



Canyonlands National Park International Dark Sky Park Designation Nomination Package

March 2015



The Dollhouse, Maze District
NPS Photo/Dan Duriscoe

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Canyonlands International Dark Sky Park Summary

Canyonlands is a spectacular resource that reflects the criteria desired for designation as a dark sky resource. Due to the remoteness, high elevation, distance from urbanization, dry air and clear skies, and status as a unit of the National Park Service, Canyonlands (CANY) has the ability to preserve, protect, and serve as a role model in the conservation of night skies.

All of the criteria addressed under the gold-tier status requirements are met at Canyonlands National Park. Based on CANY's qualifications in each of the following categories designated by the IDA, we feel that the park should be considered for the Gold Tier designation.

- 1) **Philosophy: Nighttime environments that have negligible to minor impacts from light pollution and other artificial light disturbance, yet still display outstanding quality night skies and have superior nighttime landscapes.** Though a few small communities are scattered throughout the area, CANY displays outstanding quality night skies with no visible light domes from those communities, in nearly all points of the park.
- 2) **Artificial Light and Skyglow: Typical observer is not distracted by glary light sources. Light domes are only dim and restricted to sky close to horizon.** Due to CANY's remote location, few, if any, light sources are visible from anywhere within the park.
- 3) **Observable Sky Phenomena: The full array of visible sky phenomena can be viewed.** The Milky Way is seen on every clear night throughout the year, as well as faint meteors and the zodiacal light from all locations around CANY.
- 4) **Nocturnal Environment: The area is devoid of obvious lights that can cause wildlife disorientation. Artificial light levels are thought to be below the threshold for plant and animal impact. Ecological processes related to nocturnality are unaltered. There is no lighting atop towers or buildings within park boundary.** Again, due to the remoteness of the park, CANY preserves a dark sky devoid of any obvious light.
- 5) **Visual Limiting Magnitude: Equal or greater than 6.8 under clear skies and good seeing conditions.** The NPS Night Skies Team has determined VLM data for Canyonlands at 7.1. In 2011, the Night Skies Team measured a Zenith Limiting Magnitude of 6.9 (see page 18).
- 6) **Bortle Sky Class: 1-3.** The NPS Night Skies Team has determined a Bortle class of 2-3 for CANY night skies, based on measurements from multiple nights.
- 7) **Unihedron Sky Quality Meter: >21.75.** CANY staff have basic Unihedron zenith models and have collected data during times of new moon. On four separate nights (Dec 2014 to Feb 2015), CANY staff measured sky quality at 13 distinct sites within the park. The average of these SQM measurements is 21.85. 11 of 13 sites measured well above 21.75, with only two under the guideline by a very slim margin of error, within instrument reliability (21.69 and 21.68).

Nomination Letter

Dear IDA Dark-Sky Park Program,

I am pleased to be writing this letter to recommend Canyonlands National Park for designation as a Dark Sky Park. I believe the continued integrity of the Colorado Plateau as a region of dark skies will depend on the foundation laid by such designations. Appointing Natural Bridges National Monument as the first Dark Sky Park was an important step that people in the region are proud of. The continued effort made by National Park Service staff and volunteers and community partners has built momentum for the dark sky movement and a designation for Canyonlands is a natural next step. I believe Canyonlands meets the requirements for designation, but another IDA designation on the Colorado Plateau will not simply be another park with telescopes and glarebusters. Adding Canyonlands NP to the list of designated areas will further build a heightened sense of awareness to the night sky as a broad regional resource. The placement of this park near the growing town of Moab makes this awareness a timely move towards building community partnerships.

More than any other park on the Colorado Plateau, Canyonlands conjures images of the rugged landscapes and solitude integral to wilderness values. Intrepid explorers throughout history have entered this country, either by river or by foot, to face peril and wonder. The interplay of rock and water created a carved landscape, laid bare to confront anyone within with the immense depths of geologic time. This perspective of vastness and ancient-ness is only complete when coupled with an unhindered view of the night sky. Even from the accessible viewpoints of Canyonlands, such a view is still possible.

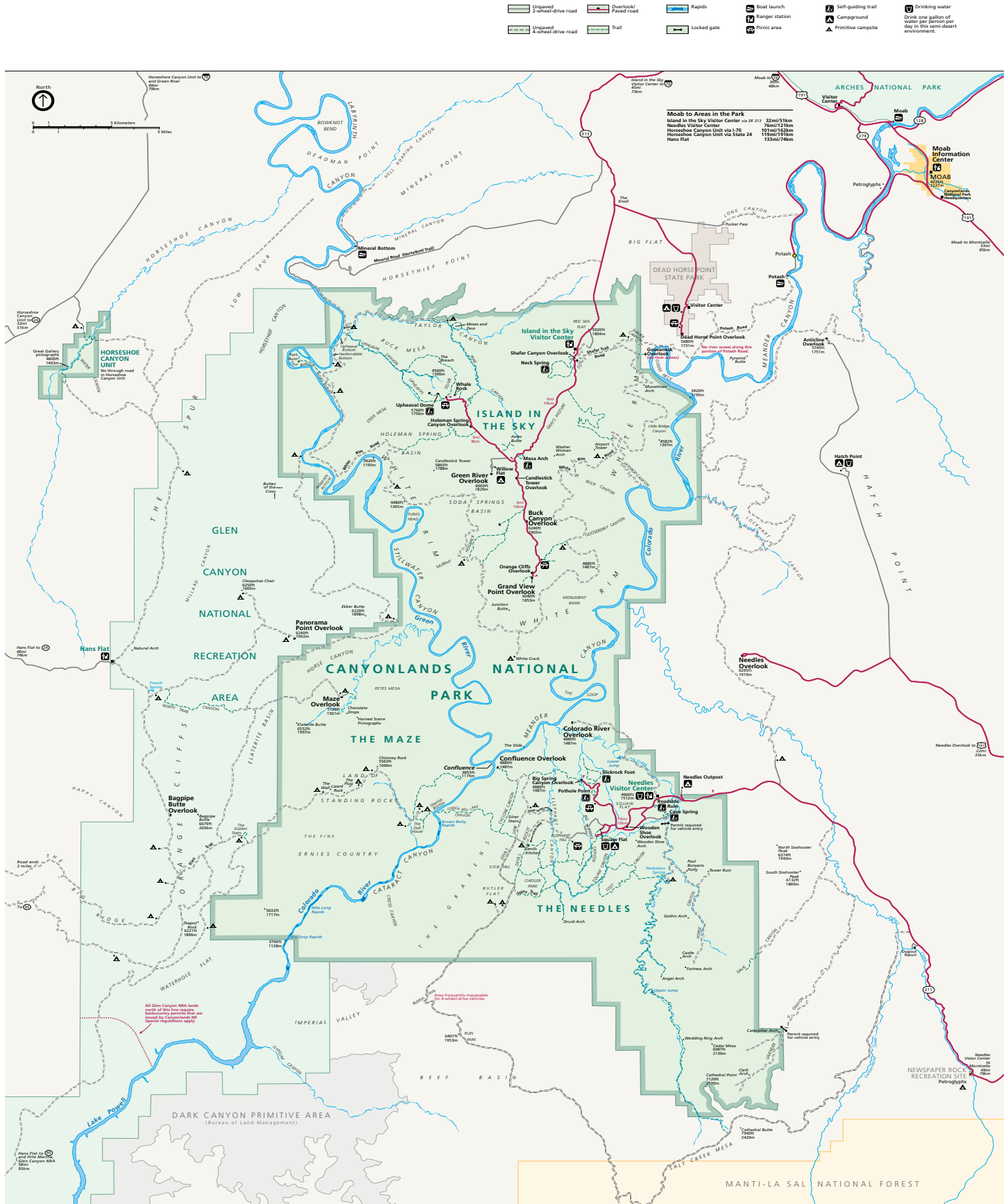
I've been lucky to have the chance to visit Canyonlands many times, both as park service employee and as a visitor. I've enjoyed long hikes in the backcountry with geology as a companion by day and stars as a companion by night. My most recent visit to Canyonlands, however, was to probably its most accessible spot, Grand View Point. This spot overlooks the drama of terraces and canyons cut by rivers over millions of years. I was there with my visiting elderly parents, who would not generally be able to see much of the park. We walked out to the precipice at sunset and gazed out at the deepening, then vanishing light across the canyons. This was only half the experience, though, as we stayed while, one by one, planets and stars revealed themselves. There is something somehow intimate about finding these familiar stars revealing themselves over such a landscape and struggling to find them as they first appear in the half-light of dusk. My parents both agreed it was the highlight of the trip.

Designation of Canyonlands NP as a dark sky park will only ensure that more people can have this all-too-rare experience. Thanks and I look forward to your decision.

Sincerely,

Kate Magargal
Moab, Utah

Map of Canyonlands National Park



Map of CANY, including roads and main features of the park.

1

Description of Canyonlands' Night Sky Resources



Telescope Practice, Island in the Sky District
NPS Photo/Sierra Coon

Description of Canyonlands' Night Sky Resources

Location and Description of the Park

Canyonlands National Park was established in 1964 via Public Law 88-590, signed by President Lyndon B. Johnson. Canyonlands was expanded to 337,598 acres in 1971 with the enactment of Public Law 92-154. There are no private inholdings. Canyonlands is managed by the National Park Service Southeast Utah Group (SEUG), the same group that manages Hovenweep National Monument and Natural Bridges National Monument, both of which have been designated Dark Sky Parks.

Canyonlands National Park is comprised of four districts: (1) the Island in the Sky, (2) the Needles, (3) the Maze, and (4) the rivers. Split by the Colorado and Green rivers, the park contains unique hiking, camping, and opportunities for solitude. The four districts are not directly linked by any roads. The most visited district, Island in the Sky, boasts easily accessed viewpoints, a variety of hikes, and a popular 100-mile four-wheel-drive road. Needles is the second most visited area—attracting hikers and backpackers, as well as providing opportunities for four-wheel-drive exploration. The Maze and rivers tend to be the least visited areas, as their remote access points discourage all but the most inspired backcountry traveler.

The Island in the Sky District is accessed via Highway 313, the Needles District is accessed by way of Highway 211, and the Maze District is most often accessed via Highway 24. The Needles and Island in the Sky are located within San Juan County, while the Maze District of the park is primarily located within Wayne County, with only a small portion residing in Garfield County. The town of Moab serves as the primary jumping off point for most visitors to the park.

Ecology and Geology

Canyonlands National Park encompasses 527 square miles of the Colorado Plateau. Canyonlands National Park is a showcase of colorful geology. In each of the park's districts, visitors can see the remarkable effects of millions of years of erosion on a landscape of sedimentary rock. It is considered an arid desert—where dry, hot summers give way to stark winters, with contrasting white snow and layers of red rock. Averaging about 9 inches of rain per year, this seemingly desolate desert area is actually home to many species. One hundred ninety-six species of birds call Canyonlands home for at least one part of their migration, while 76 species of mammals live in Canyonlands, including bighorn sheep, mule deer, coyotes, and bats. The contrast between mesa top, lower canyons, and lush riversides makes Canyonlands a unique and relatively undisturbed desert ecosystem.

History and Culture

Humans first visited Canyonlands over 10,000 years ago. Nomadic groups of hunter-gatherers roamed throughout the southwest from 8,000 B.C. to 500 B.C. The hunter-gatherers during this time created a great deal of intriguing rock art. Some of the best examples of their art, known as “Barrier Canyon Style,” remain on the cliff walls of Horseshoe Canyon. Roughly two thousand years ago, the hunter-gatherers began to rely more on domesticated animals and plants for food. These early farmers are called the ancestral Puebloan (formerly known as Anasazi) and Fremont people. Before the ancestral Puebloans left, other groups appeared in the area. The Ute and Paiute cultures may have arrived as

early as A.D. 800. The Navajo arrived from the north sometime after A.D. 1300. All three groups still live here today.

From the 1880s to 1975, local ranchers used much of Canyonlands for winter pasture. Cowboys searched the canyons for good feed and water. They constructed trails to move their stock across the rugged terrain. To guard their herds, cowboys lived in primitive camps for weeks at a time. The Cave Spring Trail in the Needles District features one such camp.

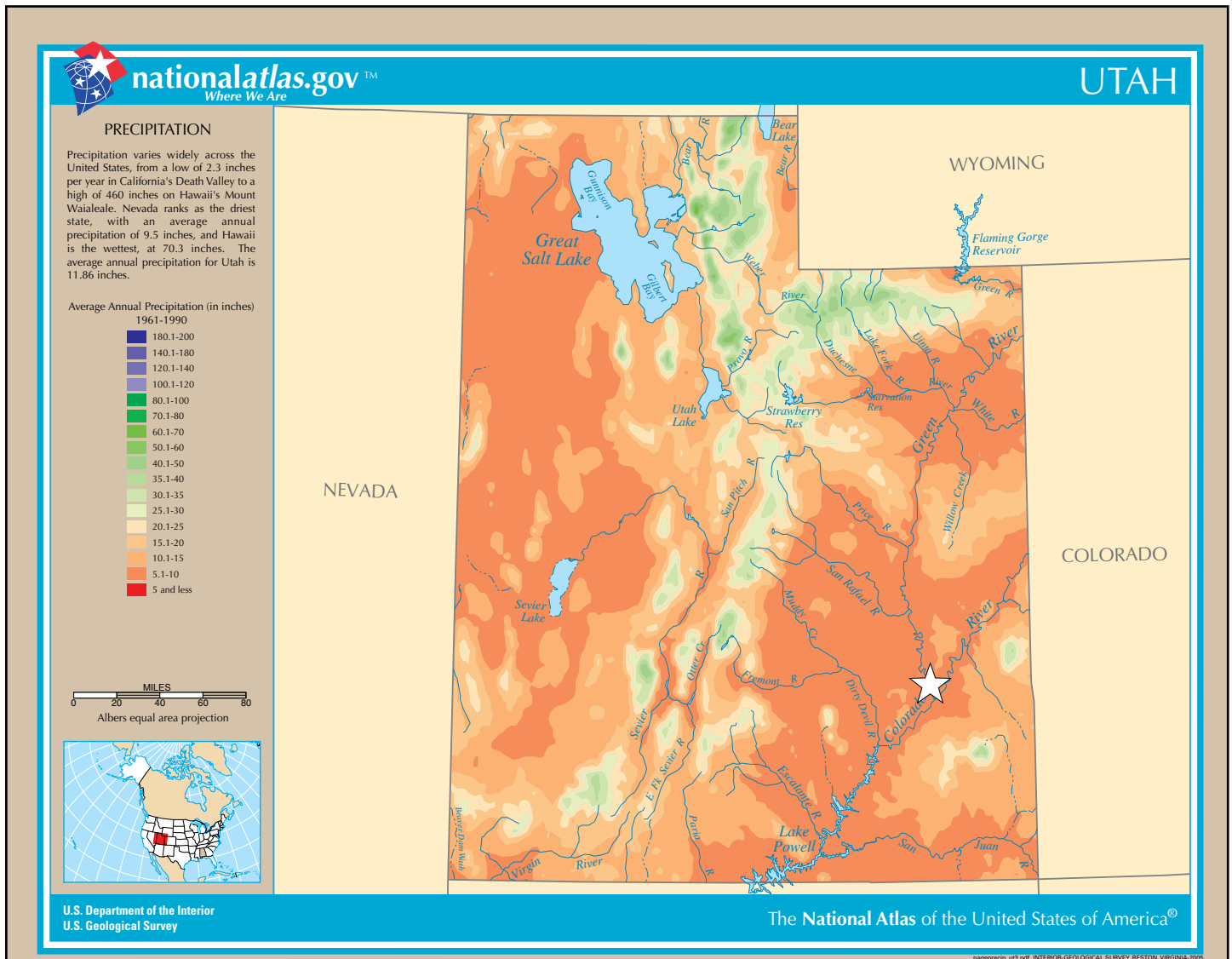
Later, uranium prospectors explored within Canyonlands, leaving behind many roads which are now used for four-wheel-drive exploration and mountain biking. These roads include the popular White Rim Road at the Island in the Sky.

Today the park draws visitors wishing to experience adventure, solitude, and beauty. The wide landscape presents open spaces of sky and rock that enhance a connection with wilderness and self, and inspire exploration. As put by author Edward Abbey, Canyonlands is “the most weird, wonderful, magical place on earth—there is nothing else like it anywhere.”

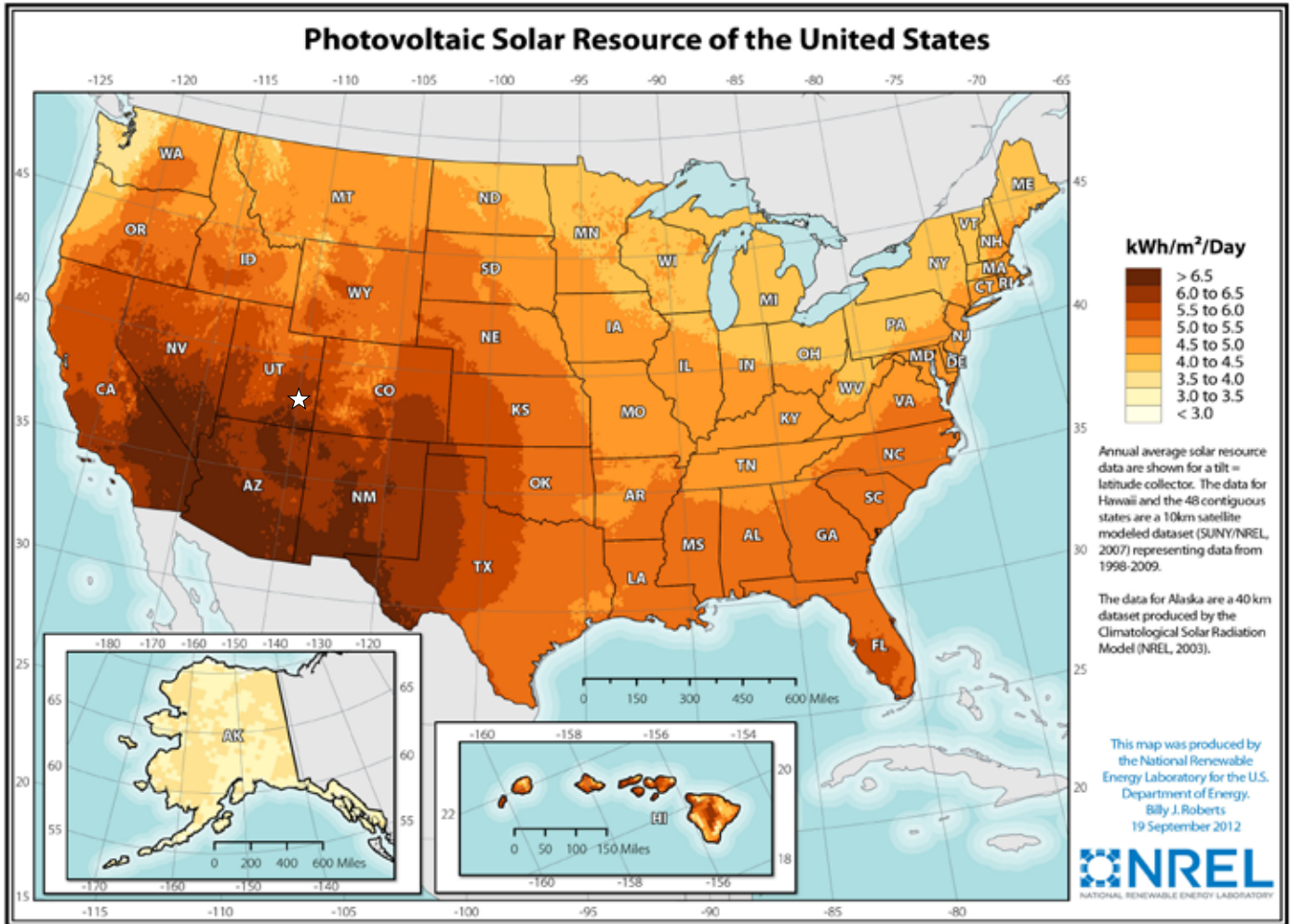
Weather, Climate, and Visibility

Canyonlands has an arid climate with precipitation averaging 8.56 inches annually. Park elevation varies between just under 4,000 feet at the level of the Colorado River below the Confluence to just over 6,000 feet at Island in the Sky.

Canyonlands is a Class I area under the Clean Air Act, which requires that the park receives the highest level of air-quality protection. Consequently, Canyonlands participates in the National Park Service's comprehensive air resources management program, designed to assess air pollution impacts and protect air quality related resources.



Average annual precipitation map of Utah. Star marks Canyonlands' approximate location. (www.nationalatlas.gov)



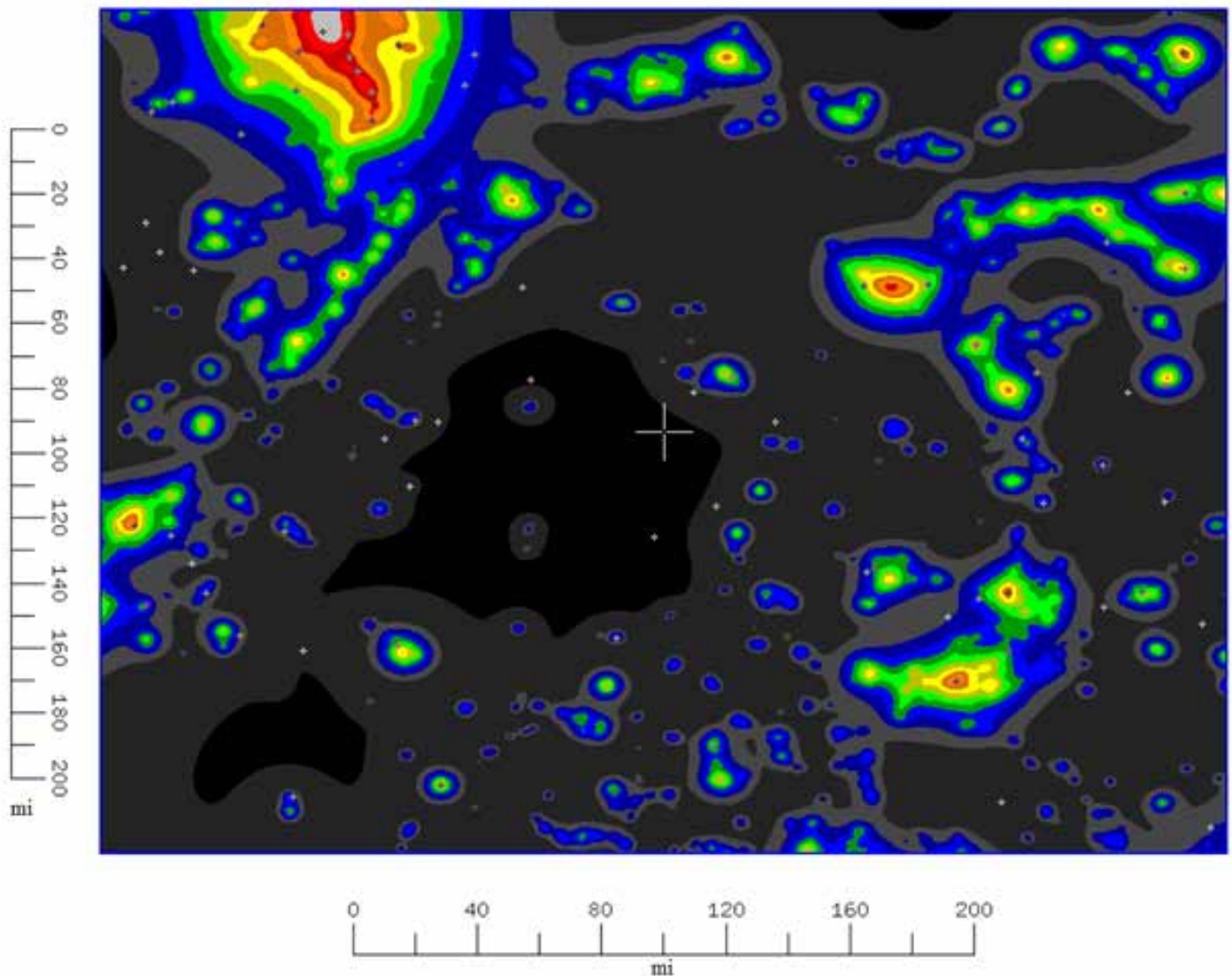
Map showing insolation received as a proxy for cloud-cover. Star marks Canyonlands' approximate location. Source: www.nrel.gov

Isolation from Light Pollution

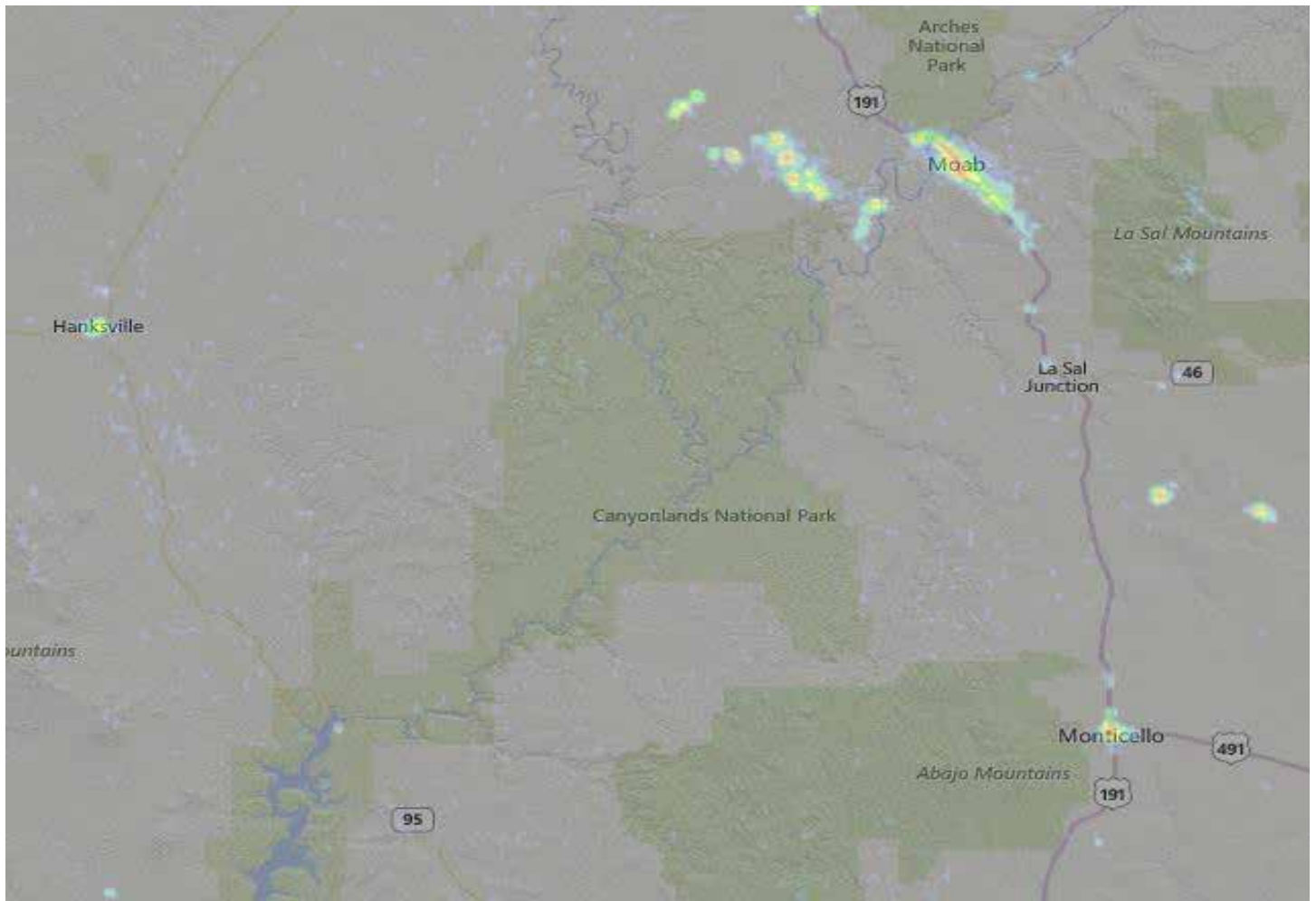
Light pollution limits the visibility of the Milky Way to the unaided eye, the visibility of nebulae and galaxies seen in telescopes, and raises the noise on CCD astrophotographs. Only the observation of planets and double stars is unaffected. Low light pollution conditions, or dark skies, are one of the most important properties of a good astronomical observing site.

This map is a small excerpt (362mi east-to-west, by 346mi north-to-south) from the Light Pollution Atlas 2006 by David Lorenz. David recalculated the The World Atlas of the Artificial Night Sky Brightness with newer data.

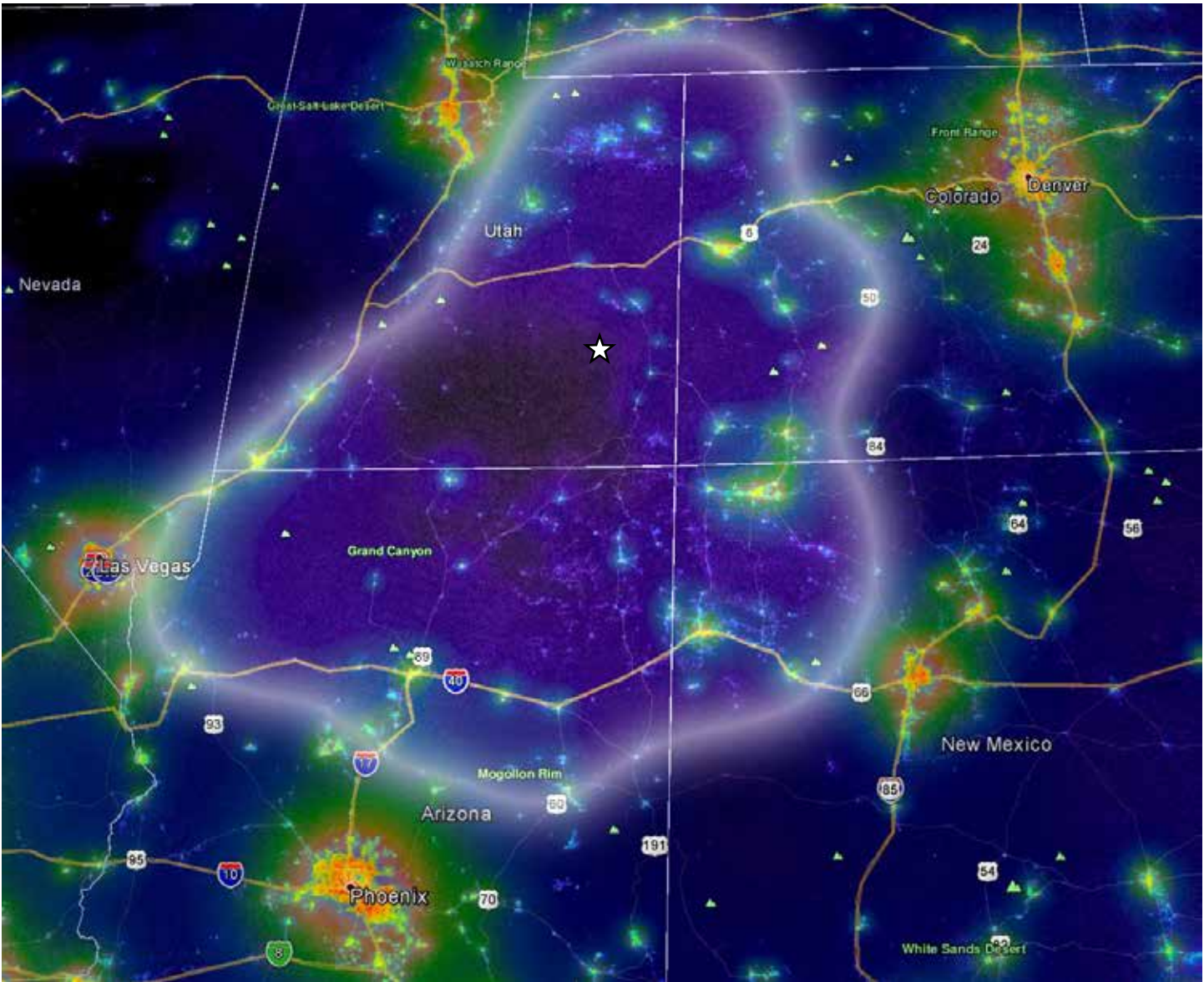
The central cross marks the location of the Canyonlands National Park clear sky chart. Tiny crosses mark other charts. This map assumes an observer at sea level. An observer at Canyonlands should see a slightly darker sky.















Source: ClearDarkSky.com

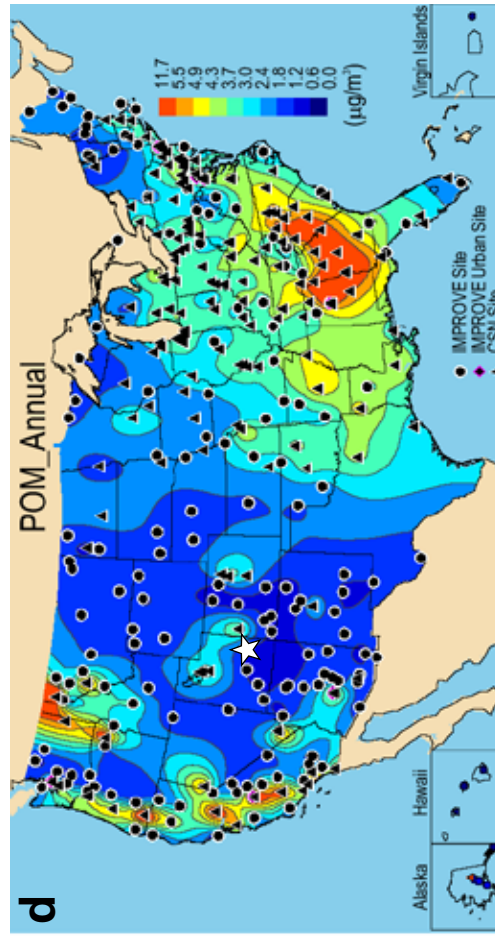
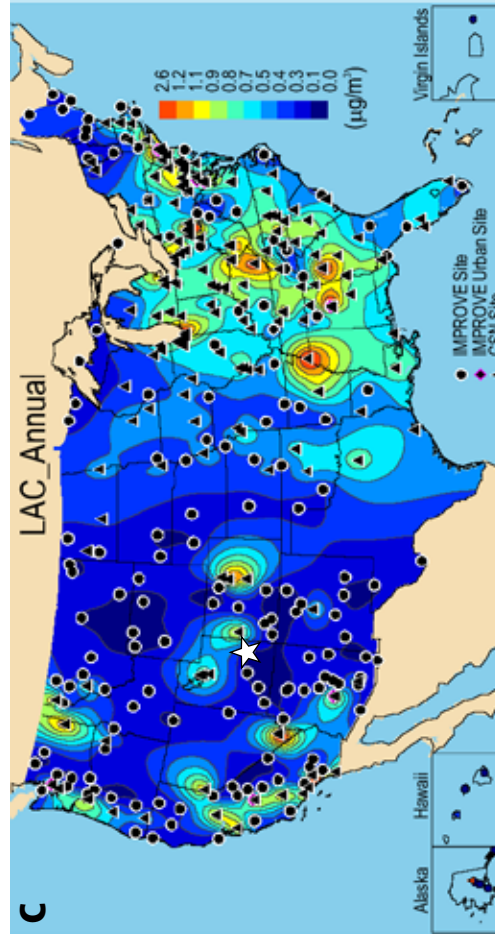
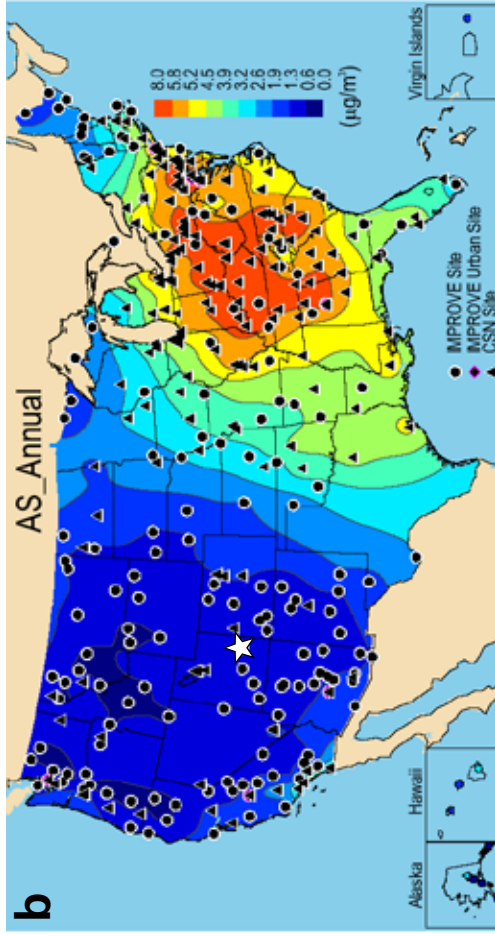
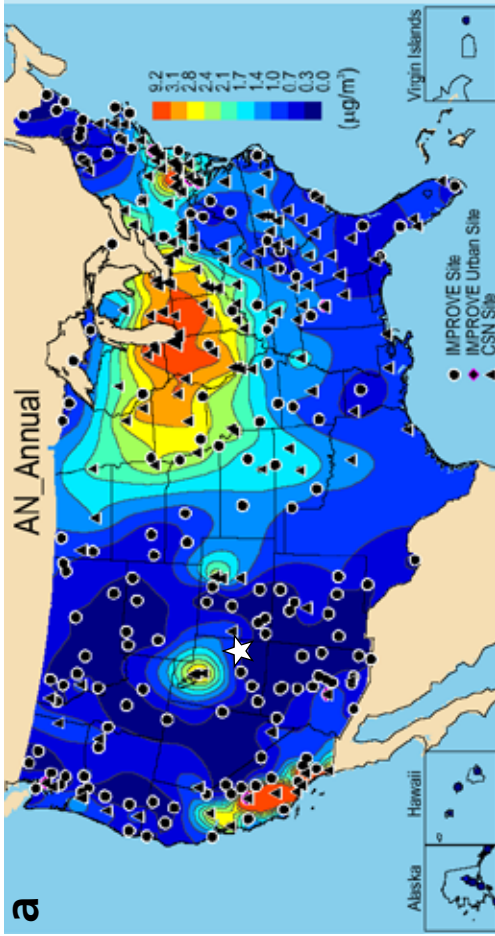


Light Pollution Map. Lights north of Canyonlands are the result of oil field and mining activity. (2014)
Source: www.lightpollutionmap.info



Outline of Colorado Plateau with light pollution sources. Star marks Canyonlands' approximate location. NPS Night Skies Team Anthropogenic Light Ratio Continental Model (2014)

Conditions at Zenith				Description (Descriptions are approximate. Your sky may vary.)
Color	Artificial / Natural Sky Brightness	Sky Brightness mags / sq arcsec V Band	Bortle Scale approx	
	< 0.01	22.00 to 21.99	1	Theoretically darkest sky limited by airglow and starlight
	0.01 to 0.06	21.99 to 21.93	2	Gegenschein visible. Zodiacal light annoyingly bright. Rising milkyway confuses some into thinking it's dawn. Limiting magnitude 7.6 to 8.0 for people with exceptional vision. Users of large dobsonian telescopes are very happy. [-ad]
	0.06 to 0.11	21.93 to 21.89	2	Faint shadows cast by milkyway visible on white objects. Clouds are black holes in the sky. No light domes. The milky way has faint extensions making it 50 degrees thick. Limiting magnitude 7.1 to 7.5. [-ad]
	0.11 to 0.19	21.89 to 21.81	3	
	0.19 to 0.33	21.81 to 21.69	3	The sky is crowded with stars, extending to the horizon in all directions. In the absence of haze the M.W. can be seen to the horizon. Clouds appear as black silhouettes against the sky. Stars look large and close. [- Richard Berry] Low light domes (10 to 15 degrees) on horizon. M33 easy with averted vision. M15 is naked eye. Milky way shows bulge into Ophiuchus. Limiting magnitude 6.6 to 7.0. [-ad]
	0.33 to 0.58	21.69 to 21.51	4	21.6: ... a glow in the direction of one or more cities is seen on the horizon. Clouds are bright near the city glow. [- Richard Berry]
	0.58 to 1.00	21.51 to 21.25	4	Zodiacal light seen on best nights. Milkyway shows much dark lane structure with beginnings of faint bulge into Ophiuchus. M33 difficult even when above 50 degrees. Limiting magnitude about 6.2 to 6.5. [-ad]
	1.00 to 1.73	21.25 to 20.91	4.5	21.1: The M.W. is brilliant overhead but cannot be seen near the horizon. Clouds have a greyish glow at the zenith and appear bright in the direction of one or more prominent city glows. [- Richard Berry] Some dark lanes in milkyway but no bulge into Ophiuchus. Washed out milkyway visible near horizon. Zodiacal light very rare. Light domes up to 45 degrees. Limiting magnitude about 5.9 to 6.2. [-ad]
	1.73 to 3.00	20.91 to 20.49	4.5	
	3.00 to 5.20	20.49 to 20.02	5	20.4: To a city dweller the M.W. is magnificent, but contrast is markedly reduced, and delicate detail is lost. Limiting magnitude is noticeably reduced. Clouds are bright against the zenith sky. Stars no longer appear large and near. [- Richard Berry] Milkyway washed out at zenith and invisible at horizon. Many light domes. Clouds are brighter than sky. M31 easily visible. Limiting magnitude about 5.6 to 5.9. [-ad]
	5.20 to 9.00	20.02 to 19.50	5	
	9.00 to 15.59	19.50 to 18.95	6	19.5: M.W. is marginally visible, and only near the zenith. Sky is bright and discoloured near the horizon in the direction of cities. The sky looks dull grey. [- Richard Berry] Milkyway at best very faint at zenith. M31 difficult and indistinct. Sky is grey up to 35 degrees. Limiting magnitude 5.0 to 5.5. [-ad]



Contour maps of various constituents of air pollution that impact visual clarity of the atmosphere. (a) Ammonium Nitrate, (b) Ammonium Sulphate, (c) Light absorbing carbon, (d) Particulate Organic Matter. Data provided by the Interagency Monitoring of Protected Visual Environments (IMPROVE) network. Annual mean mass concentrations for measurements taken between 2005-2008 ($\mu\text{g m}^{-3}$). Adapted from Hand, et. al 2011. Star marks Canyonlands' approximate location.

Canyonlands National Park is isolated from cities and towns of any significant size. The park and its immediate environs produce very little light pollution of their own, with only minimal measurable amounts from certain parts of the park.

Populated Places

Place	Population (2010)	Distance (km)	Azimuth
Moab city	5,046	39.7	42
Grand Junction city	58,566	141.2	52
Provo city	112,488	264.3	325
Colorado Springs city	416,427	447.0	80
Salt Lake City city	186,440	326.7	328
Clifton CDP	19,889	148.1	54
Orem city	88,328	271.8	325
West Valley City city	129,480	322.3	326
West Jordan city	103,712	314.1	325
Fruita city	12,646	135.7	46
Farmington city	45,877	227.5	139
Blanding city	3,375	82.1	158
Monticello city	1,972	66.6	138
Sandy city	87,461	304.0	326
Montrose city	19,132	174.9	84
Spanish Valley CDP	491	42.2	64
Redlands CDP	8,685	135.2	50

Population data from NPS Dark Skies Team.

Assessment of Sky Quality at Canyonlands

Sky quality data were collected at Canyonlands by the National Park Service Night Skies Team. They provided the following explanations and data:

Introduction and Methods

The U.S. National Park Service Night Skies Program routinely collects calibrated high resolution night sky brightness measurements over the entire hemisphere of the sky using a wide-field CCD camera and optics approximating the Johnson-Cousins V photometric band (Duriscoe, Luginbuhl, and Moore, 2007). In addition, a model of the natural sky brightness for a given location, date, and time of observation, estimated airglow brightness at the zenith, and atmospheric extinction coefficient is constructed in order to estimate the anthropogenic component of sky brightness (Duriscoe, 2013). A single data set is comprised of 45 square format images obtained over a period of about 20 minutes using a portable robotic telescope mount. The images are mosaicked into an all-sky map of sky brightness. Calibration in the V photometric band is accomplished by automated all-sky aperture photometry of selected standard stars observed on every data set. In this manner both the instrument zero-point and the atmospheric extinction coefficient are determined. The original resolution of the mosaics is about 34 million pixels/hemisphere. These are resampled to 0.05 degrees per pixel (8.25 million pixels/hemisphere) after the stellar photometry is performed and the sky background brightness is extracted by median filtering for analysis. A mosaic of the modeled natural sky brightness is produced matching the time of observation of each individual data frame. After subtraction of the model from the data mosaic, the result yields an estimate of the anthropogenic light (the sky glow mosaic).

This equipment and data reduction technique were utilized at Canyonlands National Park on May 25th, 2011. The results are presented herein in the form of false-color all-sky maps of sky brightness and tables of sky brightness summary statistics derived from the mosaics. The anthropogenic sources are identified and discussed. Dates and times are given in Local Mean Time (LMT).

The instruments are calibrated in V-magnitudes, but may be converted to units of luminance using the relation published by Garstang (1986, Eq. 19). This yields linear units of nano-Lamberts. The luminous emittance of each pixel in milli-lux may be computed given its luminance and solid angle. If the mosaics are analyzed in an equal-area projection, the relative contribution of each area of the sky will be the same. This is important in computing illuminance from the entire sky. We propose the following all-sky statistics as a means of quantifying visual sky quality: 1) zenith luminance, 2) average luminance, 3) horizontal illuminance, 4) maximum vertical illuminance. These statistics are derived for both the sky brightness data mosaic (including natural sources) and the sky glow mosaic (including only anthropogenic sources).

Each of the four indicators described above may also be expressed at a ratio to natural reference conditions. We propose the following values as the median reference condition over the sunspot cycle: 1) zenith luminance 172 ucd/m², 2) average all-sky luminance 248 ucd/m², 3) horizontal illuminance 0.80 mLux, and 4) vertical illuminance 0.40 mLux,. Data presented as a light pollution ratio (LPR) are the ratio of the sky glow mosaic value to these values.

NPS NIGHT SKIES PROGRAM DATA NIGHT REPORT

CANY110625

Canyonlands NP

Grandview Point

25-Jun-11



Data Night Attributes

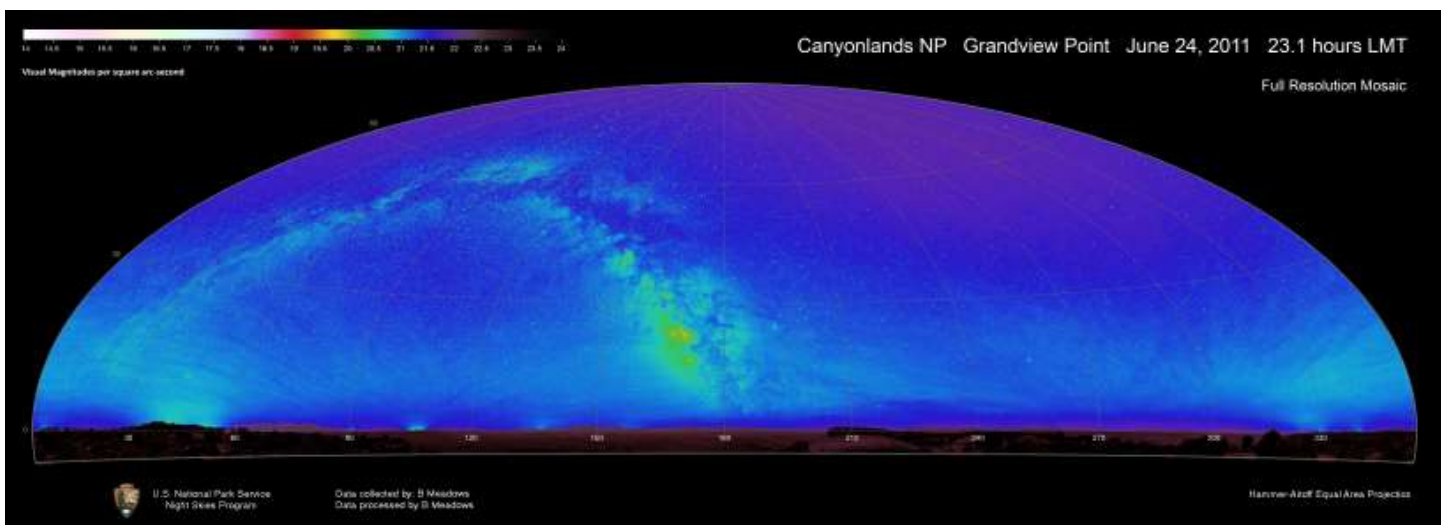
Longitude:	-109.85822	Camera:	IMG 1	Air temp. (C):	26.8	ZLM:	6.90	OBS_1:	B Meadows
Latitude:	38.31041	# of sets:	2	R. H. (%):	7.5	BORTLE:	3	OBS_2:	
Elevation (m):	1907	Exposure (secs):	14	Wind Speed (mph):	5	SQM:	21.63	OBS_3:	

NARRATIVE: Set up on benchmark approximately 440' SW of restrooms at Grandview Point. Lots of haze along the horizon from very strong winds all day and into the evening. Light dome from Moab is visible as is a small number of lights from La Sal Junction or La Sal. There were numerous vehicle headlights visible on the Needles Overlook Road until at least 1:00 am. I also saw some fairly bright light glow from an area south of La Sal (possibly a mining or oil drilling operation). Visibility before sunset fair for this location. The Henry Mountains and Aquarius Plateau were seen, but were not completely clear. Even the nearby La Sal Mountains were slightly obscured by haze from the dust in the air. After sunset, the air turbulence settled down and visibility improved. Natural airglow was moderate and the Milky Way was not at its full brightness. The view to the south and southeast along the horizon remained impaired by haze throughout the night. Temperatures remained warm (nighttime low in the 70's) and winds were constant through the night. The high temp in Moab was predicted to be 105.

Data Set Attributes

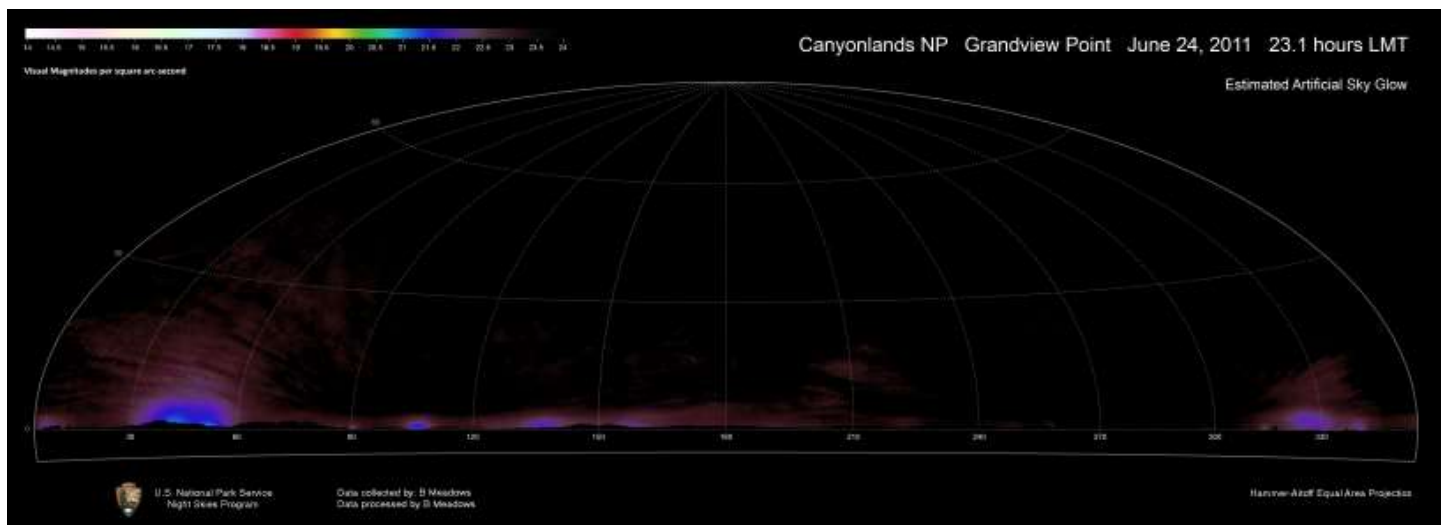
Data Set	Quality Flags				Natural Sky Model			Extinction				Collection Properties			
	Use-able	Col-lection	Pro-cessing	Atmo-sphere:	Zenith airglow ($\mu\text{cd}/\text{m}^2$)	Fit quality	Natural sky model fit notes	Ext. coeff. (mag/airmass)	Std err Y	# stars used	# stars reject	% Clouds	Ave. Point Error	Max Point Error	total bias drift
1	Y	4	4	4	95			0.191	0.04	74	3	0	0.43	0.66	13.4
2	Y	4	4	4	95			0.176	0.04	80	3	0	0.43	0.67	8.0

Shows the data collected on June 24-25, 2011.



PHOTOMETRY OF ALL SOURCES

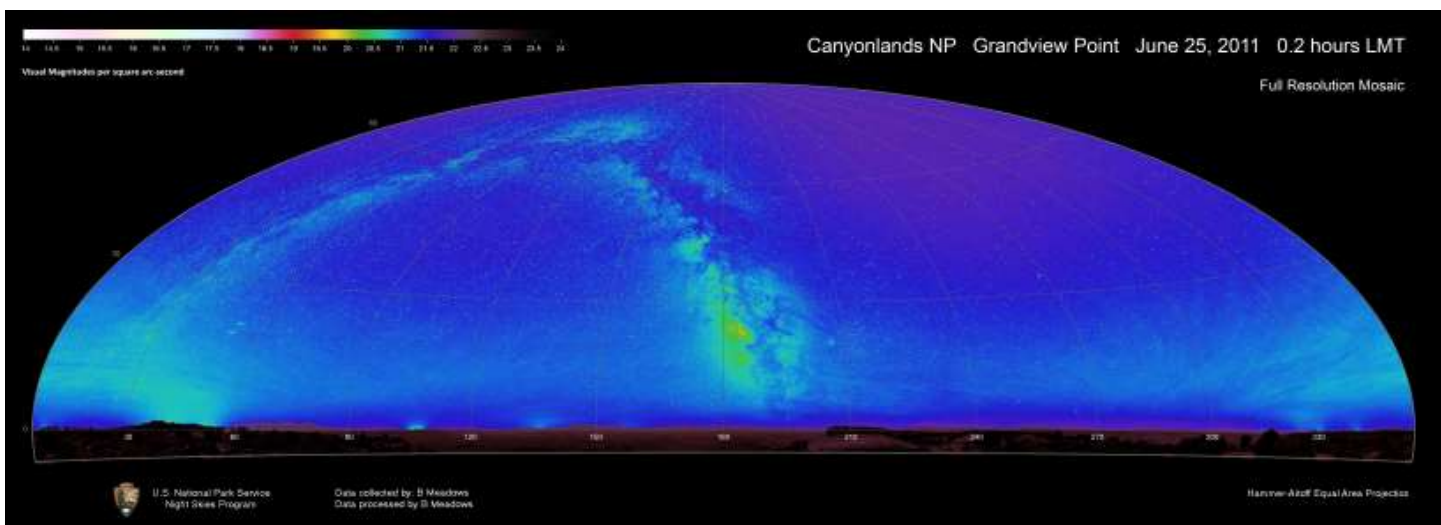
Average Sky Luminance (mag arcsec ⁻²)	Average Sky Luminance (μcd/m ²)	Zenith Luminance (mag arcsec ⁻²)	Zenith Luminance (μcd/m ²)	Brightest luminance (mag arcsec ⁻²)	Brightest luminance	Synthetic SQM (mag arcsec ⁻²)	Total luminous emittance (mags)	Illuminance (mlux) Horizontal	Max Vert
21.36	309	21.90	188	19.90	1,188	21.58	-7.21	0.879	0.553



PHOTOMETRY OF ARTIFICIAL SKYGLOW

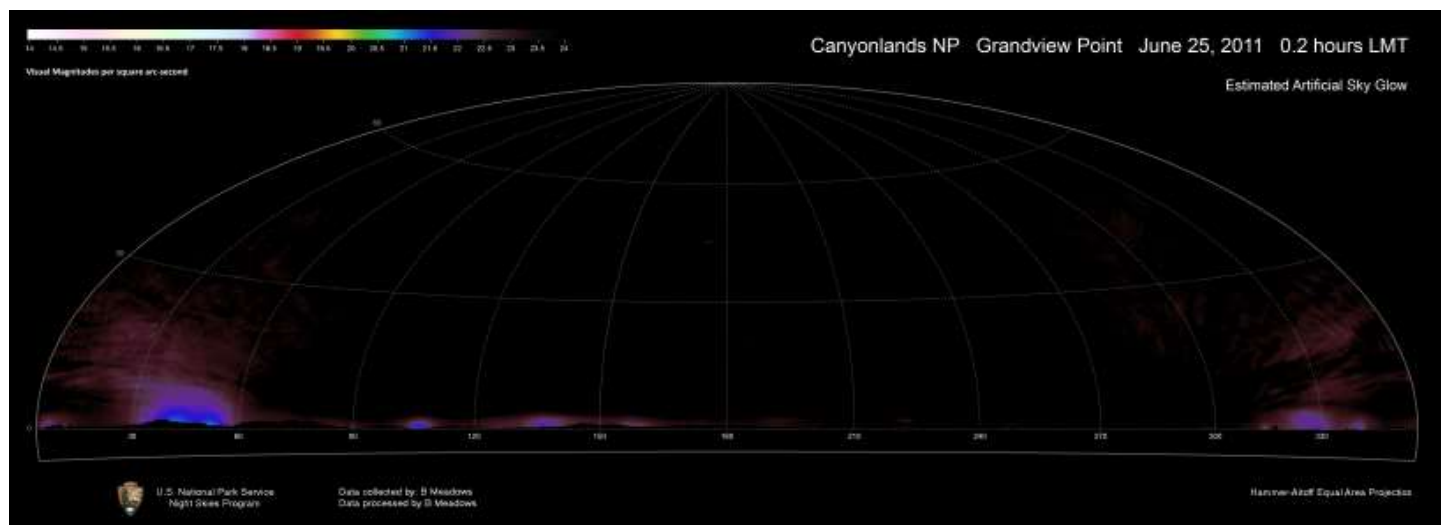
Sky Quality Index (SQI)	Average Sky Luminance (μcd/m ²)	Average Sky Luminance to zenith angle 80°	Average Sky Luminance to zenith angle 70°	Zenith Luminance	Brightest luminance (μcd/m ²)	All-sky light pollution ratio (ALR)	Total luminous emittance (mags)	Illuminance (mlux) Horizontal	Max Vert
97.2	19	14.1	12.5	7	416	0.07	-4.14	0.041	0.051

NST Data from June 24, 2011
 Top shows false color of all light detected. Bottom shows only anthropogenic light.



PHOTOMETRY OF ALL SOURCES

Average Sky Luminance (mag arcsec ⁻²)	Average Sky Luminance (μcd/m ²)	Zenith Luminance (mag arcsec ⁻²)	Zenith Luminance (μcd/m ²)	Brightest luminance (mag arcsec ⁻²)	Brightest luminance	Synthetic SQM (mag arcsec ⁻²)	Total luminous emittance (mags)	Illuminance (mLux) Horizontal	Max Vert
21.37	308	21.76	214	19.90	1,185	21.55	-7.21	0.887	0.541



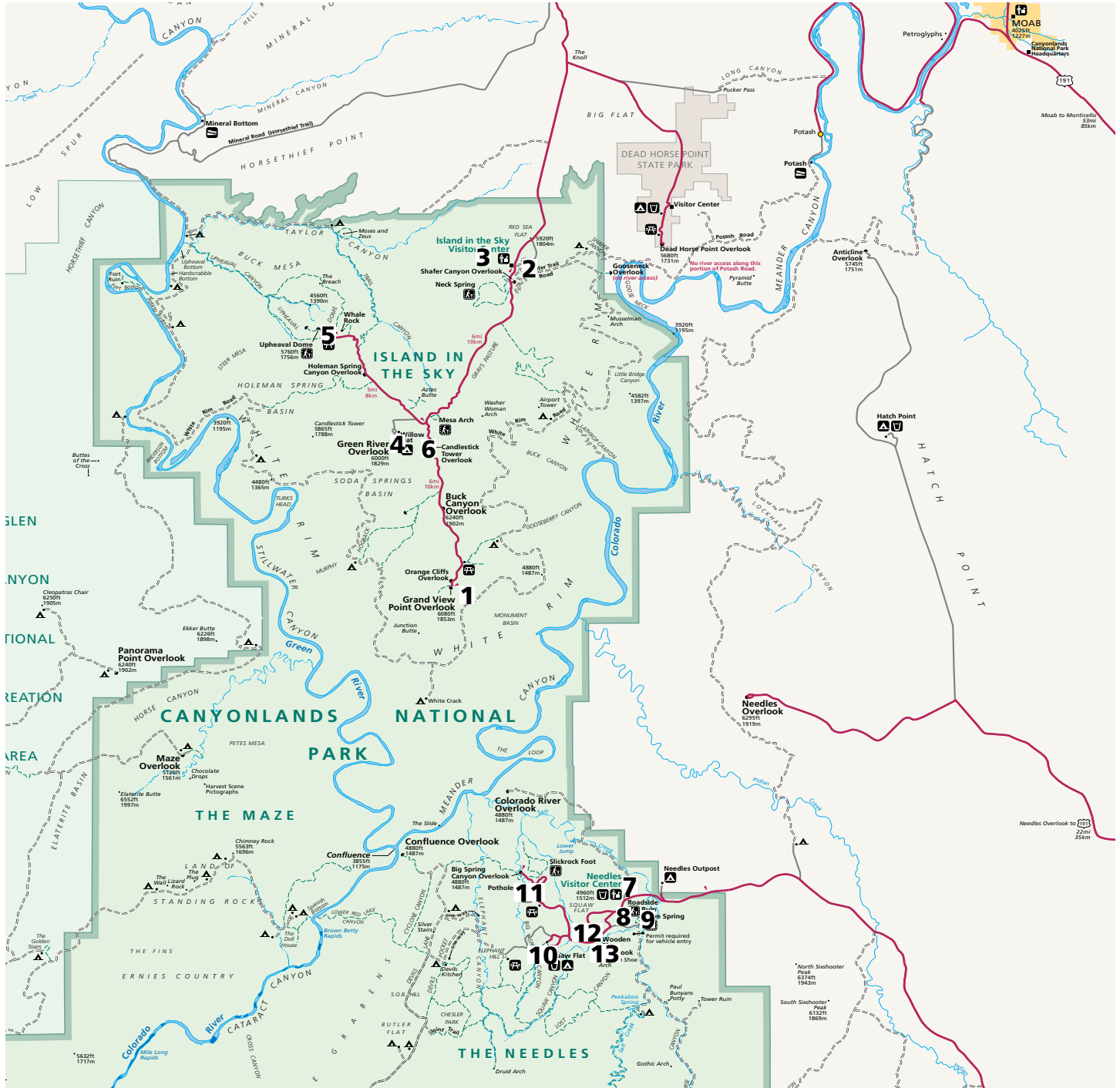
PHOTOMETRY OF ARTIFICIAL SKYGLOW

Sky Quality Index (SQI)	Average Sky Luminance (μcd/m ²)	Average Sky Luminance to zenith angle 80°	Average Sky Luminance to zenith angle 70°	Zenith Luminance	Brightest luminance (μcd/m ²)	All-sky light pollution ratio (ALR)	Total luminous emittance (mags)	Illuminance (mLux) Horizontal	Max Vert
97.6	11	8.4	7.7	7	436	0.04	-3.56	0.024	0.053

NST Data from June 25, 2011
 Top shows false color of all light detected. Bottom shows only anthropogenic light.

Further Dark Sky Measurements

Additional measurements of Canyonlands' dark skies were taken at the Island in the Sky and Needles districts of the park. A Unihedron Sky Quality Meter was used to take measurements at 13 locations around the park, ranging from the areas with the most light pollution influence from local communities, to those facing essential wilderness.



- | | | | |
|----------------------------|--------------------------------|----------------------------|--------------------------------|
| 1 - Grand View Point | 2 - ISKY Visitor Center | 3 - ISKY Housing | 4 - Green River Overlook |
| 5 - Upheaval Dome Overlook | 6 - Candlestick Tower Overlook | 7 - Needles Visitor Center | 8 - Needles Housing |
| 9 - Cave Spring Trailhead | 10 - Squaw Flat Campground | 11 - Pothole Point | 12 - Wooden Shoe Arch Overlook |
| 13 - Wooden Shoe Campsite | | | |

Island in the Sky

Location	Date	SQM (Zenith)
1 - Grand View Point	1/21/15	21.86
2 - ISKY Visitor Center	12/2/14	21.94
3 - ISKY Housing	1/21/15	21.78
4 - Green River Overlook	12/2/14	21.95
5 - Upheaval Dome Overlook	1/21/15	21.81
6 - Candlestick Tower Overlook	12/2/14	21.68

The Needles

Location	Date	SQM (Zenith)
7 - Needles Visitor Center	2/18/15	21.69
8 - Needles Housing	12/14/14	21.95
9 - Cave Spring Trailhead	2/18/15	21.77
10 - Squaw Flat Campground	2/18/15	22.02
11 - Pothole Point	2/18/15	21.93
12 - Wooden Shoe Arch Overlook	12/14/14	21.80
13 - Wooden Shoe Group Campsite	12/14/14	21.87

Average SQM (Zenith) for Canyonlands National Park: 21.85

As stated, the main sources of light pollution in Canyonlands are the surrounding towns of Green River, Moab, and Monticello. Night sky quality is also impacted by the development of oil rigs on Bureau of Land Management land located outside the park (seen below), however the Colorado Plateau Dark Sky Cooperative and our resource management team is optimistic about current progress with the BLM regarding energy development lighting mitigations.



Lights on the horizon from oil development outside of Island in the Sky. (Dec 2014)
NPS Photo/Cadence C. Cook

Long Term Monitoring

Management and staff of Canyonlands are committed to collecting long-term sky quality measurements and photo documentation.

NPS staff have purchased one basic Unihedron Sky Quality Meter at Island in the Sky to be shared among the districts, and has created a data collection form to support long-term collection. Staff will collect data at each of the 13 collection sites at minimum once per year and will collect additional measurements as weather and sky conditions allow. We will purchase additional Unihedron Sky Quality Meters as funding allows.

The park will also collect photo data once per year from several locations. This will provide tangible data to interpret. Locations will focus on potential threats and open sky.

Visitor Experience

Night Sky Interpretation at Canyonlands National Park

The solitude, remoteness, and arid landscapes of Canyonlands National Park make it an ideal place for stargazers, amateur astronomers, and astrophotographers. Canyonlands is dedicated to enhancing these experiences for visitors, using interpretation and public education to increase awareness and heighten visitor connection to the night sky. Interpretive staff at Canyonlands receives night sky training, and has partnered with a local state park as well as the Canyonlands Natural History Association to help promote dark sky awareness. Canyonlands National Park is accessible throughout the night, allowing unhindered access for stargazers.

Night sky interpretation at the Island in the Sky District of Canyonlands includes:

- Monthly star programs during the new moon where an interpretive talk, constellation tour, and telescope viewing connect visitors to this valuable resource.
- Programs are produced in collaboration with Dead Horse Point State Park, and alternate between Island in the Sky and the nearby state park.
- Interpretive talks and sunscope viewings during the two solar eclipses of 2014 and the Transit of Venus in 2012.
- A poster displayed in the campground discussing dark skies and the prevention of light pollution.

At the Needles District of the park, night sky interpretation includes:

- Star programs held three times a month, with constellation tours and telescope viewing.
- Full moon programs, with special programming based around the two lunar eclipses of 2014.
- Interpretive talks and solar eclipse viewings.

The park also reaches out to its Junior Rangers to educate about night sky values and light pollution. The Canyonlands Junior Ranger book features a full page about astronomy, with text about preserving night skies through turning out lights. The park also offers a Night Sky Ranger booklet, which covers astronomy, the basics of light pollution, and appreciating the values of the night sky.



Local participation in dark sky education

Monticello, a gateway community located to the south of the Needles District, is currently considering a dark sky lighting ordinance. In addition to this move towards public understanding of light pollution, the Four Corners School of Outdoor Education held a series of 6 astronomy events this year from April to October. The events were free to the public and consisted of interpretive talks followed by guided telescope viewing time. Telescopes were provided by Four Corners School, local and Colorado Plateau astronomy volunteers, and volunteering NPS staff from the Needles District of Canyonlands. We

believe that strong community interest in the value of dark skies, and importance of controlling light pollution will grow with the designation of Canyonlands as a Dark Sky Park.



Canyonlands National Park is supported by Canyonlands National History Association (CNHA) and has partnered with Dead Horse Point State Park to encourage the recognition of night skies as a valuable resource. The funds from CNHA bookstores help Canyonlands with interpretive projects, including the

purchase of three telescopes. Dead Horse State Park is also beginning their application for Dark Sky Park status, and will continue to be a valuable partner in raising local awareness of light pollution and natural night skies.

In addition to night skies support from CNHA, Canyonlands and nearby Arches National Park (managed by the same Southeast Utah Group) have partnered with the Friends of Arches and Canyonlands group to host community star parties in the Moab area. The Friends group continues to support night skies education and conservation efforts in Canyonlands.

Canyonlands participated in the 2014 Moab Electric Light Holiday Parade, constructing a float that highlighted iconic Southeast Utah landscapes illuminated by the Milky Way. As the winner of the previous year's float contest, Canyonlands selected 'Starry, Starry Night' as the 2014 parade theme. Canyonlands has a strong devotion to the night sky, and fully expects night sky interpretation to be maintained and grow into the future.



Moab Electric Light Holiday Parade float. (Dec 2014)
NPS Photo/Sabrina Henry

Web Presence

A page on Canyonlands website details the importance of night skies to the park.

The text reads as follows:

“Many wonders await visitors in Canyonlands, from the natural beauty of the red rock formations to the remains of prehistoric cultures. Archeologists think that the sun, moon and stars were significant to these cultures since these subjects are frequently represented in pottery designs, rock art images and even the alignment of buildings. Can you imagine the awe and mystery felt by prehistoric people as they gazed upon the night sky? That same sky is still available to us today, and is one of Canyonlands’

most spectacular features.

“National parks preserve some of the darkest skies in the country. In some areas, it’s possible to see up to 15,000 stars throughout the night. By contrast, fewer than 500 stars may be visible from more urban environments. To find the darkest parks and document the widespread effects of light pollution, the National Park Service created the Night Sky Team.

“What many people don’t realize is that light pollution affects more than just astronomers. Nocturnal animals need darkness for survival, and the circadian rhythms of humans and plants rely on an unaltered night sky. The Night Sky Team is laying the groundwork to protect and restore these dark places, ensuring our ability to connect with ancient sky watchers through the starry night and to contemplate our own place within the universe.

“Though light pollution is created by a multitude of lights, this problem can be resolved one light at a time. When an outdoor light burns out, consider it an opportunity to install a lower intensity bulb or replace the fixture with one that is more night-friendly. Shielding that directs light downward produces less glare and improves security. As long as people still care about the night sky, we can make a difference.”

Canyonlands also has a strong social media presence with almost 150,000 followers on Facebook. Posts often feature night sky photographs and will highlight dark conservation and education.

In March 2015, in partnership with the NPS Natural Sounds and Night Skies Division, Colorado State University, and the Colorado Plateau Dark Sky Cooperative, Canyonlands released a short educational video featuring the clear air and dark skies of the Colorado Plateau. In this video, we hear from rangers, park managers, and park scientists to learn more about the way our viewsheds and night skies are being impacted and what we can do to protect them.



Celebrate the Night Sky

At Canyonlands

Learn about the constellations and take a celestial tour through our telescope.

Where: Needles Visitor Center

When: Tuesday, October 21st , Saturday, October 25th,
and Sunday October 26th at 8:00 p.m.

Bring: Something warm to wear
Lawn chair or blanket to sit on
Small flashlight with red filter
A sense of wonder

Information: (435) 259-4711

Poster advertising astronomy programs at the Needles.

CELEBRATE THE STARS

Join rangers from Dead Horse Point State Park and Canyonlands National Park as we explore our night skies. A short interpretive program will be followed by telescope viewing. Programs will take place in good weather or bad. Bring a chair, a red flashlight (if you have one), and warm clothes.

March 29 -- Dead Horse Point Visitor Center, 7:30 pm

April 26 -- Island in the Sky Visitor Center, 8:30 pm

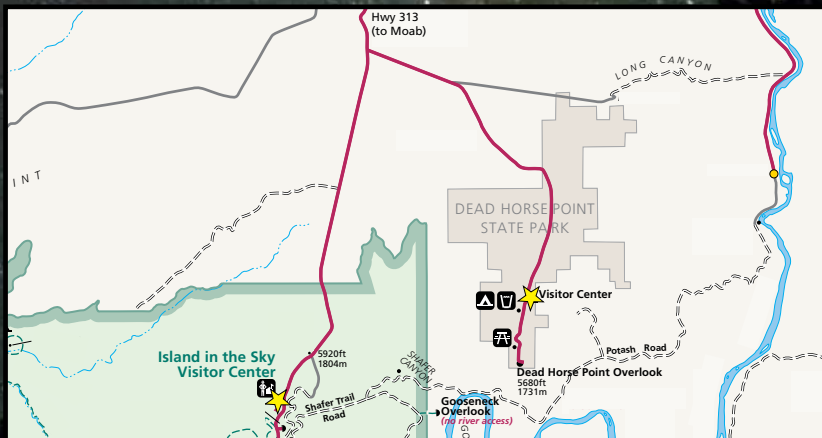
May 31 -- Dead Horse Point Visitor Center, 9 pm

August 23 -- Island in the Sky Visitor Center, 8:30 pm

September 27 -- Dead Horse Point Visitor Center, 7:30 pm

October 25 -- Island in the Sky Visitor Center, 7 pm

We look forward to seeing you!



Poster advertising astronomy programs at the Island in the Sky and Dead Horse Point State Park.



The night sky at Canyonlands National Park has intrigued and inspired people for centuries. By preserving darkness, we can protect our connection to the past and allow future generations to appreciate its beauty.



In the past, stars were more than beauty. The ancestral Puebloan people who lived here long ago used the stars and moon to predict crop cycles, prepare for changing seasons, and for ceremonial purposes. Images on rocks track star motion and record special celestial events. Even now, we share the night sky with these ancient people through their images.



Today, two-thirds of Americans cannot see the Milky Way from their backyard. The light from our homes and cities destroys darkness and our children see fewer stars than our parents did. The night sky over Canyonlands is nearly pristine, but even here you see the lights of Moab, Monticello, Green River, and Blanding. As light pollution continues to spread, places like this will become even more precious.



Everyone can help. By making simple changes in our daily lives, we can restore and protect our night sky. One example of a light pollution solution is to shield outside light fixtures. This easy step directs light toward the ground where we need it and away from the night sky. Remember, we have the power to forever preserve this magnificent display of our natural world. Together, we can rediscover and protect the stars for generations to come.



This month's star map:



For more information, visit the International Dark Sky Association's website: www.darksky.org.

Poster on display at the Island in the Sky campground.



Sample Facebook post.

2 Park Lighting Inventory



Cave Spring Road, Needles District
NPS Photo/Cadence C. Cook







Overview

Canyonlands National Park has actively worked to protect the natural nighttime environment. To this end, the districts of the park have artificial light only where deemed necessary for safety. Artificial lighting exists at a minimum level. Decisions on lighting will continue to be made by considering many factors and utilizing the appropriate amount of light necessary. The vast majority of the park contains no artificial lighting and includes all areas where there is a visitor expectation for darkness, such as at campgrounds, trails, and wilderness-managed areas. In all districts of the park, lighting exists only as minimally necessary for safety, and does not exist beyond visitor centers, fee stations, residential buildings, and one amphitheater pathway.







This lighting inventory is a result of inventory efforts by the NPS Night Skies Team and Canyonlands staff from 2008-2015. Any fixtures not conforming to the Lighting Management Plan are scheduled to be replaced as described in 2015-2017. The lighting inventory is organized by districts within the park.

Canyonlands Total Lights	Compliance with LMP	Non-Compliance with LMP
113	104 (92%)	9 (8%)

Needles District Lighting Inventory

Location	Fixture	Fully-shielded	Photo	Application	Conformity with LMP
Maintenance Generator Building-side	2 Fixed Flood H n/a W	Partial		Area Security	No; retrofit planned
Maintenance Generator Building-over front doors	2 Gardco 111 Quad Tube Fluor PL3 26 W Photocell	Yes		Building Egress	Yes
Maintenance Building	4 Wall Other Lamp Type: HPS Medium Edison 50 W Photocell	Yes		Building Egress	Yes
	3 Gardco Quad Tube Fluor PL3 26 W Photocell	Yes		Building Egress	Yes
Housing	Gardco 111 Quad Tube Fuor PL3 26 W	Yes		Building Egress	Yes
	12 Gardco 111-INC CFL Amber 13 W	Yes		Building Egress	Yes

Needles District Lighting Inventory (cont.)

	38 Gardco 111-INC CFL Amber 13 W	Yes		Building Egress	Yes
Amphitheater Pathway	None currently, but 11 planned amber LEDs, downward facing.	Yes	N/A	Pathway Illumination	Yes
Visitor Center Building	Canopy shielded CFL Amber Medium Edison 15 W	Yes		Building Egress	Yes
	2 Canopy shielded CFL Amber Medium Edison 15 W	Yes		Area Security-entry lighting	Yes
Visitor Center Building	Gardco 111 Quad Tube Fluor PL3 26 W	Yes		Building Egress-security side door light	Yes
Fee station	1 Yellow	None		Automobile Safety	Yes
Fee Station	1 Solid Red	None		Automobile Safety	Yes



Needles Visitor Center



Needles Maintenance and SAR Areas



Needles Residential Area





Additional Information about Needles District Outdoor Nighttime Lighting

Lighting in the Needles exists in three places: the visitor center, residential area, and maintenance/SAR buildings. All lights in the district are shielded or partially shielded, and the housing area and visitor center have had recent lighting retrofits. All of the houses are also equipped with dark blinds, to further protect from light spill, and contain notices about the importance of a natural night sky. The lighting to the amphitheater in the park is currently being re-done with low energy amber LEDs. This lighting operates on a switch, and is used only before and after evening interpretive programs. The fee station uses only a low energy red light on entrance. The visitor center currently has a back light that is non-conforming to best lighting practices, but discussions with maintenance resulted in a plan to retrofit the fixture while maintaining safety standards. All outside lights are on a timer at the visitor center, and lights over the bulletin board are turned off during astronomy programs. The maintenance and SAR buildings have downward facing shielded lights that are on photocells, and have motion sensors. There is a plan in the works for a new PV building, but it would be equipped as the maintenance buildings, with one shielded light. The maintenance staff in the Needles are dedicated to preserving night skies and using best management practices.

Island in the Sky District Lighting Inventory

Location	Fixture	Fully-shielded	Photograph	Application	Conformity with LMP
Maintenance Building	2 Wall Unshielded Lamp Type: I Medium Edison 11x2=200 W Motion sensors operate when dark, Point downward.	Partial		Area Security + Building Egress	No; retrofit planned
Maintenance Building	Shielded	Yes		Building Egress	Yes
Housing	2 DSS (Silver) CFL Amber 13 W	Yes		Resident Porch Lights	Yes
SAR Cache	4 Wall Other I 100x2=200 Switch Operated	Partial; now pointed directly downward		Area Security + Building Egress	Yes
Housing	2 DSS (Silver) CFL Amber 13 W	Yes		Back Porch Light	Yes





Island in the Sky District Lighting Inventory (cont.)

Housing Area-Residence 5B 10A	Canopy Recessed Medium Edison	Partial		Building Egress	Yes
Housing Area-Residence 5B-10A	2 DSS (Silver) Wall CFL Amber 13 W	Full		Building Egress	Yes
Housing Area-Residence 5B-10B	Canopy Recessed Medium Edison 40 W	Partial		Building Egress	Yes
Housing Area-Residence 5B-11A	2 Canopy Recessed Medium Edison 40 W	Partial		Building Egress	Yes
Housing Area-Residence 5B-11A	2 DSS (Silver) CFL Amber 13 W	Full		Building Egress	Yes
Housing Area-Laundry, Gym	1 Wall Unshielded Medium Edison 40 W	None, retrofit planned: will add shield.	Not Available	Building Egress	No; retrofit planned

Island in the Sky District Lighting Inventory (cont.)

Housing Area- Laundry, Gym	1 Shielded CFL Amber 13W	Full		Building Egress	Yes
Housing Area- Residence 5B-12 A	3 DSS (Silver) CFL Amber 13 W	Yes		Building Egress	Yes
Housing Area- Residence 5B-12A	Canopy Recessed I Medium Edison 40 W	Yes		Building Egress	Yes
Housing Area- Residence 5B-12B, 12C	2 Canopy Recessed H Medium Edison	Yes		Building Egress	Yes
Housing Area- Residence 5B-12B, 12C	2 DSS (Silver) CFL Amber 13 W	Yes		Building Egress	Yes
Housing Area- Residence 5B-13A	2 Canopy Recessed I Medium Edison	Partial		Building Egress	Yes

Island in the Sky District Lighting Inventory (cont.)

<p>Housing Area-Residence 5B-13B</p>	<p>2 DSS (Silver) CFL Amber 13 W</p>	<p>Full</p>		<p>Building Egress</p>	<p>Yes</p>
<p>Housing Area-Residence 5B-14</p>	<p>2 DSS (Silver) CFL Amber 13 W</p>	<p>Full</p>		<p>Building Egress</p>	<p>Yes</p>
<p>Visitor Center Building (front patio)</p>	<p>2 Canopy Recessed CFL 13 W</p>	<p>Partial</p>		<p>Safety, Info Board light</p>	<p>Yes</p>
<p>Entrance Station</p>	<p>4 Wall Other 100x2=200 Switch Operated</p>	<p>Partial; now pointed directly downward</p>		<p>Automobile Safety</p>	<p>Yes</p>






Additional Information about Island in the Sky District Outdoor Nighttime Lighting

Island in the Sky has four lit areas: the visitor center, housing and SAR area, maintenance, and fee booth. The visitor center has two lights out front that are operated by switch. They are turned on during the night, and allow visitors to identify the visitor center and read safety and park information. Although the visitor center structure has additional lighting mounts, these are the only two with bulbs that are operated.


The maintenance area has one lit building. The building has two sets of front egress lights, both of which are operated by motion sensors after dark. There is an additional shielded light in back, which is low wattage and amber.

The housing area has two duplexes, three apartments, two independent houses, and a trailer. The duplexes each have amber recessed porch lights in front, and shielded amber back porch lights. The houses have shielded porch lights, as do the apartments and trailer. While doing a walk-around of the structures, site maintenance director Dave Larsen agreed that it would be an easy change to make every light in the housing area an amber CFL 13W light. The laundry/gym building has one shielded light and one unshielded, with plans to add a shield. All lighting within the residential area operates on a switch, and residents are encouraged to keep porch lights off.

Maze District Lighting Inventory

Location	Fixture	Fully-shielded	Photo	Application	Conformity with LMP
Visitor Center Building	2 DSS CFL Amber 13 W Medium Edison	Full		VC Front Door Building Egress	Yes
Maintenance PV Building	Wall Unshielded Lamp type: IH 45 W Medium Edison	Yes		PV Building Egress	Yes
Housing, Apartments H, G, F, E	DSS CFL Amber Medium Edison 13 W	Yes		Building Egress	Yes
Housing Apartment D	DSS CFL Amber Medium Edison 13 W	Yes		Building Egress	Yes
Housing Apartment C	Wall Unshielded CFL Amber Medium Edison 13 W	Partial (roof eave); full shield to be installed		Building Egress	No; retrofit planned

Maze District Lighting Inventory (cont.)

Housing Apartment B	DSS CFL Amber Medium Edison 13 W	Yes		Building Egress	Yes
Housing Apartment A	Wall Unshielded CFL Amber Medium Edison 0 W	Partial (roof eave)		Building Egress	No; full shield to be installed
Apartments A, B, C, D	DSS CFL Amber Medium Edison 13 W	Yes		Building Egress	Yes
Maintenance Building- exterior lights	Fixed Flood I Medium Edison 120 W	Partial	Not Available	Task	No; full shield and motion sensor to be installed



3 Management Documents



Grand View Point Overlook, Island in the Sky District
NPS Photo/Dan Duriscoe

NPS Management Policies

An assortment of laws and directives at the federal and park level serve as guidelines for Canyonlands National Park in its mission to protect natural night skies. From the 1916 Organic Act to the Lightscape Management Plan in 2006, the federal government has laid out a basis for the idea of protecting night skies. In addition to these, the Director’s Call to Action Report 2012 Action 27 reaffirms the National Park Service’s support towards the protection of dark sky resources. The Foundation Document of Canyonlands National Park provides further guidance and approval for the extension of park protection of the night skies.

National Park Service Organic Act

The Organic Act was passed in 1916 to protect and manage the national park lands of the United States. The act protected the ecological and scenic values within federal lands, under which falls dark sky resources.

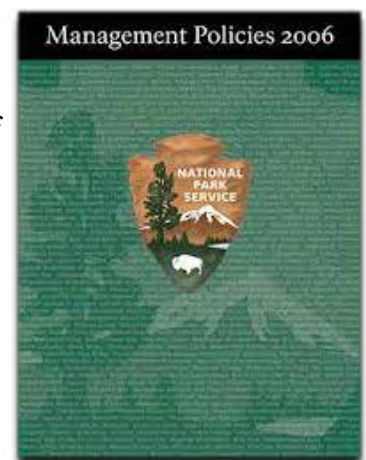
“The service thus established shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations hereinafter specified by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.”

4.10 Lightscape Management (2006)

This service-wide document of management policies provides the National Park Service with required and recommended actions to manage programs and parks. Included within is a Lightscape Management Plan, which lays out specific guidelines and recommendations for light management and use.

“The Service will preserve, to the greatest extent possible, the natural lightscapes of parks, which are natural resources and values that exist in the absence of human caused light....The stars, planets, and earth’s moon that are visible during clear nights influence humans and many other species of animals, such as birds that navigate by the stars or prey animals that reduce their activities during moonlight nights.

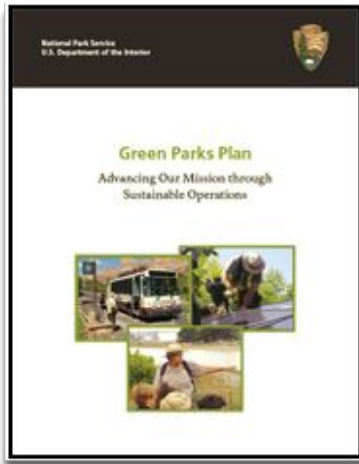
“Improper outdoor lighting can impede the view and visitor enjoyment of a natural dark night sky. Recognizing the roles that light and dark periods and darkness play in natural resource processes and the evolution of species, the Service will protect natural darkness and other components of the natural lightscape in parks. To prevent the loss of dark conditions and of natural night skies, the Service will minimize light that emanates from park facilities, and also seek the cooperation of park visitors, neighbors, and local government agencies to prevent or minimize the intrusion of artificial light into the night scene of the ecosystems of parks. The Service will not use artificial lighting in areas such as sea turtle nesting locations where the presence of the artificial lighting will disrupt a park’s dark-dependent natural resource components.



“The Service will:

- restrict the use of artificial lighting in parks to those areas where security, basic human safety, and specific cultural resource requirements must be met;
- use minimal-impact lighting techniques;
- shield the use of artificial lighting where necessary to prevent the disruption of the night sky, natural cave processes.”

The Green Parks Plan 4/2012



The Green Parks Plan is a long-term strategic plan for management of NPS operations in a sustainable manner.

“The NPS will minimize the impact of facility operations on the external environment. Outdoor experiences can be adversely affected by facility operations. Exterior lighting can reduce dark night sky quality and vehicle traffic can diminish the natural silence and sounds of an ecosystem. Reducing the impact of NPS operations on the environment will improve the visitor experience and protect natural and cultural resources through the preservation of night skies, natural sounds, water quality, ecosystems, and viewsheds.

Objectives

- 1: The NPS will reduce light pollution from park facilities with the goal of dark night sky preservation.
- 2: The NPS will minimize sound pollution in the outdoor environment.
- 3: The NPS will ensure that all facilities and operations are sustainably integrated into the park landscape to minimize impact on the natural and cultural environment.”

Night Sky Management

Natural Sounds and Night Skies

“America’s national parks contain many cherished treasures; among them are captivating natural sounds and awe-inspiring night skies. The joy of listening to the quiet symphony of nature or the beauty of seeing the Milky Way stretching overhead have become rare experiences in our lifetimes, but they can still be found in many of our national parks. Natural sounds and natural darkness, though often overlooked, are essential in keeping our national treasures whole. They are magnificent in their own right, but also inspirational to the visitors who come to national parks, vital to the protection of wilderness character, fundamental to the historical and cultural context, and critical for park wildlife.

“The Natural Sounds and Night Skies Division uses science, engineering, and technology to understand and better manage these spectacular resources. We pioneer innovative techniques to measure the impact of noise and light pollution, develop new approaches to safeguard natural sounds and natural darkness, and identify management solutions to restore these public resources.

“The Natural Sounds and Night Skies Division works to protect, maintain, or restore acoustical and dark night sky environments throughout the National Park System. We work in partnership with

parks and others to increase scientific understanding and inspire public appreciation of the value and character of soundscapes and star-filled skies. We welcome your interest in learning about these sublime resources of our national parks and the efforts you can take to help us preserve them for future generations. Whether it's simply talking a little softer or turning off an outdoor light, you too can make a difference in the protection of these vital resources. Most of all, we encourage you to experience for yourself the natural soundscapes and lightscapes of your national parks.”

The Director's Call to Action Report 2012

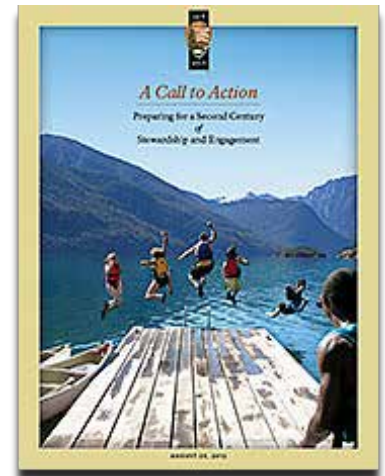
The Director's Call to Action Report is a guideline for employees and partners that contains specific goals and measurable actions, and charts a path towards unified goals.

“Starry, Starry Night: Action 27

Lead the way in protecting natural darkness as a precious resource and create a model for dark sky protection by establishing America's first Dark Sky Cooperative on the Colorado Plateau in collaboration with other federal agencies, partners, and local communities.”

As an essential piece of the newly formed Colorado Plateau Dark Sky Cooperative, Canyonlands National Park is taking lighting, conservation, and educational steps to fulfill the mission of the Call To Action #27, Starry, Starry Night. This voluntary initiative forms America's first Dark Sky Cooperative, and links communities, tribes, businesses, state/federal agencies, and citizens in a collaborative effort to celebrate the view of the cosmos, minimize the impact of outdoor lighting, and ultimately restore natural darkness to the area. Canyonlands International Dark Sky Park designation would bring further awareness and legitimacy to the Cooperative.

In addition, Canyonlands is a featured park as part of Call to Action #38, Enjoy the View. This initiative protects clean, clear air and spectacular scenery, including the night sky, now and for future generations. Collaborative efforts in ten NPS parks are creating Viewshed Cooperatives with other federal agencies, tribes, and local partners to assess air pollutants and preserve treasured viewsheds and natural and cultural resources. These two action items highlight the dedication of NPS and Canyonlands to preserving clear, dark skies for future generations.



Canyonlands National Park Management Actions

Canyonlands Foundation Document (August 2013)



The Foundation Document for Canyonlands National Park functions as a “formal statement of its core mission that will provide basic guidance for all planning and management decisions.”

In Fundamental Resource or Value: Remote Wilderness and Solitude, it is recognized that “Canyonlands National Park is primarily a backcountry park with limited accessibility. The wilderness character, natural acoustical environment, and dark skies enhance opportunities to experience the remoteness in solitude.”

The conditions and trends for night sky values are identified in this document as: “park has baseline data—very good condition, but no data on trends other than recent actions to reduce NPS impacts on night skies by changes in lighting.”

Threats and opportunities are identified as: “—lighting from Moab, external development”, and “Park will ask the Night Sky Monitoring Program team to send their data, analysis, results. Colorado Plateau Dark Sky Cooperative effort associated with Director’s A Call to Action.

Stakeholders interested in this resource are identified as “Park visitors and staff. State and local governments, nongovernment organizations, traditionally associated tribes, commercial operators, Friends of Arches and Canyonlands parks, the Bates Wilson Legacy Fund, Canyonlands Natural History Association.”

Canyonlands recognizes the laws that impact the resource of Remote Wilderness and Solitude, and therefore Night Skies, as “Wilderness Act of 1964, NPS Management Policies 2006, Directors Order 41: Wilderness Preservation and Management.”

Canyonlands Lighting Management Plan

From 2008 to 2015, the Canyonlands management team and the project leaders of this project drafted and implemented a long-term plan for the park's outdoor lighting, setting dark sky conservation in motion.

Introduction

The remote location of Canyonlands within the arid desert of Southeast Utah allows for pristine night skies that are relatively free of light pollution. The park believes that preserving the natural night sky is an integral part of the resource protection done at Canyonlands, and is committed to the ongoing conservation of this important cultural, natural, and scientific resource. Through responsible lighting management as well as a persistence of night sky interpretation and public education, Canyonlands will continue to preserve natural night skies for this and future generations.

Purpose

Impact to Natural Resources

The park understands that the preservation of natural lightscapes is paramount to the maintenance of a natural ecosystem. As the varied and unique ecosystems of Canyonlands National Park have evolved under the natural night sky, a night sky free from excessive light pollution must be sustained to ensure the maintenance of an unchanged landscape and ecosystem. As acknowledged in the *Frontiers in Ecology and the Environment* journal: "Ecological light pollution has demonstrable effects on the behavioral and population ecology of organisms in natural settings." (*Ecological Light Pollution*, Longcore/Rich). Within the Royal Astronomical Society of Canada and IDA DSP Programs Guidelines for Outdoor Lighting, it is clearly stated that wildlife depends on the darkness of night, and that long exposures to light throughout the night can shift the circadian rhythm and modify behavior patterns of animals. With this understanding, Canyonlands strives to protect its natural resources and pristine night skies through public education and the implementation of a dark sky friendly Lighting Management Plan, and therefore uphold its own mission to protect the fundamental resource of the Colorado Plateau Ecosystems.

Impact to Visitor Experience

The park additionally acknowledges that light pollution, identified as spilled or wasted artificial light, is a threat to the visitor experience of solitude and wilderness. As identified in the Foundation Document of the park, "Canyonlands National Park is primarily a backcountry park with limited accessibility. The wilderness character, natural acoustical environment, and dark skies enhance opportunities to experience the remoteness in solitude." Visitor experience of these values while within the park would be severely threatened by an increase in light pollution and decrease in the natural night sky.

1.1 Introduction

In conformance with NPS Management Policy 4.10— Natural Lightscapes, the installation and use of artificial outdoor lighting should be used only when and where dictated by safety, and should not be driven by convenience. Mitigation should be employed to the maximum practical extent. These guidelines direct park management to design park lighting to mitigate light pollution and to preserve natural darkness as much as possible.

Canyonlands National Park (CANY) preserves the four unique park districts (Island in the Sky, Maze, Needles, and River) and their numerous natural and cultural resources in a particularly rugged and remote part of the Colorado Plateau. Visitors experience a vast and remote landscape, highlighted by grand daytime vistas overlooking red cliffs and canyons. These experiences are solidified further by access to night-time views which allow for quiet contemplation of not just the vastness of canyon country, but the vastness of our Universe. This night sky is a diminishing resource that the National Park Service seeks to preserve. The goal of this Lighting Management Plan (LMP) is to provide for the safety, security and route finding of Park visitors and staff without any significant impact on the night skies of CANY.

Good lighting design and application requires the synthesis of several human and environmental factors— what visual tasks are to be performed, psychology of security, ocular adaptation level, fixture efficacy, lamp efficacy, fixture placement, ambient illumination level, light spectrum, and lighting controls (i.e. switches, timers, and dimmers) to name a few. Additionally there are environmental consequences of artificial outdoor lighting related to direct glare, angular distribution, atmospheric scattering, color, duration, and intensity. Unfortunately most of the knowledge base and recommended practices for outdoor lighting were developed in urban and suburban environments. These practices apply to an ambient environment that is significantly brighter and more frequently occupied by humans at night than a national park. Standards for protection of the natural environment are higher within parks, including maintaining levels of illuminance (the amount of light striking a surface) and luminance (the amount of light reflected from a surface) within the range of natural variability in protected areas.

Fundamental differences between a park and more urban environments are many. First, visitors' and employees' expectation for outdoor illumination includes an understanding that all of the conveniences widely available in cities will not be found in parks. For example, visitors expect to need a flashlight while camping or while walking at night. Second, parks are a dark environment, and thus typically require less light to provide commensurate visibility because of the dark adaptation ability of the human eye. In parks, a person commonly transitions between lit and unlit areas, whereas in cities a person experiences a mostly uninterrupted series of lit environments. To maximize visibility, sharp contrasts in illumination should be avoided. Lastly, in parks there are far more sensitive environmental concerns. An errant light can impact a stargazer's night vision a quarter mile away in the dark environment of a park, and what is a disappointment to visitors can be a matter of survival for wildlife.

Although it is preferable for government agencies to utilize widely adopted standards in lieu of inventing their own, the Recommended Practices issued by the Illuminating Engineering Society of North America (IESNA) fit the National Park Service mission so poorly that specialized guidelines are necessary. Only a small fraction of the published IESNA guidance addresses lighting in dark ambient environment, and those that do seldom incorporate the latest research on light pollution and wildlife impact. Nor are they derived from a set of assumptions remotely similar to the NPS Organic Act.

Finally, IESNA guidance does not address light “warranting”- assessing whether a light is necessary in the first place.

The National Park Service Night Sky Team has created two documents to assist individual parks in creating an LMP. These are listed below under “Sources” along with other guiding documents that have contributed both ideas and language for this LMP. Fortunately, the primitive nature of most of CANY, along with the small scope of facilities in the park, both extant and planned, means that the LMP for CANY is generally simple and in line with what park staff and visitors have come to expect.

Light Pollution

A natural lightscape is one that is free of light pollution. Spilled light or wasted light are phrases that describe the misuse of outdoor lighting, especially in a natural or protected environment such as a national park. The term light pollution has commonly been used to emphasize the concept that anthropogenic light in the naturally dark environment is indeed a pollutant with undesirable ecological consequences, not just a nuisance. There are many good reasons to eliminate light pollution in national parks, including:

1. The preservation of natural lightscapes (the intensity and distribution of light on the landscape at night) will maintain the nocturnal scotopic (vision under low light conditions) environment within the range of natural variability. Excursions outside this natural range may result in a modification to natural ecosystem function, especially to systems involving the behavior and survival of nocturnal animals. The natural night sky is therefore one of the physical resources under which natural ecosystems have evolved.
2. The scenery of national park areas does not just include the daytime hours. A natural starry sky absent of anthropogenic light is a key scenic resource, especially large wilderness parks remote from major cities (i.e. CANY).
3. The history and culture of many civilizations are steeped in interpretations of night sky observations, whether for scientific, religious, or time-keeping purposes. As such, the natural night sky is an important cultural resource, especially in areas where evidence of aboriginal cultures is present.
4. The recreational value of dark night skies is important to campers and backpackers, allowing the experience of enjoying the night sky or sleeping under the stars.
5. Night sky quality is an important wilderness value, contributing to the ability to experience a feeling of solitude in a landscape free from signs of human occupation and technology.

1.2 Guiding Principles

Providing light for visitor and staff safety in commonly used developed areas will be achieved while protecting the natural environment from light pollution. Decisions on lighting necessary for employee and visitor safety must be made by considering factors such as the expectation of permanent artificial lighting, existing safety hazards (such as tripping, falling, criminal activity, and wildlife), type of tasks performed, frequency of those tasks or use level, and available alternatives. In some cases, modification

of the built environment, relocation of tasks, alteration of work schedules, or use of temporary lighting can be done in lieu of installing permanent outdoor lighting.

Outdoor lighting zones will be delineated in Canyonlands National Park management plans (specifically this document), with each zone having varying degrees of visitor expectations for natural darkness/outdoor lighting, varying degrees of nighttime use and activity, and/or varying degrees of cultural/natural sensitivity.

Energy efficiency should be a goal for all outdoor lighting, as it lessens the park's carbon footprint. An important distinction here, however, is that – especially with new LED technology - an energy efficient light is not necessarily a night-friendly light.

Long term sustainability in the operation and maintenance of outdoor lighting solutions should be maximized. The total lifecycle cost should be weighed in a sustainability assessment. In many cases, the lower wattage requirements of a lighting installation designed to preserve night skies makes that installation more economical than the traditional alternatives over the life of the products. Outdoor lighting will be sensitive to the impact upon wildlife. The addition of artificial light into a park setting will alter nocturnal habitat, and the impact may reach beyond the bounds of the developed area. Parameters of direct light intensity, scattered light intensity, light color, light timing and duration are all important considerations for wildlife.

The darker the ambient environment, the more careful lighting choices must be. A good example is a park entrance station, which is sometimes isolated from other developments and surrounded by natural darkness. Excessive outdoor lighting intensity here will unnecessarily impact the surrounding areas.

Cultural and Historic Resources will be supported, not degraded, by outdoor lighting. The use of period light fixtures represents a special challenge, as these are generally more decorative and less efficient than their modern equivalents. Successfully preserving the cultural and historical integrity may require additional expense and creative solutions, as well as tolerating lower task area illumination typical of decorative fixtures.

Protecting the naturally dark surroundings of many park environments is an essential factor in outdoor lighting design. Because of the human eye's reliance on contrast for vision, a dark ambient environment often enables the use of lower illumination levels to achieve the same visual effect. Additionally, in parks both visitors and employees are often transitioning from lit areas to unlit areas, so this transition must be addressed. For example, it would be counterproductive to brightly illuminate a visitor center walkway, only to terminate the light at the edge of a dark parking lot. By gradually tapering lighting levels between use areas and lighting zones, the dark-adaptation ability of the human eye is promoted. To implement such a design strategy, there can be no minimum illumination standards.

External threats to the natural lightscape within the parks will be addressed, primarily by setting a leadership example for surrounding communities. NPS management policies put a positive responsibility upon superintendents to partner, to the extent possible, with these communities to protect the natural environment of parks. Part of this effort is to provide examples of outdoor lighting Best Practices for the public. This requires that outdoor lighting in parks be held to a high standard, that the existing lights incorporate these principles, and that park facility lighting is interpreted to visitors and the surrounding community.

1.3 Lighting Guidelines

All exterior lighting in Canyonlands National Park shall be designed to eliminate light trespass, minimize glare, and use an intensity, color, and duration that will preserve the natural darkness as much as possible.

NPS Management Policies direct parks to use artificial light on an “only as needed” basis and to minimize impact whenever possible. Merely shielding a light does not necessarily constitute lightscape, wildlife, or night-sky friendliness; especially if that light is unnecessary in the first place. Even when a light is necessary, the incorporation of a timer, motion sensor, or switch can greatly reduce its impact. The mitigation of outdoor lighting impacts upon the environment is best accomplished by addressing six parameters of lighting.

1) Warranting- Light only WHERE you need it

- a. Lighting installations should be placed only where uses dictate.

2) Controls- Light only WHEN you need it

- a. Rather than defaulting to a dusk-till-dawn operational cycle, lighting controls should be designed to minimize the amount of time the light is on while still fulfilling the need met by installing the light at that spot in the first place.

3) Shielding- Direct light DOWNWARD

- a. No fixture should emit light above the horizontal. In most cases, beams of light should be restricted even further.

4) Spectrum- Select LAMPS that minimize negative impacts

- a. Humans and many other animals are most sensitive to blue/white light. Most evening lighting goals can be achieved using warmer temperature lighting, which decreases the disruption to wildlife (including insects), maintains the human ability to adapt to low light conditions, and decreases sky glow.

b. The color tint of white light is measured in Kelvins (K), a scale in which warm-toned white light has smaller values (1800-3000K) and cold-toned light has larger values (5000K and higher). Between 3000 and 5000K, light is said to be “neutral” in tone. The common incandescent lamp is 2700K.

c. Traditional incandescent lighting is about 2700K, a warm toned light considered normal for residential and hospitality lighting in North America. For reasons of consistency and appearance, light sources should be 2700-3000K with a minimum Color Rendering Index of 70. Amber or yellow light sources are preferable, both to limit attraction by insects and to reduce sky glow. Light sources should be chosen for energy efficiency, long life and low maintenance. Because some locations in the park experience extremes of temperature, elevation and exposure, light sources must be suitable for all expected operating conditions. The following light sources are acceptable for outside use:

- i. LED 2700K “warm” white lamps, yellow, or amber colored, 1, 3, or 7 watt. LED’s superior

life, energy efficiency, instant starting and low temperature performance are superior but some capabilities of the source are limited. Use with caution in hot climates. Use amber LEDs in most environmentally sensitive areas.

ii. Compact fluorescent, 9 watt, twin tube and 13 watt double twin tube or Edison base spiral 3, 7, 10, 13 or 26 watt (2700K only or yellow “bug lamps”). Because of low starting temperature and low cost components, this light source can be used for many basic outdoor lighting applications.

iii. Halogen IR, 20 watt, 12 volt MR16 lamp. Uses are generally limited to temporary (presence detector activated) lighting applications. Because of their low luminous efficacy they should not be used in continuous duty applications.

iv. Ceramic metal halide lamps, 20 watts, T4.5 and 39 watt, T6, 3000K only. In general, these are the most powerful light source to be used outdoors, but warm up and restrike time preclude use where frequent switching or power quality issues are present.

5) Intensity- Use the minimum AMOUNT of light necessary

6) Efficiency- Select the most energy EFFICACIOUS lamp and fixture

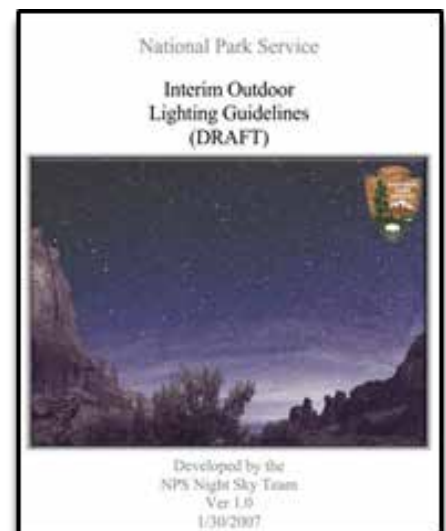
Existing Standards and Codes

A Royal Astronomical Society of Canada (RASC) Dark Sky Park is defined as an area whose night sky has little or no sky glow and minimal lighting within the DSP. As such, Canyonlands has created and adapted a lighting guideline outline that minimizes the lighting within the park.

From the NPS Interim Outdoor Lighting Guidelines

Best management practices for outdoor lighting will:

- Curtail and reverse the degradation of the nighttime visual environment and the night sky, including casual observation, astronomy, and air quality related values.
- Minimize glare, light trespass, obtrusive light, and artificial sky glow by limiting outdoor lighting that is misdirected, excessive, or unnecessary.
- Ensure good neighbor lighting by minimizing light trespass.
- Help minimize suspected health risks to humans from adverse exposure to light at night.
- Help protect natural ecosystems from the damaging effects of night lighting.
- Permit reasonable and rational use of outdoor lighting for nighttime safety, utility, security, and productivity.
- Help to conserve energy and resources.
- Minimize maintenance and operating costs
- Provide some flexibility for architectural and artistic lighting within the above constraints



The following basic principles are adapted from the RASC and IDA DSP Programs, the National Park Service Interim Lighting guidelines (2007), and other sources, and provide guidelines for lightscape management in Canyonlands National Park:

1. Artificial light within the park should exist only where deemed necessary.
2. Artificial light should exist at a minimum practical level.
3. The area of illumination should be restrained to the area judged necessary.
4. Duration of illumination should be similarly restrained to a practical and required area.

Canyonlands recognizes the value of these guidelines, and adopts them into the park's own Lighting Management Plan.

2.0 Lighting Zones

While Canyonlands is a large park, its amenities are limited. Each district contains a small visitor center, residential area, and maintenance/SAR areas. Beyond these limited visitor and employee areas, the park is unlit by artificial lighting. Campgrounds and trailheads remain dark, and fulfill the visitor expectation for a wilderness experience.

The park can be divided into two zones:

- **Zone One**, where minimum artificial lighting is deemed necessary for safety—such as at residential and visitor services areas. Zone one exists as a **Standard Lighting Zone (SLZ)**, and contains structures that support the operation needs of the park. Lighting here exists on a level dictated by necessity only, and should be restricted temporally and spatially.
- **Zone Two** is the majority of the park, and contains no artificial lighting. This zone includes campgrounds, trailheads, and roads, as well as the general wilderness areas of the park. Zone two is a **Natural Darkness Zone (NDZ)**, where no permanent light fixtures exist. Any lighting needs in this zone will be on an individual case, and will be addressed by temporary lighting devices such as flashlights. This zone comprises the wilderness and solitude values of the park, and minimizing and eliminating light trespass into this zone is paramount.

Lighting Standards

Standard Lighting Zone (SLZ)

Exterior Lighting exists solely for security and convenience. Lights shall remain on only in minimum capacity, and with the aim of safety. Canyonlands has altered and retrofitted much of the outdoor lighting in all the districts of the park. Permanent fixtures are allowed in this zone, provided they are limited to immediate task area. Artificial lighting is used only when necessary for safety, as in lights around fee stations, residential porches, and visitor centers. Any future buildings or projects will conform to these standards. In order to alleviate light trespass, the following basic principles are observed:

- Light fixtures should exist only where needed for specific tasks.
- Light should only exist when necessary. Lights should operate on manual switches or motion sensors/timers.

- Light should only exist in the minimum amount necessary. Individual fixtures should be limited to 600 lumens, with exceptions for specific safety and special uses based on need.
- Lights should be selected with warm colors, such as amber ($\leq 2500\text{K}$ color temperature).
- Energy efficiency should be considered when choosing lighting. Standard bulbs should be compact fluorescent (CFL), which are low-wattage, or light-emitting diodes (LED).
- Lights should be directed downward and shielded.



Needles District Visitor Center
NPS Photo/Cadence C. Cook

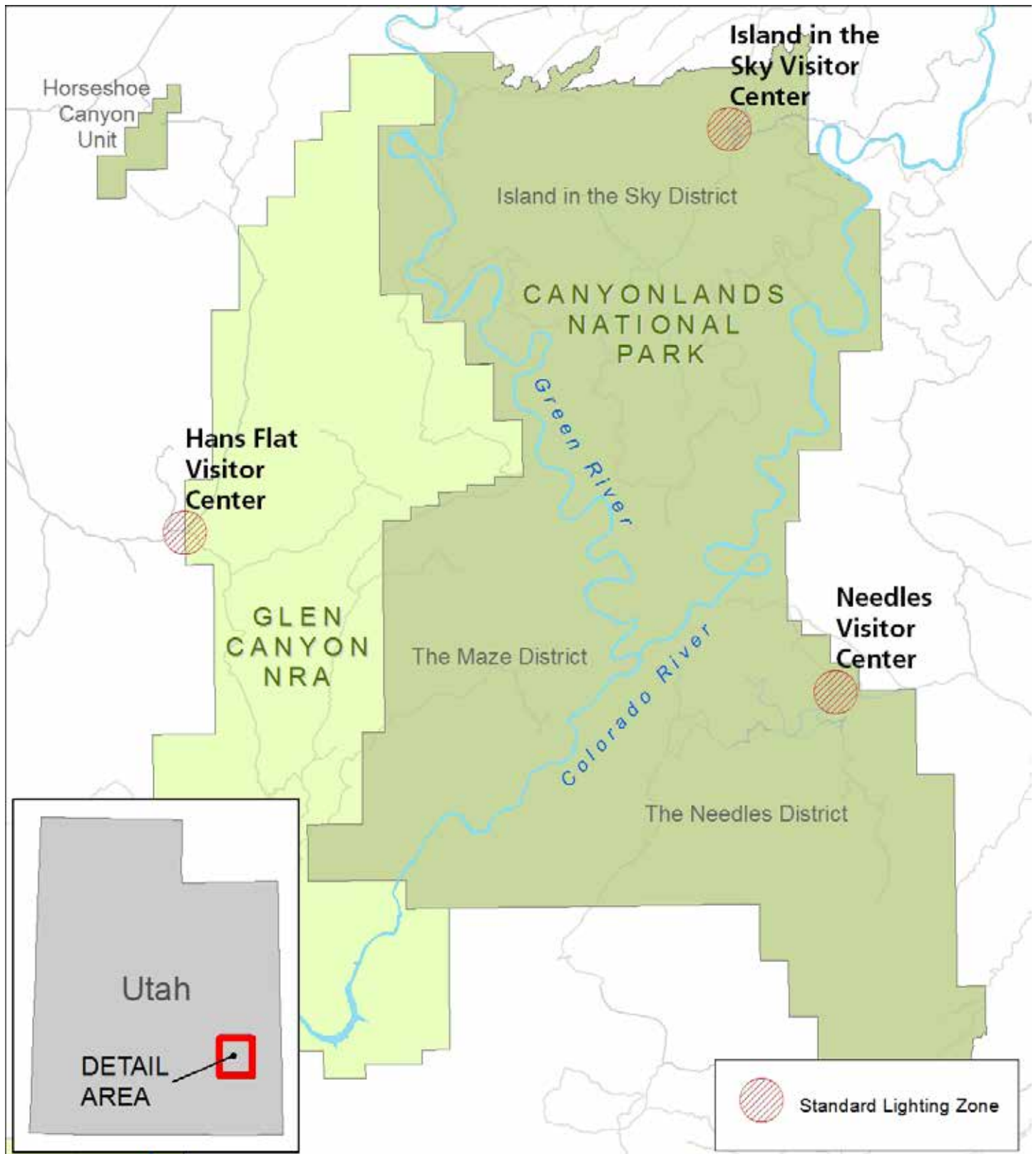
Natural Darkness Zones (NDZ)

All areas outside of Zone One fall under this zone. These areas include the main drive of Island in the Sky, main drive of the Needles, and backcountry hiking and four-wheel-drive areas of all districts. No permanent lighting exists or is allowed in this area. Light trespass from outside sources and Zone One is minimal and all attempts are made to eliminate any excess light pollution. This area makes up the large majority of the park, and the essence of Canyonlands National Park.

Conclusion

Canyonlands is dedicated to maintaining a lighting system that is low-impact and exists only as necessary for safety. Future lights will comply with this low-impact lighting management system and be compatible with NPS Management policies, which state that it is important to specify the need in each case of outdoor lighting and choose the appropriate lighting design. Artificial lighting in the park does not exist in areas where there is an expectation for darkness by the visitor and employees.

Canyonlands Lighting Zones



4 Letters of Support



Grand View Point Overlook, Island in the Sky District
NPS Photo/Cadence C. Cook



United States Department of the Interior

NATIONAL PARK SERVICE
Southeast Utah Group
Arches and Canyonlands National Parks
Hovenweep and Natural Bridges National Monuments
2282 S. West Resource Boulevard
Moab, Utah 84532-3298

IN REPLY REFER TO:

N16 (SEUG-RSS)

January 22, 2015

Board of Directors
International Dark-Sky Association
3225 North First Avenue
Tucson, AZ 85719

Dear Board of Directors:

I am writing to express my strong support for the designation of Canyonlands National Park as an International Dark Sky Park (IDSP). Canyonlands was established in 1964 to preserve superlative scenery and scientific features for the inspiration and benefit of the public. Among the park's most significant and inspirational features are silence, solitude, and darkness – three rarities that the author Bill McKibben has described as the most precious things in the modern world. IDSP designation would serve to recognize and celebrate the pristine night skies of the Canyonlands area, and would thereby facilitate the protection of this resource through greater public and institutional awareness and appreciation.

The National Park Service (NPS) strives to protect the quality of night skies around Canyonlands, in the Colorado Plateau region, and nationwide. At Canyonlands, we have adopted energy conservation measures and night sky-friendly lighting as cornerstones to our public messaging about stewardship of resources in general and the night sky in particular. As an essential element of the newly formed Colorado Plateau Dark Sky Cooperative, Canyonlands National Park is taking lighting, conservation, and educational steps to fulfill the mission of the agency's servicewide Call To Action #27, Starry Starry Night (<http://www.nps.gov/calltoaction/>). In addition, we work with adjoining federal land-management agencies and nearby communities to minimize impacts of development and recreational activities on night sky resources.

Interpretation of the night sky also is an important component of our comprehensive program to celebrate and protect dark night skies. At Canyonlands, our interpretive efforts feature ways that the public can become more involved in conservation issues in their own communities. Canyonlands recently has partnered with Dead Horse Point State Park to host a series of astronomy events that are free to the public. NPS rangers in the Needles District of Canyonlands regularly host astronomy programs in the Needles campground, and park management and staff members are committed to maintaining a dark sky lightscape as an important element of the park environment.

For all of these reasons, Canyonlands National Park is a prime candidate for IDSP designation by the International Dark-Sky Association. I am pleased to present the enclosed IDSP nomination package, and I

ask for your favorable consideration.

Sincerely,

A handwritten signature in cursive script that reads "Kate Cannon". The signature is written in a dark ink and is positioned above the printed name and title.

Kate Cannon
Superintendent

Enclosure



United States Department of the Interior

NATIONAL PARK SERVICE
INTERMOUNTAIN REGION
12795 West Alameda Parkway
P.O. Box 25287
Denver, Colorado 80225-0287



IN REPLY REFER TO:
NPS-IMR-NR-1242
JAN-9/2015

Board of Directors
International Dark-Sky Association
3223 North First Avenue
Tucson, Arizona 85719-2103

Dear IDA Board of Directors:

The National Park Service Intermountain Region's Natural Resources Program is pleased to support the Canyonlands International Dark Sky Park nomination. Canyonlands National Park is located in one of the most remote regions in the continental U.S., and offers exemplary wilderness experience and dark skies mostly unmatched on other public lands and National Parks across the country. The dark skies of Canyonlands have immense value to astronomy, wildlife conservation, cultural resources, and scientific research in the region. In addition, Canyonlands International Dark Sky Park designation would assist in the conservation of dark night skies in neighboring Glen Canyon National Recreation Area, Arches National Park, Dead Horse Point State Park, and nearby Capitol Reef National Park. Two International Dark Sky Parks, Natural Bridges and Hovenweep, are currently managed by the same NPS Southeast Utah Group (SEUG) as Canyonlands National Park.

As an essential piece of the newly formed Colorado Plateau Dark Sky Cooperative, Canyonlands National Park is taking lighting, conservation, and educational steps to fulfill the mission of the NPS Call to Action #27, Starry Starry Night. This voluntary initiative forms America's first Dark Sky Cooperative, and links communities, tribes, businesses, state/federal agencies, and citizens in a collaborative effort to celebrate the view of the cosmos, minimize the impact of outdoor lighting, and ultimately restore natural darkness to the area. Canyonlands International Dark Sky Park designation would bring further awareness and legitimacy to the Cooperative.

Since July 2011, the Intermountain Region's Natural Resources Program has been a member of the International Dark Sky Association. As a member of this association, we join the worldwide network of committed individuals who care deeply about preserving the beauty and heritage of our night skies. We fully support the efforts of the Canyonlands National Park as they seek designation of the Canyonlands International Dark Sky Park. Such efforts to conserve dark skies will benefit park visitors, nearby communities, and future generations. Should you have any questions, please contact Nate Ament at Nathan_ament@nps.gov or via phone 435-719-2349.

Sincerely,

A handwritten signature in black ink, appearing to read "Patrick Malone". The signature is fluid and cursive, with the first name "Patrick" and last name "Malone" clearly distinguishable.

Patrick Malone
Assistant Regional Director, Natural Resources

Cc: Catherine Cannon, Superintendent, Canyonlands National Park
Chad Moore, WASO Night Skies Team Leader
David Vana-Miller, Resource Stewardship Program Manager, IMR-NR
Nathan Ament, Colorado Plateau Dark Sky Cooperative Coordinator



Colorado Plateau Dark Sky Cooperative

2282 S. West Resource Blvd

Moab, UT 84532

December 1, 2014

VIA ELECTRONIC COPY ONLY- NO HARD COPY TO FOLLOW

Board of Directors
International Dark-Sky Association
3223 North First Avenue
Tucson, Arizona 85719-2103

Dear IDA Board of Directors:

The Colorado Plateau Dark Sky Cooperative is pleased to support the Canyonlands National Park International Dark Sky Park nomination. Canyonlands National Park is located in one of the most remote regions in the continental U.S., and offers an exceptional, unfettered view of the dark night skies over the Colorado Plateau. The dark skies of Canyonlands have immense value to astronomical viewing, cultural resources, and wildlife conservation in the region. For the last 2 years, Canyonlands has partnered with Dead Horse Point State Park to host a series of astronomy events that are free to the public. In addition, Canyonlands International Dark Sky Park designation would assist in the conservation of dark night skies in neighboring Glen Canyon National Recreation Area, Arches National Park, Dead Horse Point State Park, and nearby Capitol Reef National Park.

As an essential piece of the newly formed Colorado Plateau Dark Sky Cooperative, Canyonlands National Park is taking lighting, conservation, and educational steps to fulfill the mission of the NPS Call To Action #27, Starry Starry Night. This voluntary initiative forms America's first Dark Sky Cooperative, and links communities, tribes, businesses, state/federal agencies, and citizens in a collaborative effort to celebrate the view of the cosmos, minimize the impact of outdoor lighting, and ultimately restore natural darkness to the area. Canyonlands International Dark Sky Park designation would bring further awareness and legitimacy to the Cooperative.

We fully support the efforts of Canyonlands National Park as they seek designation of the Canyonlands International Dark Sky Park. Such efforts to conserve dark skies will benefit park visitors, nearby communities, and future generations. Should you have any questions, please contact Nate Ament at 435-719-2349.

Sincerely,

Nate Ament

Colorado Plateau Dark Sky Cooperative Coordinator

December 31, 2014

IDA Board of Directors
International Dark-Sky Association
3225 North First Avenue
Tucson, Arizona 85719-2103

Dear IDA Board of Directors

Re: Dark-Sky Status Application

Canyonlands Natural History Association (CNHA) is a not-for-profit which supports the Nation Parks, Bureau of Land Management, and Forest Service with their interpretive and educational programs. It has been our pleasure to serve these public land partners for over 48 years.

Recently, the visitor has become increasingly more aware and appreciative of the value of night sky opportunities on public lands. But as their awareness of this natural resource grows, we understand that the resources itself is shrinking. Canyonlands National Park has been in the forefront of night sky awareness and its promotion for several years.

In support of these efforts, CNHA has made funds available for the purchase of telescopes and equipment for night-sky programs at several locations in the Southeast Utah Group. These programs enrich the visitor experience and establish night sky education as a core objective for visitor interpretive themes.

As a visitor advocate, CNHA enthusiastically supports the nomination of Canyonlands National Park for designation as an International Dark Sky site. This will assist the Park Service staff in their efforts to sustain educational programs which create stewardship of night sky values.

Please feel free to contact us with any questions.

Cindy Hardgrave



CNHA Executive Director



PO Box 1680 Moab, Utah 84532

February 12, 2015

IDA Board of Directors
International Dark Sky Assc.
3225 North First Ave.
Tucson, AZ 84719-2013

To Whom It May Concern;

The Friends of Arches and Canyonlands Parks is pleased to support the Canyonlands National Park International Dark Sky nomination. Canyonlands National Park is located in one of the most remote locations in the country in the beautiful Colorado Plateau. There are four districts in Canyonlands which include; Island in the Sky, the Needles, the Maze, the Colorado and Green Rivers. All of these districts are miles from any towns or cities that can offset the beauty of dark skies. When visiting these special places the night sky becomes part of the landscape where the stars are so bright that they create their own light.

The Friends organization was founded by the family of Bates Wilson, who was instrumental in the establishment of Canyonlands National Park and become its first superintendent in 1964. One of Superintendent Wilson's influences to convince those in power was through his many camping trips under the night skies. He firmly believed that the national parks were parks 24/7 and the dark stary skies were a natural resource that also needed to be preserved and protected.

The Friends of Arches and Canyonlands Parks believes in the importance of protecting the night sky and encourage visitors to experience for themselves the wonderful solitude that comes with darkness. The Friends organization offers many programs including sponsoring night sky events within the parks primarily targeting local gateway communities. We believe that through education and local involvement the idea of maintaining the dark skies as an important resource, both economically and environmentally, will provide support for changes needed to protect the night skies of southeastern Utah.

We hope that the International Dark Sky Association will seriously consider this nomination which will complete the three national parks located in beautiful San Juan County Utah. This designation will allow for increased opportunities to celebrate and educate the wonders of the universe.

Thank for your consideration.

Sincerely,

Joette Langianese
Executive Director
Friends of Arches and Canyonlands Parks:
Bates Wilson Legacy Fund



GARY R. HERBERT
Governor

GREG BELL
Lieutenant Governor

State of Utah

DEPARTMENT OF NATURAL RESOURCES

MICHAEL R. STYLER
Executive Director

Division of State Parks and Recreation

FRED HAYES
Division Director

February 21, 2015

International Dark Sky Association
Attn: Board of Directors

Dear Nomination Committee,

I am writing in support of Canyonlands National Park's application for designation as an International Dark Sky Park. Surrounded by miles of public lands and protected from the glow of artificial light, the night sky visible from all areas of Canyonlands National Park is astounding. I've spent many nights underneath their dark skies viewing various nebula, star clusters and galaxies with my eyes and have been filled with wonder.

For the past several years, I have been working with rangers from Canyonlands National Park on presenting public night sky programs. I can attest to their commitment to protect the darkness found within the park, and to sharing their love of the universe with visitors from around the world. These night sky programs are in such demand that on one evening, even though there was lightning all around, seven park visitors waited in their cars for the storm to pass just to go to the indoor version of our astronomy programs, reserved for cloudy nights.

I would be thrilled to see this designation presented to Canyonlands National Park in honor of the truly amazing night skies contained within its borders. With such a dedicated staff to monitor all light sources, and educate traveling visitors on the wonders of the universe and the importance of keeping the nights dark, I have no doubt that this addition to the Dark Sky Park family would be of value.

Thank you for your consideration.

Sincerely,

Crystal Carpenter, Assistant Park Manager
Dead Horse Point State Park
(435) 259-2614
crystalcarpenter@utah.gov

Dead Horse Point State Park, PO Box 609, Moab, UT 84532-0609
telephone (435) 259-2614 • facsimile (435) 259-2615 • TTY (801) 538-7458 • www.stateparks.utah.gov



References

This document drew from and is indebted to the following sources and people:

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Guidance for Outdoor Lighting Death Valley National Park (DVNP)

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Canyonlands National Park Foundation Document 2013

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Tyler Nordgren, artist/professor/author

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Contributors

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Michelle Busbee, Supervisory Park Ranger, Canyonlands NP

Catherine Cannon, Superintendent, Canyonlands NP

Crystal Carpenter, Assistant Park Manager, Dead Horse Point State Park

Cadence C. Cook, NPS Volunteer, Canyonlands NP

Sierra Coon, Island in the Sky Lead Park Guide, Canyonlands NP

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Lori Rome, Chief of Interpretation, Capitol Reef NP

Charles Schelz, Biologist, formerly NPS Southeast Utah Group

Chris Swenson, Needles Maintenance Supervisor, Canyonlands NP



Nordgren

*When visiting Utah's Dark-Sky Country,
remember...*

*"Half the park
happens after dark."*

SEE THE MILKY WAY
IN CANYONLANDS NATIONAL PARK