cedar Breaks has made 69 astronomy or dark sky themed Instagram and Facebook posts (advertising dark sky programming, International Dark Sky week, photos of the park at night, etc.) which have collectively been viewed 185,887 times, and generated 4155 reactions (likes, shares, comments, etc.) The internet and social media will continue to remain an important way for us to spread the word about our International Dark Sky Park status, even for folks that may not be able to visit the park in person.

Master Astronomer Program

The Master Astronomer Program (MAP) is a 40-hour workshop developed and taught by Cedar Breaks National Monument staff which trains local residents as stewards of dark night skies. A total of 35 individuals participated in three Master Astronomer Workshops offered in 2017, the inaugural year of the program, and ten are currently participating in our Fall 2018 workshop offered in conjunction with Southern Utah University's Community Education Program.

Master Astronomer Program graduates have recorded 786 hours of volunteer service (as of Aug 2018) in the name of astronomy and dark sky outreach in Southern Utah and beyond. Many have become involved with local astronomy clubs, and several have become regular volunteers at Cedar Breaks. Several program graduates have also been hired as rangers at other International Dark Sky Parks, such as Glacier NP, Canyonlands NP and Black Canyon of the Gunnison NP.

To keep participants engaged in the dark sky community, we publish a monthly newsletter (the *Master Astronomer Messenger*) to keep people informed about volunteer opportunities, dark sky and astronomy news, upcoming sky events, and much more. In the fall and spring, we also offer a monthly continuing education class to past participants.

Southwest Astronomy Festival

The Southwest Astronomy Festival brings astronomy and dark sky preservation into the communities of St. George and Cedar City through an annual three-day festival

The screenshot shows the 'Master Astronomer Messenger' newsletter for September 2018. At the top left is a logo for the Master Astronomer Program featuring a lightbulb with a crescent moon and stars. To the right are logos for Cedar Breaks National Monument, the International Dark Sky Association (IDA), and International Dark Sky Park. The title 'Master Astronomer Messenger' is prominently displayed, with the date 'September 2018' below it. A 'Contents' table lists sections like 'Welcome Back!', 'SW Astro Fest', and 'September Sky Events'. The main content includes a 'Welcome Back!' message, a 'Southwest Astronomy Festival, Sept 7-9' announcement with a link to the festival page, and a list of activities such as star parties, night sky photography workshops, and astronomy art exhibitions. A photo of a smiling woman in a cardboard telescope is featured. At the bottom, there is a call to action for submitting news items to zachary_schierl@nps.gov.

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Welcome Back!
After a several month hiatus, we are back and excited to be getting ready for a fun-filled fall of Master Astronomer Events! The next few months will be busy: Our 2nd Annual Astronomy Festival takes place Sept 7-9, the Fall Master Astronomer Workshop begins Sept 12th, and Continuing Education workshops begin again in October. See below for details and we hope to see all of you soon!

Southwest Astronomy Festival, Sept 7-9
Thanks to Leesa Ricci and our co-organizers at Grand Canyon-Parashant National Monument, we have three fun filled days of astronomy events planned at locations throughout Iron and Washington Counties. A full schedule of events can be found at <https://www.nps.gov/cebr/planyourvisit/southwest-astronomy-festival.htm>
Please note that while all events are FREE, some require advance registration. Email Leesa at leesa_ricci@nps.gov to sign-up.

ACTIVITIES INCLUDE:
★ Star Parties
★ with Great Telescopes
★ Solar Parties
★ Night Hikes
★ Night Sky Photography Workshop
★ Astronomy Workshops
★ Astronomy Art Exhibitions

Have a news item, photo, or other tidbit you would like to contribute to the Messenger? Send to zachary_schierl@nps.gov

Screenshot of monthly newsletter sent to Master Astronomer Program graduates.

coordinated by Cedar Breaks National Monument. The festival is held in partnership with several dozen government and non-profit partners throughout southwestern Utah, including Grand-Canyon Parashant NM, Bureau of Land Management, St. George Astronomy Group, Southern Utah Space Foundation, local elementary schools, and several local businesses. While a handful of events are held at Cedar Breaks, the vast majority of events are held in surrounding communities, as well as at other local, state, and federal parks and protected areas throughout SW Utah.

More than 2800 people attended the 2018 event, Sept 7-9. More information on the community-based festival can be found at: <https://go.nps.gov/swastrofest>.

Library Telescope Program

In 2017, Cedar Breaks National Monument launched a Library Telescope Program in partnership with public libraries in Iron and Washington Counties, Grand Canyon-Parashant National Monument and the Zion National Park Forever Project.

This program provides 11 telescopes at 10 public libraries (every public library in Iron and Washington Counties) allowing patrons check-out a telescope from their local library just like they would a book. These library telescopes extend the reach of our dark sky message and make the dark skies of Southern Utah accessible to everyone with a library card, including many people who do not, or cannot, attend astronomy programs at Cedar Breaks. Each Orion 4.5" reflecting



TAKE THIS TELESCOPE HOME!

For FREE! You can check it out from numerous Iron and Washington County libraries, just like a book, and use it to enjoy the amazing dark skies of Southern Utah!

ABOUT THE TELESCOPES:

Each library telescope, a 4.5" Orion StarBlast, is specially modified to be easy to use and allows you to see craters on the moon, the moons of Jupiter, the rings of Saturn, and a variety of star cluster, nebulae, and other deep-sky objects.

EACH TELESCOPE ALSO COMES WITH:

- Custom instruction manual
- Red LED headlamp (to protect night vision)
- Night Sky Field Guide
- Moon Map



Top: Advertisement for the Library Telescope Program. Below: Cedar Breaks volunteers prepare the telescopes for delivery to libraries.

telescope includes information on the importance of dark sky preservation and what people can do to help protect the night skies of Southern Utah.

Cedar Breaks purchased and modified the telescopes in preparation for the program launch, and continues to oversee the program. Each telescope is monitored by a “caretaker” from a local astronomy club or the Master Astronomer Program for signs of damage or maintenance, which so far has been minimal. Most libraries report a long waitlist for the telescopes, and we have even given a second telescope to the Cedar City Library to keep up with demand.

Telescopes are checked out for a week at a time, which means that each telescope reaches ~50 families per year. With eleven telescopes in near-constant circulation, and an average Utah household size of 3.14, we estimate the program reaches about 1800 local residents annually.

Astronomy Volunteers (Astro VIPs)

Cedar Breaks hosts several dedicated astronomy volunteers each summer to assist with astronomy and dark-sky programming both in the monument, and in surrounding communities. In the past two seasons, these volunteers have come from as close as St. George, UT, and as far away as Germany. Most Astro VIPs live and work at Cedar Breaks for about one month, although several stay for the entire summer. These volunteers are an integral part of our dark-sky program, and are responsible for a large number of visitor contacts.

Community and Media Relations

Community Lighting

To our knowledge, no changes have been made to lighting codes by local municipalities. However, awareness of the issue is on the rise. During the 2017 Cedar City Council campaign, a question about dark sky preservation was one of six questions posed to candidates at a debate hosted by Southern Utah University. One of the council candidates was a graduate of the Cedar Breaks Master Astronomer Program.

In 2017, Cedar Breaks staff provided input on a LED streetlight retrofit project recently undertaken by Cedar City. The city originally planned to replace existing high-pressure sodium lamps with 4100K LED lamps, but switched to 3000K LED bulbs after Cedar Breaks staff approached city engineers and the city council with information regarding the benefits of using warmer bulbs. Cedar Breaks plans to continue working closely with Cedar City and other nearby municipalities on these types of issues in order to secure the best possible future for the dark skies of Cedar Breaks.

ID #	Photo	Location	Application	Fixture	Lamp	Watts	Fully-Shielded?	Controls	Compatible with LMP?
1		Ranger Station Exterior S	Area light, walkway illumination	Fully shielded floodlight	Yellow CFL	13W	YES	Motion sensor + indoor switch	YES
2		Ranger Station Exterior W	Area light	Fully shielded floodlight <i>(damaged by snowfall last winter)</i>	None	N/A	YES	Motion sensor + indoor switch	YES Not currently in use
3		Ranger Station Exterior N	Area light	Fully shielded floodlight	Halogen PAR	90W	YES	Motion sensor + indoor switch	YES Not currently in use
4		Ranger Station Exterior E	Area light, walkway illumination	Fully shielded floodlight <i>(damaged by snowfall last winter)</i>	None	N/A	YES	Motion sensor + indoor switch	YES Not currently in use
5-7		Ranger Station Porch	Porch illumination	Wall mount with directional bulb	Amber LED	6W	YES, by overhang	Inside switch	YES

8		Ranger Station Entry	Egress/ingress	Recessed canister	Soft White CFL	13W	YES	Inside switch	YES
9		Caretakers Cabin	Egress/Ingress, porch illumination	Ceiling mount	Halogen	52W	Partial, by overhang	Inside switch	NO Not currently in use
10-11		Campground Restrooms (North side)	Ingress/egress, walkway illumination	Recessed canister	Yellow CFL	5W	YES	Inside switch	YES
12		Campground Restrooms Utility Door	Ingress/egress, walkway illumination	Recessed canister	Yellow CFL	5W	YES	Inside switch	YES
13-14		Campground Restrooms (South side)	Ingress/egress, walkway illumination	Recessed canister	Yellow CFL	5W	YES	Inside switch	YES
15-16		Fee Station	Area light, walkway/curb illumination	Recessed canister	Yellow CFL	5W	YES	Inside switch	YES

17		Visitor Center Porch	Area light, ingress/egress	Canister	2700 K CFL	12W	YES	Inside switch	YES
18		Pt Supreme Restrooms SE Wall	Area light, walkway illumination	Canister	Red LED	4W	YES	Inside switch	Yes
19-20		Pt Supreme Restroom entrances	Area light, ingress/egress	Canister	Red LED	4W	YES	Inside switch	Yes
21-30		Staff Residences	Ingress/egress, walkway illumination	Recessed box	Yellow CFL	5W	YES	Switch inside residences	YES
31		Maintenance Building	Area light	Wall mount	None	N/A	NO	Inside switch	NO Not currently in use
32		Maintenance Building front door	Ingress/egress	Fully shielded wall pack	Soft White LED	?	YES	Inside switch	YES