

Goblin Valley State Park Green River, Utah



International Dark Sky Park Designation Nomination Package



Photo Credit: Wally Pacholka.

A Proposal to the
International Dark Sky Association
3225 N. First Avenue
Tucson, Arizona 85179

Preface

Growing up in rural Upstate New York, along the foothills of the Berkshire Mountains, I gained an appreciation for the night sky at an early age. Grade school-level astronomy assignments could be completed simply by sitting out in our front yards and drawing what we saw...the constellations, the planets, and even the Milky Way. Over time, however, the expanding suburban sprawl of the Albany Tri-City area manifested itself as a creeping red glow on the western horizon. By the time I left for college, I wondered if there could be anywhere left in the country free of artificial light pollution.

Having since worked in such remote places as Tonto National Monument, Death Valley National Park, and Goblin Valley State Park, I have found that the answer to this question is a resounding “yes!” Here at Goblin Valley, visitors often tell me that not only is this the darkest sky they’ve ever seen, but that it is their first time ever having gazed upon the Milky Way. As park naturalist, I am happy to serve as an ambassador to this unique resource, while also informing the visiting public as to measures they can take at home to increase the quality of their own night sky. It was therefore an exciting opportunity to be asked to be the primary contributor to this application for international dark sky certification.

This document represents more than two years of tireless, dedicated efforts by the small staff of Goblin Valley State Park – past and present. From lighting modifications, to interpretive design, to community outreach, enthusiasm has remained high throughout the application process. It would be a great honor to see Goblin Valley take its place among the other gold-tier dark sky parks of the world.

- James E. Wells II, PhD.
Park Naturalist



Colorado Plateau Dark Sky Cooperative

2282 S. West Resource Blvd
Moab, UT 84532

October 14, 2015

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 Goblin Valley State Park International Dark Sky Park nomination. Goblin Valley State 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 Goblin Valley have immense value to astronomical viewing, astronomy education, and wildlife conservation in the region. For the last two years, Goblin Valley has hosted a series of astronomy events that are free to the public. In addition, Goblin Valley International Dark Sky Park designation would assist in the conservation of dark night skies in nearby Glen Canyon National Recreation Area, Canyonlands National Park, Green River State Park, Dead Horse Point State Park, and Capitol Reef National Park. Goblin Valley is one of the darkest places on the Colorado Plateau and can help to lead the way for other parks in the Utah State Parks system.

As an essential piece of the Colorado Plateau Dark Sky Cooperative, Goblin Valley State Park is taking lighting, conservation, and educational steps that 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. Goblin Valley International Dark Sky Park designation would bring further awareness and legitimacy to the Cooperative.

We fully support the efforts of Goblin Valley State Park as they seek designation of the Goblin Valley 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



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

January 16, 2016

Dear IDA Board of Directors:

Thank you for considering Goblin Valley State Park for Dark Sky Certification. We are very excited about this possibility, as one of Goblin Valley's most significant assets is its dramatic night sky, far from any town or other sources of light.

We have capitalized on the park's wondrous night sky for a number of years by offering programs ranging from star parties, to full moon hikes, to the observation of nocturnal wildlife. I view this potential designation as beneficial not only to Goblin Valley State Park, but also to the public who could learn about the benefits of a dark sky through this program. Goblin Valley and its surroundings have grown significantly in popularity over the past decade. We are expecting more than 100,000 visitors in 2016!

My staff is very excited about attaining dark sky certification, and has worked hard on both the application and in becoming compliant within the parameters of the program. They are developing an outreach program to bring school children from Green River to view the dark sky of Goblin Valley, and have also conducted telescope programs in town. They have been encouraged by the very dark readings they have recorded with the park's light meter, and are in the process of drafting a "best management plan" for the park's already limited outdoor lighting. Finally, this designation will also serve to remind future park managers of Goblin Valley of the value and significance of the dark sky resource. Thank you for your consideration and work to protect this diminishing resource.

Sincerely,

Aaron Farmer
Park Manager
Green River-Goblin Valley State Parks





GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

State of Utah

DEPARTMENT OF NATURAL RESOURCES

MICHAEL R. STYLER
Executive Director

Division of Parks and Recreation

FRED HAYES
Division Director

February 15, 2016

To Whom It May Concern:

For the past several years, the naturalists at Goblin Valley have noted that night sky programs such as full moon hikes, meteor shower-viewings, and star parties were among the park's most popular. When Goblin Valley staff learned about International Dark Sky Park designation, they wanted to pursue the designation to be able to draw more visitors to the park to experience the remarkable night sky.

Dark sky readings were taken at the park and these turned out to be some of the darkest readings ever recorded in the United States!

Staff immediately committed to follow the process that would enable them to obtain Dark Sky Park designation. All the funds needed have been expended to retrofit the park's outdoor lighting with properly shielded light fixtures and nice telescopes have been purchased to enhance night sky viewing.

Goblin Valley State Park has also garnered key local support for this designation from the Emery County Commission and the Emery County Public Lands Council.

Because of all of these factors, I, Fred Hayes, Director of Utah State Parks, support the long-term preservation of the wondrous night sky at Goblin Valley and endorse the park's efforts to be designated as a Dark Sky Park by the International Dark-Sky Association.

Furthermore, a resolution of support for Dark Sky Designation in appropriate Utah State Parks will be presented by the Utah State Parks Board in May 2016.

Cordially,

Fred M. Hayes
Director, Utah State Parks





GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

State of Utah

DEPARTMENT OF NATURAL RESOURCES

MICHAEL R. STYLER
Executive Director

Division of State Parks and Recreation

FRED HAYES
Division Director

September 5, 2014

Dear IDA Board of Directors:

As the Southeast Region Manager of Utah State Parks, I would like to voice my support of Goblin Valley State Park's application for certification as an official Dark Sky Park.

We are very excited about this possibility, as one of Goblin Valley's most significant assets is its dramatic night sky, far from any town or other sources of light.

We have capitalized on the park's wondrous night sky for a number of years by offering programs ranging from the classic star party, to night hikes, to the observation of nocturnal wildlife. I view this potential designation as beneficial not only to Goblin Valley State Park, but also to the public who could learn about the benefits of a dark sky through this program.

Recently, Goblin Valley and its surroundings have grown significantly in popularity. Over the past four years, visitation has more than doubled to over 94,000 people, and this year's numbers are already significantly ahead of last year's.

My staff is very excited about attaining dark sky certification, and has worked hard on both the application and in becoming compliant within the parameters of the program. They are developing an outreach program to bring school children from the nearest town (Green River - 47 miles away) to view the dark sky of Goblin Valley. They have been encouraged by the very dark readings they have recorded with the park's new light meter, and are in the process of drafting a "best management plan" for the park's already limited outdoor lighting. Finally, this designation will also serve to remind future park managers of Goblin Valley of the value and significance of the dark sky resource.

Thank you for your consideration and work to protect this diminishing resource.

Sincerely,

Tim Smith
Southeast Region Manager
Utah State Parks





GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

State of Utah

DEPARTMENT OF NATURAL RESOURCES

MICHAEL R. STYLER
Executive Director

Division of State Parks and Recreation

FRED HAYES
Division Director

November 30, 2015

Dear IDA Board of Directors:

What a privilege it is to frolic with goblins under the beguiling light of a billion stars. I want everyone to have the chance to experience this wonder. It is in this spirit that I lend my whole-hearted support to Goblin Valley State Park's application for certification as an official Dark Sky Park.

Several years ago I was walking around one of our utterly dark state parks at night and gasped at seeing the bright trail of the Milky Way. It wasn't until then that I realized that I hadn't seen that celestial configuration in my own town since I was a child.

Goblin Valley State Park has one of the darkest skies in the United States and a staff committed to making the public aware of what a treasure dark sky is. State park employees routinely offer night programs that feature educational walk and talks concerning light pollution, constellations, meteor showers and phases of the moon. These programs are popular with people camping at the remote park and even draw people who drive out just to participate in the luminous scene.

Goblin Valley is leading the way on this initiative for Utah State Parks. Since staff presented on this topic at our Annual Interpretive Training in early November, a half dozen other state parks have expressed an interest in beginning the Dark Sky certification process.

I do hope you will grant Goblin Valley State Park its Dark Sky certification as soon as possible.

Please do not hesitate to contact me if you desire any additional information from me on this topic.

Cordially,

Justina Parsons-Bemstein
Heritage, Interpretation and ADA Resources Manager
Utah State Parks





Board of Commissioners
Keith Brady - Paul Cowley - Ethan Migliori
75 East Main Street • P.O. Box 629 • Castle Dale, Utah 84513

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

Re: Accreditation Application - Goblin Valley State Park

To the IDSP Accreditation Committee Members:

The Emery County Commission supports the application for accreditation of Goblin Valley State Park as an International Dark-Sky Park. We believe this would further bring attention to the park and support our efforts to further economic and tourism development in our county.

Goblin Valley State Park has continued to grow its notoriety with a unique and otherworldly landscape with its amazing rock formations. One the key attractions to this State Park is the undisturbed and incredible visibility of the Milky Way you see at night. Goblin Valley State Park already has night events throughout the year, such as the Moonlit Hike and Telescope Tour. We hope that with the designation as an International Dark-Sky Park that the Goblin Valley State Park will continue these great events and increase visitorship to the park to be able to enjoy the many park features during the day and the stars at night.

Thank you for your consideration.

Sincerely,

A handwritten signature in black ink, appearing to read "Ethan Migliori".

Ethan Migliori
Chairman
Emery County Commission

Telephone (435) 381-3570 • Fax (435) 381-5644 • Email - commission@emery.utah.gov



PO Box 907
Castle Dale, UT 84513

December 15, 2015

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

Dear IDA Board of Directors:

The Emery County Travel Bureau is pleased to support the Goblin Valley State Park officials in their efforts to apply for the International Dark-Sky Park certification.

Goblin Valley is a unique draw to the Emery County area with its amazing rock formations and incredible activities that can be held both in and outside the park. One of those key attractions is the undisturbed visibility of the Milky Way you see at night.

Each year we schedule small FAM (familiarization) tours to show our guests how rare Goblin Valley is. The views from the park at night are spectacular, due to the management of their outdoor lighting. They've also provided events (Moonlit Hike, Telescope Tour) each month throughout the year for their guests.

We fully support Goblin Valley State Park in their efforts in seeking this designation and for conserving our night skies for guests, communities and generations to come.

Sincerely,

A handwritten signature in blue ink that reads "Keith Brady".

Keith Brady
Chairman
Emery County Travel Bureau



THE JOHN WESLEY POWELL
RIVER HISTORY MUSEUM
GREEN RIVER, UTAH

PO BOX 387
GREEN RIVER, UT
81525

(135) 561-3127
(135) 561-3525

1/4/2016

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

Dear Board of Directors,

I am writing to offer my full support of Goblin Valley State Park's ongoing efforts to seek International Dark Sky designation for their park.

Goblin Valley State Park, and the desert landscape that surrounds it, is one of the premier destinations to experience the kind of solitude, wildness, and remote atmosphere that can only be found in the vast unpopulated desert of southern Utah. With that in mind, the park is an exceptional resource for the community of Green River, and specifically our museum. In recent years, we have grown into a partnership with the Goblin Valley that exists to offer local residents greater access to the benefits of the park, and to seek better opportunities for our community to interact with the unique elements of the desert landscape.

Through museum programming, specifically an outdoor youth education program called Goblin Gang, we have used our surrounding landscape to instill a sense of pride and ownership of place for the youth of Green River. In that same regard, we have also worked with Goblin Valley to provide curriculum and programming that has already been developed by the park, and is offered by their rangers at our facility. This provides educational opportunities for local residents and tourists who may not have the ability to travel to the park, but have an interest in the region as a whole. With these efforts as a backdrop, International Dark Sky designation will go a long way in our efforts to connect local youth and other residents with their surrounding landscape, to take pride in their community and hometown, and to utilize local "backyard" resources that can inspire our community in advancing education.

As educators, we already know the value of the places like Goblin Valley and the surrounding landscape, this designation will only help us increase awareness for how special it is. Goblin Valley State Park meets the requirements for Dark Sky status, and as an organization we fully support its official designation.

Thank You,

Tim Glenn
Executive Director

EPICENTER

November 1, 2015

International Dark Sky Association
3223 North First Ave.
Tucson, AZ 85719-2103

Dear International Dark Sky Association Board of Directors,

It is our pleasure to write to you in support of Goblin Valley State Park's proposed International Dark Sky designation.

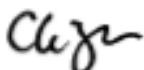
Green River is a great place to call home. It is full of wonderful, hard-working, and kind people, and it is situated in one of the most unique landscapes in the world. It has a rich history. But, the years have been tough on the town. The town's population has shrunk in half since its heyday in the 1970s. This has left many vacant buildings and lots all over town and along Broadway, which used to be a thriving downtown. The town's small size, isolated and rural location, and high percentage of low-income families makes getting resources to better or galvanize our community difficult.

Epicenter is always exploring creative ways to raise the quality of life for Green River residents and investing in quality programs, especially those that celebrate and emphasize the area, are a great way to do that. Goblin Valley State Park is in the process of strengthening their partnership with Green River's own John Wesley Powell River History Museum that will bring more interpretive and science-based activities in town, as well as special overnight programming for youth. Such activities, especially those related to Goblin Valley's dark sky designation, will enrich both locals' and tourists' understanding and appreciation of what our region has to offer – from our unique geology, to our exceptional vantage points to the heavens.

Goblin Valley's designation as a Dark Sky Park will help outsiders recognize what we already know: Southeastern Utah has the best stargazing in the world. This idea will bring more tourists to town and bolster the economy. And perhaps more importantly, it will create more opportunities for community interaction (through local programming partnerships with Goblin Valley State Park) and reinforce the fact that we are lucky to live in one of the most unique places on earth.

For these reasons, Epicenter highly encourages you to accept Goblin Valley State Park's proposal for International Dark Sky status.

Sincerely,



Chris Lezama
Epicenter Principal



Mark Sykes
Epicenter Principal

POTLUCK

GREEN RIVER BUSINESS GROUP

November 24, 2015

International Dark Sky Association
3223 North First Avenue
Tucson, AZ 85719-2103

To Whom It May Concern:

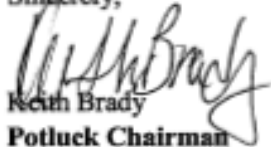
I am writing to you on behalf of Goblin Valley State Park's international dark sky status application.

Green River is a rural desert town with a population of 952. Large industry has come and gone. Now, Green River's main opportunity and challenge is using our town's surrounding assets and collective strength to support other economic opportunities. Many in the community, including myself, believe the biggest opportunity lies in tourism. Potluck's main goal is to develop that tourism infrastructure and message for our community. Goblin Valley State Park's potential dark sky certification and related publicity/outreach efforts are exactly the types of opportunities we're looking for – it will help showcase nearby Goblin Valley and help accentuate what makes it special.

Potluck will appreciate the economic benefits the dark sky program will bring to our community as it will provide one more reason for people to stay and play in Green River's backyard. Potluck will soon be spearheading a new Green River tourism campaign that will feature some of Green River's famous neighbors (including Arches National Park and Goblin Valley State Park) – and will be sure to promote and celebrate Goblin Valley's dark sky status to potential visitors.

Potluck enthusiastically supports Goblin Valley's proposed dark sky designation and hopes the International Dark Sky Association will as well. Thank you for your consideration.

Sincerely,



Keith Brady

Potluck Chairman
Robbers Roost Motel Owner
Emery County (Utah) Commissioner



Department of Green River PACT

mail PO Box 191 Green River Utah 84525
 office (435) 564-8221
 email pyramidyouthprograms@gmail.com
 place Community Center, 125 South Long Street

December 16, 2015

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

As a member of Goblin Valley State Park's local community, Pyramid Youth Programs supports the efforts to certify as a Dark Sky Park. Green River is a rural community that is a launchpad to numerous natural resources. Often, youth in Green River feel as though there is nothing to do. Yet with access to parks such as Canyonlands, Dead Horse Point, Capitol Reef, and Goblin Valley, youth have an opportunity to explore singular landscapes that few others can readily experience.

Pyramid Youth Programs, in partnership with the John Wesley Powell River History Museum, connects youth to these ready-made educational experiences. Goblin Valley is a cornerstone to these efforts. Pyramid and the Museum's first efforts at connecting youth to this landscape took the form of Goblin Gang, named after Goblin Valley's eponymous rock formations. Goblin Gang is an outdoor recreation and educational program that highlights the glut of beauty and bevy of unique history that surrounds Green River.

As Goblin Valley begins to expand its reach, we hope to partner further with the park to expand youth opportunities for exploration. The recent night sky program that took place in Green River was very successful and brought in high school students. The night sky within the very city of Green River is darker than most rural sites in the Eastern United States. By promoting Goblin Valley as a Dark Sky Park, Green River could become a community that provides in-town access to incredible night skies. Goblin Valley, as a Dark Sky Park, can influence the lightscape of town and create a community that showcases the dark sky.

The educational value of Goblin Valley and the night sky to the youth of Green River is something Pyramid recognizes and believes in. We hope that Goblin Valley will be recognized as a Dark Sky Park to help with the promotion of our shared natural nightscape.

Thank you,

Justin Queen
 Executive Director

HOME OF THE PIRATES

GREEN RIVER HIGH SCHOOL
745 WEST PIRATE AVE.
P.O. BOX 450
GREEN RIVER, UTAH 84525



Kayce Fluckey
PRINCIPAL
PHONE: (435-564-3461)
FAX: (435-564-8259)

RE: Goblin Valley State Park International Dark Sky Certification

12/11/2015

To Whom It May Concern:

Green River High School enthusiastically supports the efforts that Goblin Valley State Park is making to acquire Dark Sky status. The area around Green River is well known for our unique features, such as Goblin Valley, remote hikes, and recreation opportunities. Having International Dark Sky status would be another attraction that would bring economic and educational support to our area.

Goblin Valley State Park has partnered with the John Wesley Powell Museum to provide the youth of Green River telescope tours in Green River and at Goblin Valley. Our science class at the high school was happy to give extra credit to those who participated in these tours. Therefore, having Dark Sky status would further encourage this partnership to continue. Thus, providing the students at Green River High School valuable learning opportunities.

It is a pleasure to support the Goblin Valley State Park in their quest to obtain this certification. We at Green River High School can only see an added benefit to our school and community if the certification is granted.

Sincerely,

A handwritten signature in cursive script that reads "Kayce Fluckey". The signature is written in black ink and is positioned above the printed name.

Kayce Fluckey
Green River High School
Principal

12/13/2015

To whom it may concern,

Hello, my name is Nathan O'Bryant and I am the Music teacher at Green River High in Green River, Utah. I am writing on behalf of James Wells and Goblin Valley State Park and their desire to become an official Dark Sky Park. I am in my second year teaching at Green River High school and I appreciate the great sky we already have here and imagine it could be even darker with proper implementation. Although I have not been here long, my mother has owned a house here for over ten years and we have been and will continue to be invested in Green River community and surrounding area. I have had the chance to experience the Dark Sky community of Flagstaff AZ and was greatly impressed and enthused about it. In contrast, if you take a drive along I-15 in Utah Valley you can witness the ever increasing amount of light pollution in the form of lighted billboards along the freeway and outside business establishments. If only Utah Valley had a better light pollution ordinance in place, the impact of night time lights is a real threat to nature. Who knows, maybe we will get a telescope in the Goblin Valley/Green River area some day.

I would like to conclude by saying that I fully support the idea of Goblin Valley becoming a Dark Sky park and I am confident that Green River could benefit from this greatly, not only in terms of natural conservation but also economic and educational growth/improvements.

Sincerely,

Nathan O'Bryant
Green River High
Music Dept.
Green River, Utah 84525

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Park Overview

Geology

Goblin Valley State Park, situated on 3,650 acres of land at the southeastern edge of Utah's San Rafael Swell, is known worldwide for its unique geology. Here lies one of the earth's largest concentrations of hoodoo rock formation: tens of thousands, spread across an area of approximately three square miles. In contrast to the spires of Bryce Canyon, most found in this state park are twisted and human-sized, earning them the nickname "goblins."

Four layers of uplifted sand and siltstone cover Goblin Valley State Park, dating as far back as 170 million years. The Entrada formation is the oldest of these, and is the source of the park's "goblins." Once a muddy tidal flat along a shallow inland sea, the formation today consists of lithified shale and sandstone blocks hidden within a layer of loose siltstone. Wind and water slowly erode this loose sediment, exposing the harder material, which in turn acts as an umbrella and shields an ever-growing stalk of siltstone beneath it. Spheroidal erosion has since given the capstones a rounded, sometimes oblong appearance. The park's approximately 100,000 annual visitors are invited and encouraged to wander the "Valley of Goblins" at will. There are no designated trails through these features.



A typical scene within the Valley of Goblins. The San Rafael Swell rises to the northwest.
Photo Credit: Sarah Siefken-Perez.

Human History

Curiously little is known about human interaction with the Valley of Goblins prior to the mid-20th century. Although the nearby San Rafael Swell served as a seasonal hunting ground for the ancient Fremont and Barrier Canyon people, no related artifacts or rock art have ever been found within the park. Similarly, while a photograph of Wild Horse Butte proves that the John C. Fremont expedition of 1853-1854 passed just within the park's northern boundary, there is no evidence that these explorers ever laid eyes upon the unique rock formations that stood less than two miles away. As ranchers began trickling into the area during the closing decades of the 19th century, the Valley of Goblins was eventually discovered but remained a mere local curiosity.

In 1949, everything changed. Guided by Hite ferryman Arthur Chaffin, and local ranchers Perry and J. Worthen Jackson, wilderness photographer Philip Tompkins documented what he referred to as "Goblin Gulch" for the first time. The men held a press conference in Salt Lake City the following year, resulting in nationwide fervor to explore the previously unknown geologic wonder. Severe impact upon the hoodoos and surrounding landscape led to the establishment of a better-protected Goblin Valley State Reserve in 1954, which in turn became Utah's 17th state park in 1964.

Since its establishment, the facilities at Goblin Valley State Park have been upgraded several times. Solar power came online in 1988. The park's entrance road was paved in 1999. The combined visitor center and entrance station, as well as an expanded campground, opened during the following decade. Finally, two rentable yurts were constructed in 2011.



Left: The Goblin Valley State Park visitor center and entrance station.

Right: A view of the park's campground, with the combined shower and restroom facility at center.



Above: Facilities at the Valley of Goblins observation point.

Photo credit:
James Wells



Above: One of the park's two yurts, located just north of the main campground

Stargazing Opportunities

While its unique geology is the primary reason that visitors come to Goblin Valley State Park, stargazing stands as a close second. Located more than one hundred miles from any major population center, the night sky here possesses a clarity not often seen within the United States today. The park gates are open to the public between 6:00am and 10:00pm, allowing for at least some night sky viewing throughout the entire year. Hours are extended during evening interpretive programs, and campers enjoy unlimited access.

As the highest easily accessible ground in the park, the Valley of Goblins Observation Point is the most popular location for stargazing. From here, there are virtually unimpeded views in all directions. Only Wild Horse Butte presents a minor obstruction to the northwest. As the images below exemplify, many photographers venture down into the Valley of Goblins itself, as the twisted rock features make for a fantastical addition to any picture of the night sky.

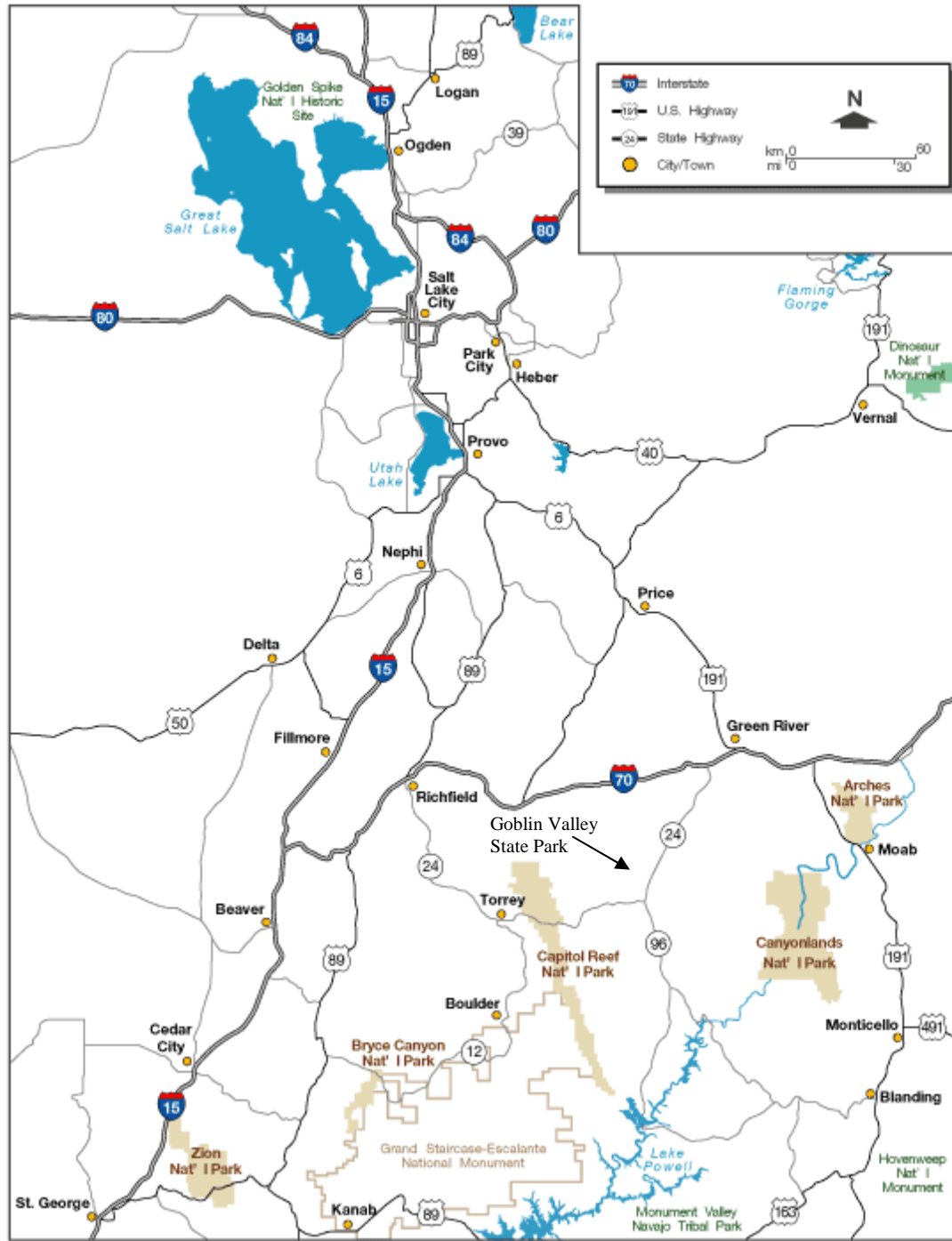


Photo Credit: Wally Pacholka,
AstroPics.com



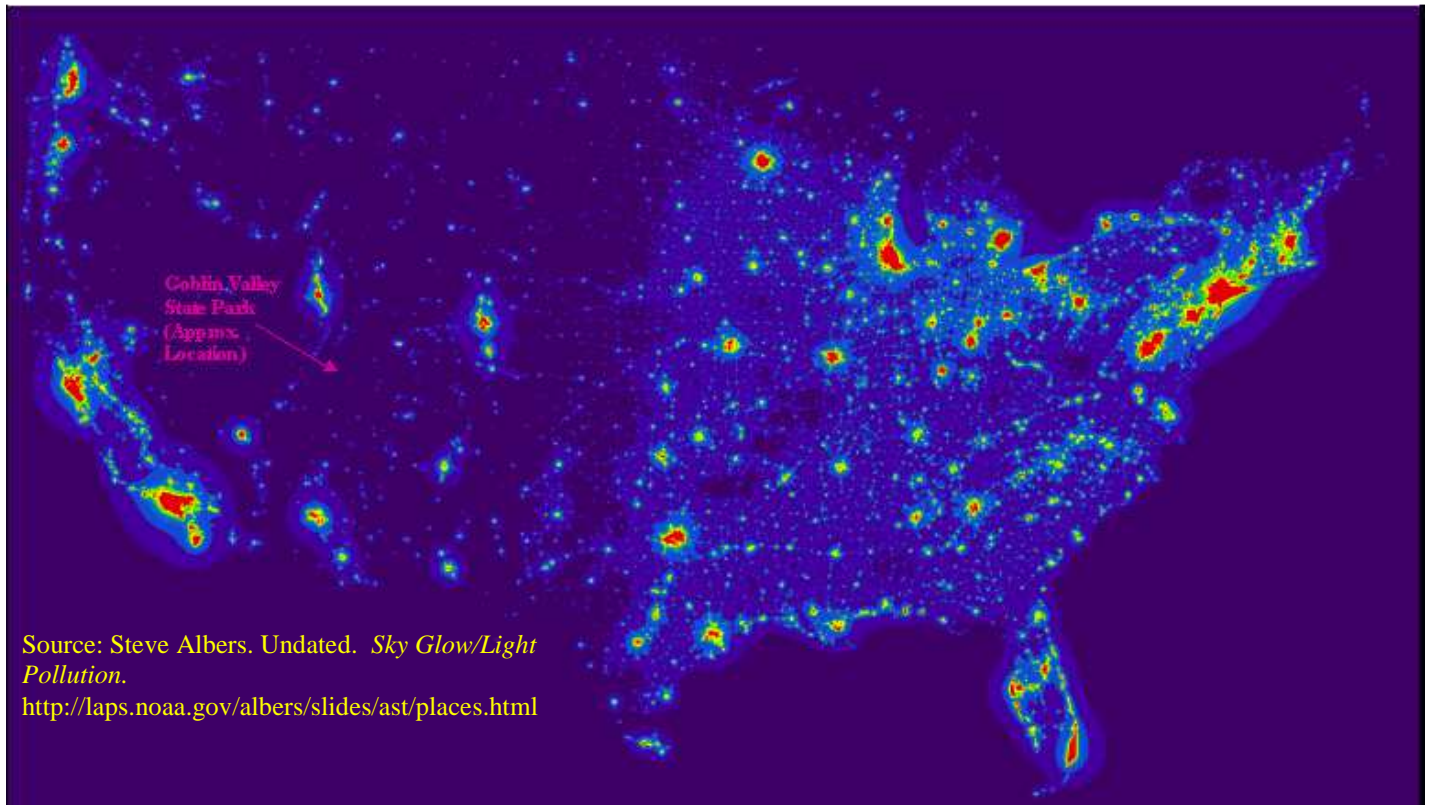
Park Location & Dark Sky Designation Area

Goblin Valley State Park is located in southeastern Utah, on the southeastern edge of the San Rafael Swell. Hanksville (pop. ~200) to the south, and Green River (pop. ~1,000) to the north are the nearest communities.

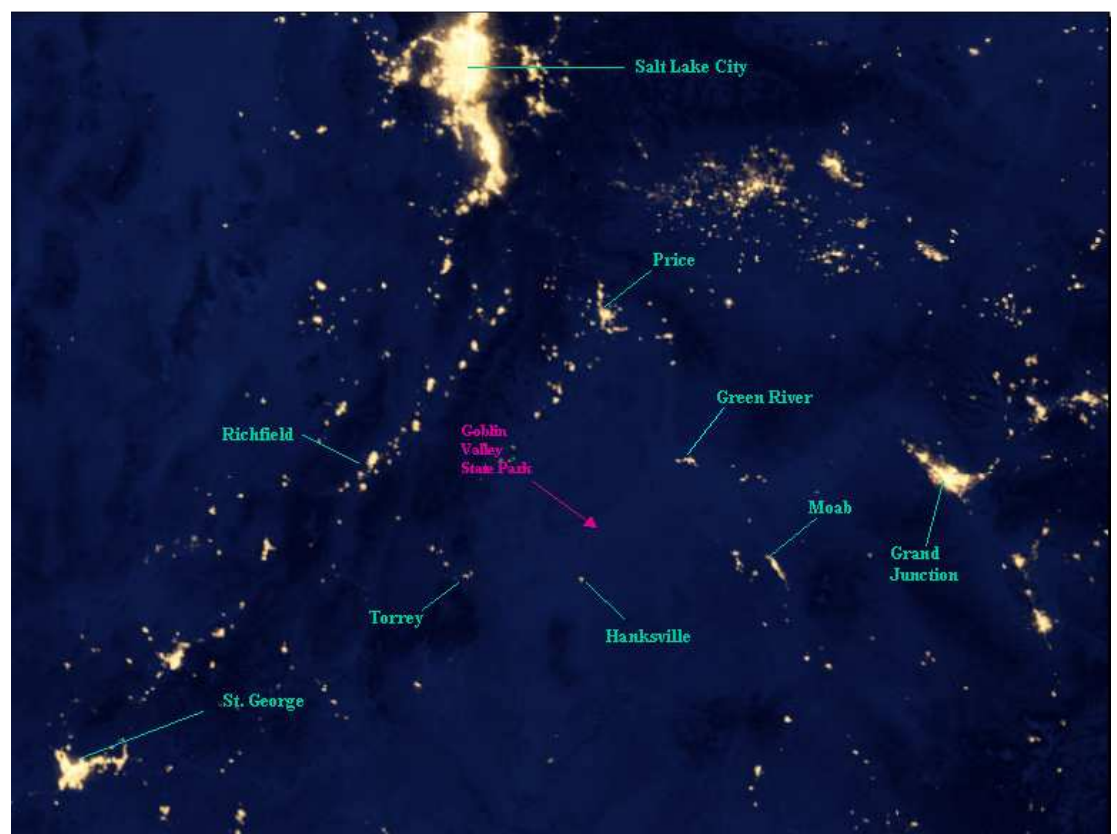


Source: Utah Travel Industry Highway Map. 2014. <http://www.utah.com/maps/utahhighwaymap/>

Similar to nearby national park units at Capitol Reef and Natural Bridges, Goblin Valley State Park exists in a very dark corner of the American West. As the images below reveal, the state park is almost completely unaffected by sky glow emitted from regional population centers.

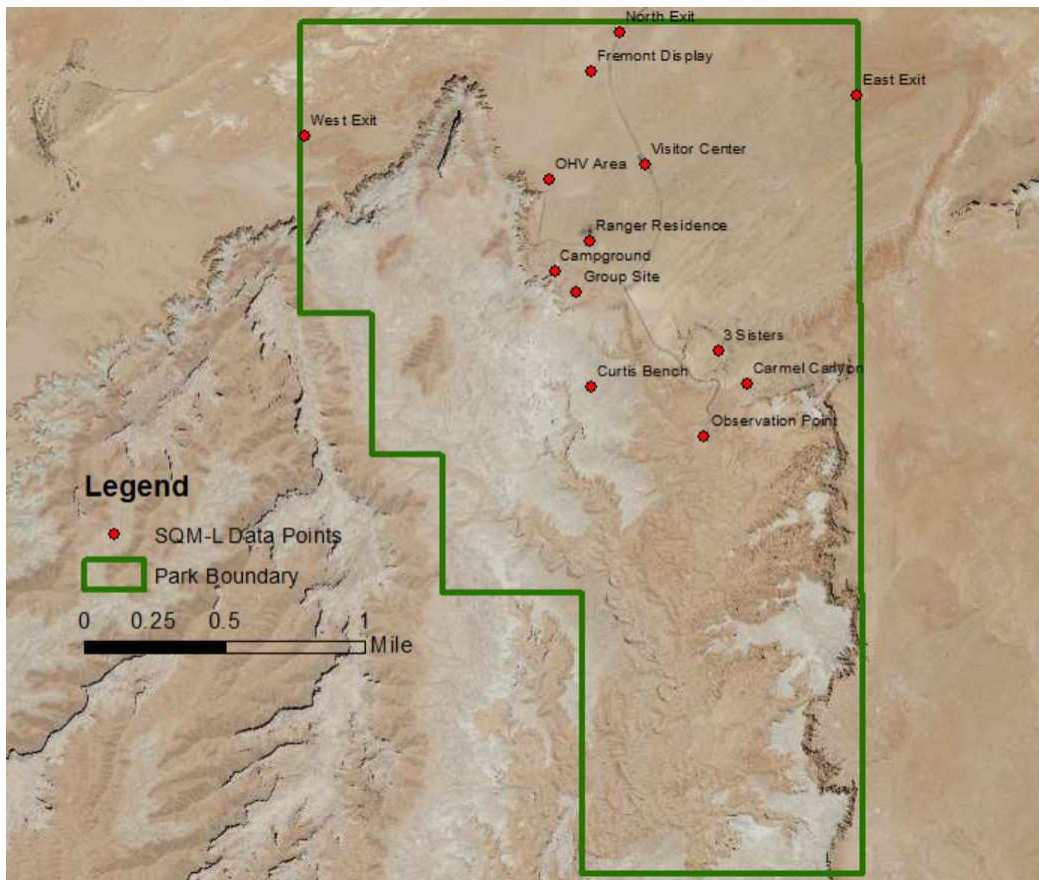


Source: NASA. 5 December 2012.
NASA-NOAA Satellite Reveals New Views of Earth at Night.
http://www.nasa.gov/mission_pages/NPP/news/earth-at-night.html#.U-TmrVVdW-k



Night Sky Measurements

The entirety of Goblin Valley State Park is thus submitted for international dark sky status. Measurements of night sky quality are taken on a monthly basis, after the end of astronomical twilight, and on a moonless night (as close to a new moon as cloud cover allows). The thirteen sites chosen for analysis represent some of the most likely locations from which visitors observe the night sky. The rugged backcountry terrain of the southern and western reaches of the park presents a potential safety hazard in darkness, and so is excluded from the study. Due to the park's small area, it is unlikely that these areas would significantly alter the data if measured. Night sky quality is measured with the park's Unihedron SQM-L light meter.



Map Notes

- The “Fremont Display” is an interpretive panel detailing the passage of John C. Fremont’s expedition through the park in 1854.
- “Curtis Bench” and “Carmel Canyon” are hiking trails.
- “3 Sisters,” or “The Three Sisters,” refers to the name of the park’s most iconic goblin formation.

The chart below depicts the culmination of fifteen months of light meter readings. Spread across the thirteen study sites, this amounts to nearly two hundred unique data points. As of the time of this application submission, the park as a whole averages a light meter reading of approximately 21.4 on moonless, cloudless nights. There appears to be seasonal variation, with spring and summer nights being darker than those of the fall and winter. The reason for this is unknown, but could be due to a combination of seasonal air quality differences and positioning of the Milky Way. Park staff will continue taking measurements on a monthly basis, and will hopefully be able to further document this phenomenon.

Data Point	Jul-14	Aug-14	Sep-14	Dec. 2014	Jan. 2015	Feb. 2015	Mar. 2015	Apr. 2015	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	S. Avg
North Exit	21.51	21.17	21.42	21.2	21.25	21.36	21.18	21.52	21.65	21.55	21.59	21.46	21.47	21.27	21.38	21.4
East Exit	21.51	21.26	21.45	21.21	21.28	21.31	21.28	21.55	21.64	21.59	21.54	21.43	21.32	21.18	21.36	21.39
West Exit	21.65	21.18	21.42	21.19	21.25	21.29	21.29	21.57	21.62	21.62	21.52	21.3	21.34	21.29	21.34	21.39
Fremont Display	21.54	21.17	21.39	21.18	21.31	21.26	21.37	21.55	21.66	21.55	21.62	21.52	21.37	21.29	21.36	21.41
Visitor Center	21.53	21.2	21.38	21.22	21.3	21.33	21.34	21.57	21.67	21.52	21.56	21.38	21.37	21.28	21.3	21.4
OHV Area	21.58	21.23	21.42	21.21	21.3	21.32	21.14	21.5	21.63	21.5	21.54	21.52	21.38	21.32	21.37	21.4
Ranger Residence	21.41	21.36	21.4	21.09	21.27	21.29	21.12	21.47	21.58	21.51	21.48	21.47	21.45	21.34	21.25	21.37
Campground	21.5	21.25	21.36	21.15	21.27	21.36	21.1	21.5	21.65	21.51	21.37	21.6	21.29	21.22	21.27	21.36
Group Site	21.62	21.25	21.41	21.16	21.29	21.32	21.18	21.4	21.6	21.51	21.52	21.61	21.43	21.24	21.33	21.39
Three Sisters	21.49	21.27	21.38	21.23	21.29	21.3	21.28	21.54	21.64	21.76	21.52	21.57	21.41	21.23	21.34	21.42
Carmel Canyon	21.55	21.23	21.39	21.22	21.27	21.24	21.15	21.5	21.68	21.74	21.57	21.58	21.37	21.3	21.33	21.41
Curtis Bench	21.63	21.35	21.39	21.2	21.3	21.28	21.18	21.54	21.65	21.55	21.54	21.46	21.27	21.32	21.3	21.4
Observation Point	21.6	21.25	21.37	21.21	21.3	21.33	21.19	21.49	21.64	21.77	21.58	21.57	21.31	21.27	21.27	21.41
Park Average	21.55	21.24	21.4	21.19	21.28	21.31	21.22	21.52	21.64	21.59	21.53	21.49	21.37	21.27	21.32	21.39

Notes:

- The park's original SQM-L light meter began malfunctioning in October 2014, resulting in extremely bright readings for both that month and November. This data has been discarded. The park purchased a new light meter in December 2014.
- The March 2015 readings, out of necessity with the moon cycle, took place during one of the busiest times of the year. Significant campground light pollution may have influenced many of the data points.

In November 2015, light meter readings were also taken in the nearby town of Green River in order to compare the skies of Goblin Valley State Park with those of a local population center. Three data points were chosen for this limited analysis:

- 1) The John Wesley Powell Museum of River History, located on the eastern side of the city near several hotels catering to interstate travelers.
- 2) The campground of Green River State Park. Sheltered by trees in all directions, this is likely to be the darkest spot in the community.
- 3) The clubhouse of Green River State Park, centrally located along Main Street.

These three locations are both important to the community outreach activities of Goblin Valley State Park, and present a wide spread of data points across the city. Although still quite dark, with an average light meter reading of 20.68, the skies over Green River did not approach Goblin Valley State Park's November average of 21.37.

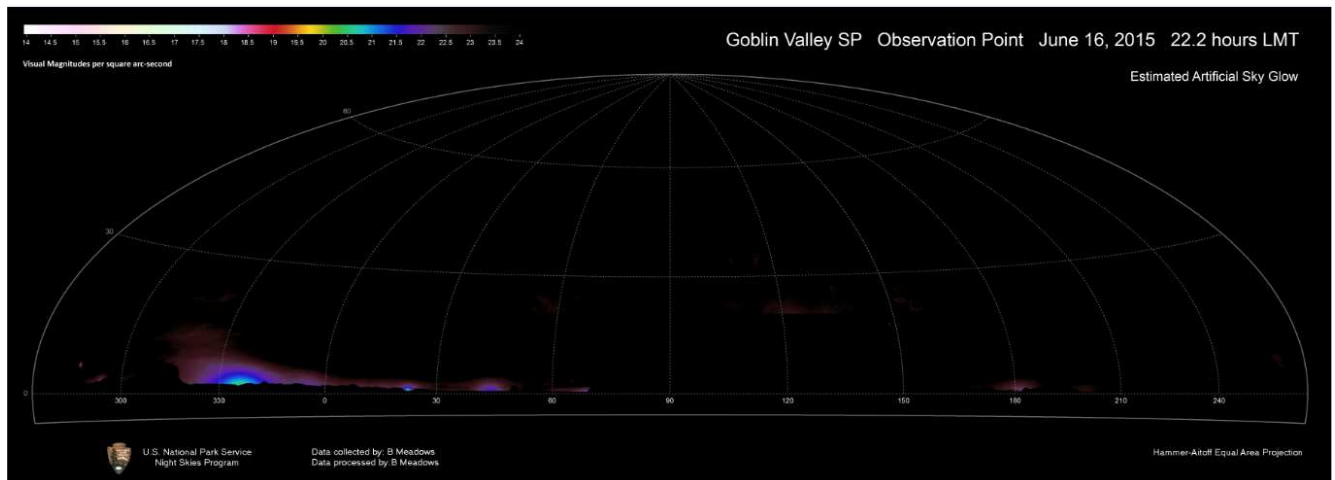
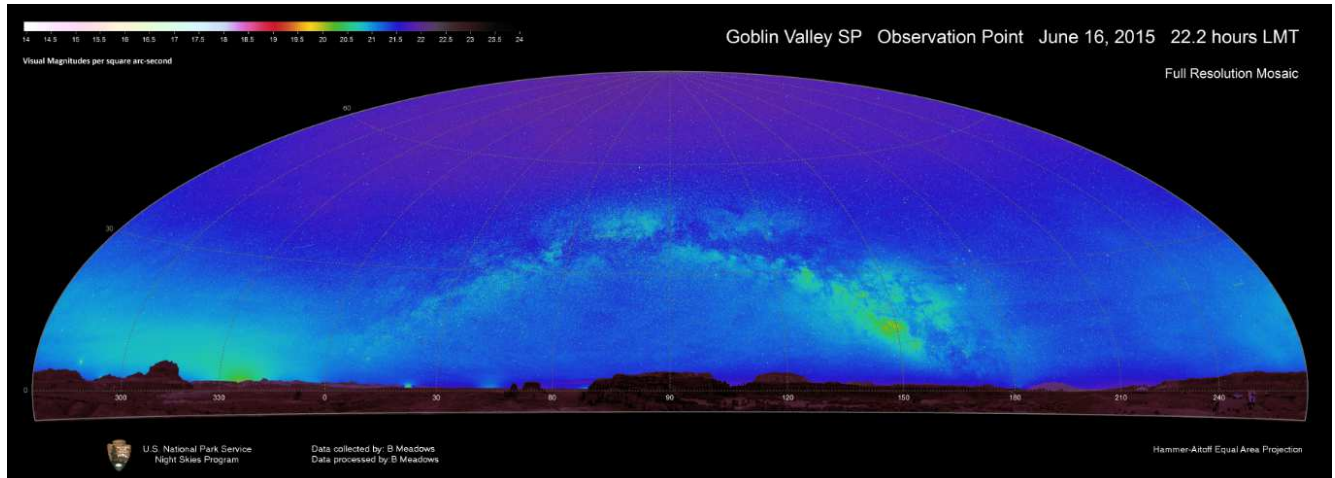
Light pollution is thus a topic of discussion in all educational activities conducted in Green River.



The geographical distribution of light meter data points taken in Green River, November 2015.

Professional Data Collection

Bob Meadows of the National Park Service's Dark Sky Team visited Goblin Valley on June 16, 2015. His analysis, conducted at the observation point parking lot, revealed one of the darkest skies on record. As shown in the images below, Goblin Valley State Park is virtually unaffected by artificial light pollution and is thus classified as having a Bortle Class 2 sky. In conjunction with the photography, both Meadows and park staff conducted light meter readings at the observation point, measuring 21.80 and 21.77 respectively.



Above: Imagery of the night sky over Goblin Valley State Park, as captured by Bob Meadows of the National Park Service Dark Sky Team. The Hunter and Huntington Power Plants, located approximately fifty miles north in the Castle Valley, create what is normally the only light dome visible from the park. These images also captured faint lights from Green River and Moab to the east/northeast, as well as Hanksville to the south.

The small, bright light captured at approximately 20 degrees is actually that of a vehicle entering the park, and is thus excluded from the analysis.

NPS NIGHT SKIES PROGRAM DATA NIGHT REPORT

GVSP150617

Goblin Valley SP

Observation Point

17-Jun-15



Data Night Attributes

Longitude: -110.70208	Camera: ML 3	Air temp. (C): 28.6	ZLM: 7.20	OBS_1: B Meadows
Latitude: 38.56542	# of sets: 2	R. H. (%): 12.4	BORTLE: 42006	OBS_2:
Elevation (m): 1515	Exposure (secs): 14	Wind Speed (mph): 3	SQM: 21.80	OBS_3:

NARRATIVE: An excellent night sky from this location. Moab and Green River barley visible to the E and NE and the Greater Salt Lake City area also just visible to the north. There is some residual haze along the distant horizon from the very hot temperatures. Very good detail in the Milky Way and stars visible down to almost the horizon to the south. Some airglow obvious all around (especially to the west), but otherwise a fairly pristine night sky. No artificial lights from within the park visible from this astronomy site.

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. ($\mu\text{mag}/\text{airmass}$)	Std err Y	# stars used	# stars reject	% Clouds	Ave. Point Error	Max Point Error	total bias drift
1	Y	5	5	5	95	4	Some banded airglow	0.175	0.03	145	2	1	0.37	0.57	2.8
2	Y	5	5	5	89	4	Some banded airglow	0.170	0.03	132	2	1	0.42	0.63	1.9

Above: Meadows' written analysis of the photos taken by the NPS dark skies team. The narrative states that the northerly skyglow is a result of the Salt Lake City metro area. Further data collection in the region, however, revealed that it is actually a result of two power plants located in the Castle Valley.

Jim,

After a conversation with Mark Miller (Chief of Resources for Arches & Canyonlands) about the images I collected at Arches a couple of days after Goblin Valley, I am fairly certain that the light dome to the north is the Hunter Power Plant just south of Castle Dale. Coincidentally, the Huntington Power Plant is only 15 miles further north on almost the same bearing. The two plants combined are probably creating the light dome we are seeing. Hunter was visible from both Arches and Dead Horse Point, and from those sites there is nothing else along that bearing. For Goblin Valley, Salt Lake City is at the same bearing, but the data from the other parks tells me that the power plant(s) is what we are seeing. Hope this finally clears up the mystery!

Bob

Bob Meadows
Physical Scientist
National Park Service - Natural Sounds & Night Skies
Natural Resource Stewardship and Science (NRSS)

Above: Email correspondence between Bob Meadows of the National Park Service Dark Skies Team and Goblin Valley State Park naturalist James Wells, regarding the sky glow observed north of the park.

Night Sky Interpretation

Due to a small staff size, interpretive activities at Goblin Valley are limited to approximately two programs per week. All park employees are encouraged to develop and present these activities, which are overseen by a naturalist who maintains a certification as Interpretive Guide through the National Association for Interpretation. Depending upon weather conditions and moon phase, evening programs may include...

Full Moon Hikes – Visitors are led on a ½ mile hike through the Valley of Goblins. The primary draw of the program is to experience the eeriness of the landscape under the silver light of a full moon – allowing one to better understand how these hoodoos received their local name. One additional topic discussed during the hike is the effects of the moon cycle upon various animal species (including humans), and how artificial light pollution can mimic or even surpass the influence of a full moon.

Half Moon Hikes – Similar in both route and interpretive scope to the full moon hikes. The advantage here is that visitors can experience Goblin Valley’s beautiful night sky while still generally being able to navigate the terrain without a flashlight. Depending upon the moon’s position, even the Milky Way can be visible during these hikes.

Telescope Tours: These highly popular programs are conducted on moonless nights, and began with the park’s purchase of a Celestron CPC Series telescope in early 2014. They are conducted by a staff member who has undergone training in the interpretation of astronomy. Themes vary by season, depending on which phenomena are visible in the early evening. At all times of year, a shielded flashlight demonstration is given in order to highlight the importance of dark sky lighting.

A Walk with the Bats: This program utilizes the park’s new Magenta 5 Bat Detector, which converts echolocation into audible sound. A brief 15 minute presentation is first conducted at sunset, giving some basic facts about bat species and their echolocation ability, followed by a ¼ mile walk near a cliff side that bats tend to frequent – allowing visitors to hear them at “work.”

Basic attendance statistics for these programs are kept, as outlined in the examples below:

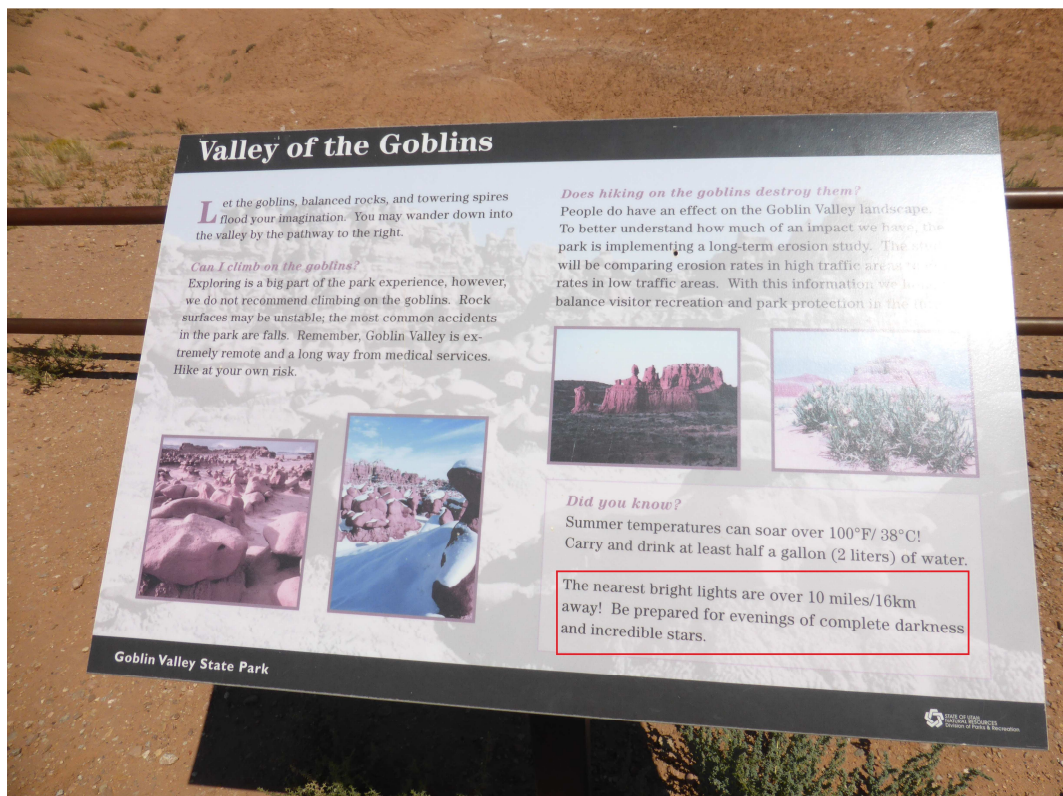
Date	Time	Program Title	Location	Adults	Children	Total	Where From?
7/11/2015	9:20-10:00pm	Telescope Tour	Observation Point	15	5	20	UT, WA, Germany
7/24/2015	9:30-10:30pm	Half Moon Hike	Valley of Goblins	2	3	5	UT, CA
8/1/2015	9:30-10:15pm	Full Moon Hike	Valley of Goblins	12	5	17	UT, AZ, BC, Germany
9/25/2015	7:15-8:00pm	A Walk with the Bats	Amphitheater	10	8	18	Utah



This photo from October 16, 2008 reveals that full moon hikes have long been a popular activity in Goblin Valley State Park

Interpretive Signage

Information on the night sky has only recently become a theme. Park renovations in 2007 added several displays at the Valley of Goblins Observation Point, but only two sentences (highlighted below) mentioned the quality of darkness that can be experienced on a moonless night.

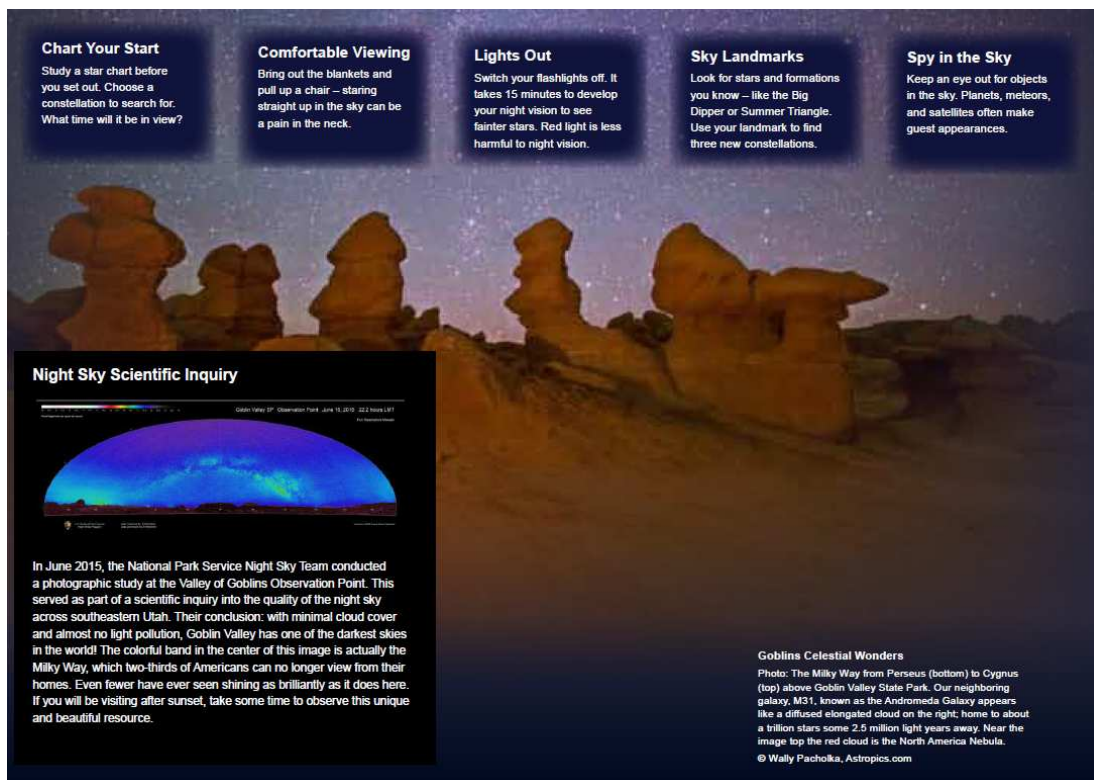
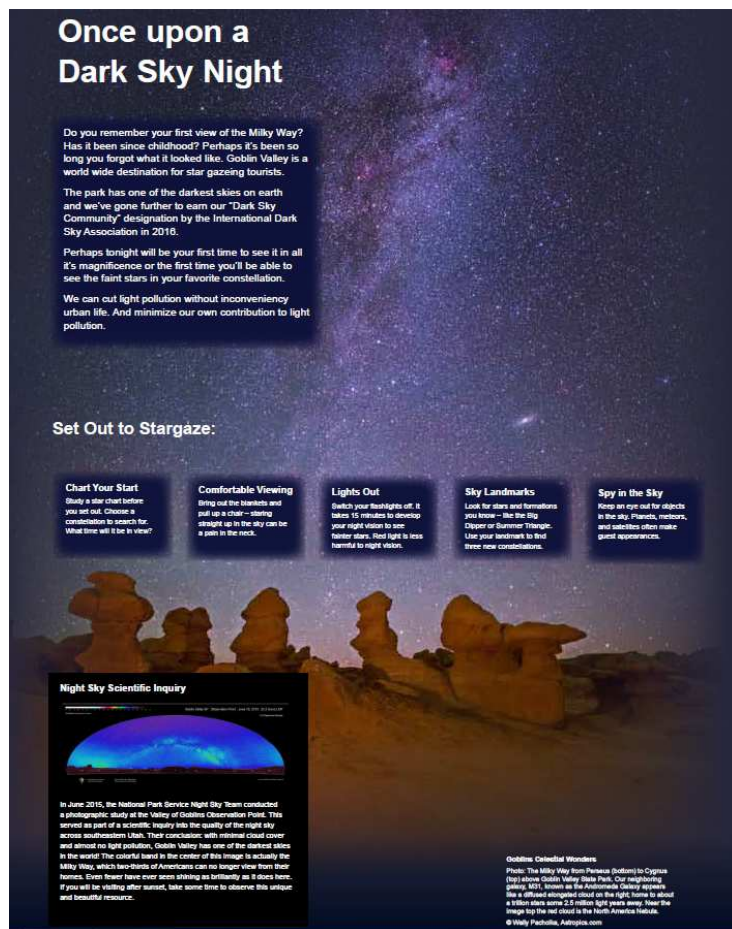


In order to draw more attention to the magnificent dark skies over Goblin Valley, park staff developed two additional panels in 2015. The panel depicted here will be placed at the Valley of Goblins Observation Point with the goal of assisting visitors in their evening stargazing efforts. A small insert in the lower left lets the reader know that they are, in fact, experiencing one of the darkest skies on the planet.

As an additional resource, monthly sky charts from www.skymaps.com are posted in both the campground and at the Valley of Goblins observation point.


Right: The full draft panel to be placed at the Valley of Goblins Observation Point. Dimensions are 3 feet wide x 4 feet tall.

Below: An expanded view of the lower half of the panel.



Protecting the Night Sky: It's all about the lighting


As a society, we only need to modify our lights with shielding so that they project downward, illuminating the areas necessary for safety while preventing needless skyward pollution.



The exposed light in the photo to the left.



The shielded light in the photo below.



Light up where light is needed. Use a shield to protect the sky.



Ranger Residence

Lighting modifications to Goblin Valley State Park's ranger residence, completed in December 2014, serve as an example of how we can make a difference one home or business at a time.

Notice how even low wattage bulbs, if left exposed, can cause tremendous glare (photo top left). Inexpensive shielding mitigated this problem, directing light only to where it is most needed.

An Escape from Light Pollution

Every year, thousands of visitors come to Goblin Valley after dark in order to experience the region's incredible night sky. For some, it is the first time they have ever seen the Milky Way.

There is no reason, however, why anyone should have to travel to experience the stars. Light pollution is not a necessary result of urban living.

Bring Dark Sky Home

If you would like take steps to protect your own night sky, try following these simple guidelines:

1. Light only WHERE you need it
2. Light only WHEN you need it
3. SHIELD lights and direct them downward
4. Use the MINIMUM AMOUNT of light necessary
5. Select lamps with WARMER COLORS
6. Select the most ENERGY EFFICIENT lamps and fixture

Dark Sky Communities

Many places around the world, such as those listed below, have already taken on the task of improving their night sky quality. This has earned them the designation of "Dark Sky Communities" by the International Dark Sky Association.

- Flagstaff, Arizona
- Dripping Springs, Texas
- Sedona, Arizona
- Homer Glen, Illinois
- Borrego Springs, California
- Beverly Shores, Indiana
- Coll, Scotland
- Sark, Channel Islands

International Dark Sky Association. www.darksky.org.

Meanwhile, the above interpretive panel (dimensions 3 feet wide x 2 feet tall) will be placed in the Goblin Valley State Park visitor center as a publicly visible lighting project. The ranger residential complex is similar to many small apartment buildings and single family homes found across the United States. It is therefore hoped that many readers will envision upgrading their own residences with dark sky lighting, and perhaps even talk to their neighbors and community leaders about doing the same. At the time of this application (March 2016), the completed panels have just arrived in the Utah State Parks central office in Salt Lake City. They will be transferred to Goblin Valley State Park and installed during the coming weeks.

Right: The newly completed panels awaiting transfer to Goblin Valley State Park.



To aid in the interpretive efforts of its staff, Goblin Valley State Park's visitor center gift shop also maintains a display dedicated to night sky materials. Magnet and note card souvenirs display the incredible nightscapes that can often be seen from the valley floor. For those interested in learning more, star charts, astronomy guides, and an assortment of books (including children's books) are available for purchase.



Note: Gift shop book selection can vary due to supplier inventory.

Educational Outreach

With a maximum staff size of five individuals during peak season, Goblin Valley State Park is somewhat limited in its ability to conduct educational programming off site. Still, an educational partnership is in the process of being developed with the John Wesley Powell River History Museum, centrally located within the town of Green River. Weather and staff size permitting, interpreters from Goblin Valley will conduct telescope programs at the museum several times each year. The hope is to attract members of the local population who may otherwise not wish to make the hour-long drive to Goblin Valley State Park. The first such event took place on October 10, 2015, with a turnout of twenty people, all residents of Green River. Additionally, the state park will host overnight events for the museum's youth program (the Goblin Gang). Depending upon conditions, these may include any combination of moonlit hikes, telescope programs, and/or bat viewings.

Beyond Green River, Goblin Valley State Park has joined the Colorado Plateau Dark Sky Cooperative. It is hoped that even with limited resources, park interpreters will be able to contribute to any event or initiative happening around the greater Moab or Capitol Reef areas.

Goblin Valley's Dark Sky in the Media

Publicity in local media outlets has occasionally aided in the educational and interpretive outreach activities at Goblin Valley State Park. Efforts to attain international dark sky certification began to attract media attention during the fall of 2014. In November of that year, the park's telescope and constellation tour was featured on *At Your Leisure*: a program dedicated to outdoor pursuits across Utah and the greater Southwest. In addition to its Internet posting, the 30-minute episode also aired on Salt Lake City's ABC Channel 4, as well as the Uintah Basin's VTV Channel 6. The full segment can be viewed at the link below, with the sky tour beginning shortly after the 15-minute mark.

<https://www.youtube.com/watch?v=621E1brOOSc&list=UUtMXQDKxkYuPQSZ0F0MUFfQ>

In August 2015, park naturalist James Wells traveled to Salt Lake City for an interview with local news station Fox 13 Now. The short three-minute segment, which can be viewed at the link below, focused on the recent NPS analysis of Goblin Valley's dark sky, as well as the park's application for IDA certification.

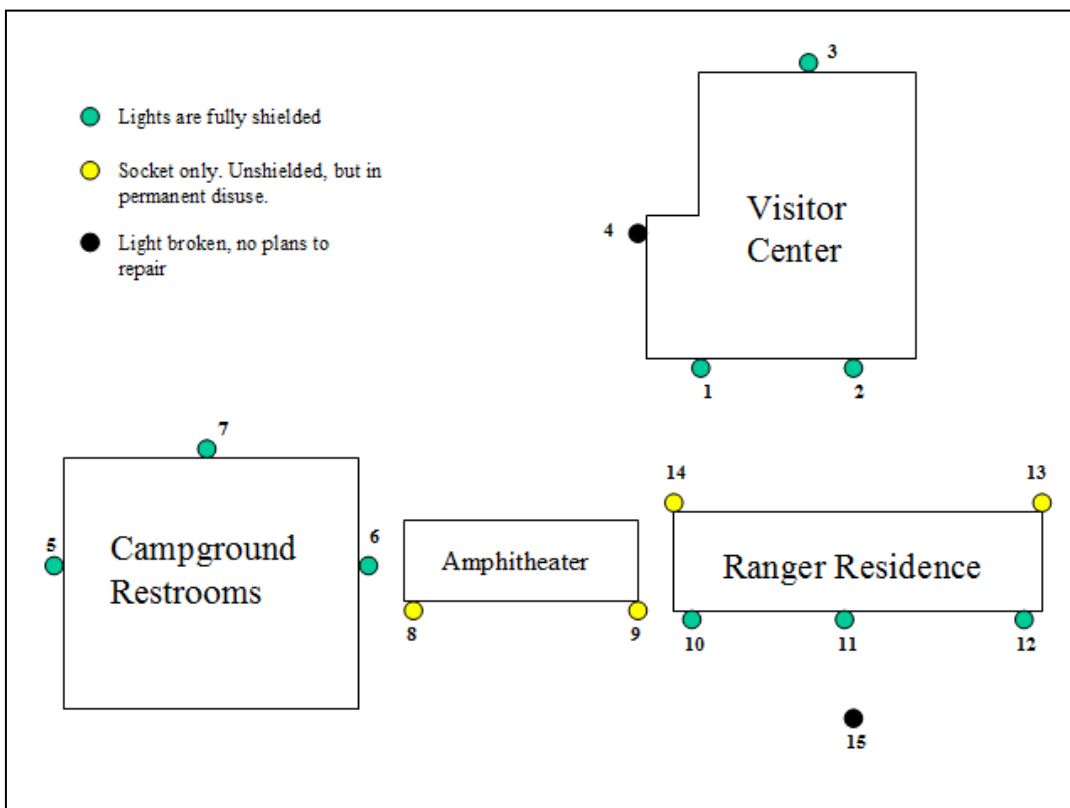
<http://fox13now.com/2015/08/13/utah-adventure-star-gazing-in-goblin-valley-state-park/>

Park Lighting Inventory












Goblin Valley State Park possesses fifteen exterior lights, spread across four buildings. Six are designated for pedestrian safety around public egress points at the visitor center and campground restroom facility (numbers 1-3 and 5-7). All are encased within their buildings and thus fully shielded. These safety lights are also used only sparingly. At the campground, all are activated by motion sensor and automatically switch off within a few minutes. At the visitor center, the lights must be switched on via circuit breaker, and are only used during rare special events (for example, the start of the Goblin Valley Ultra Marathon each October).




At the ranger residence, the front exterior lights of the ranger residence have been modified, from 13w unshielded fluorescent bulbs, to 9w shielded incandescent. These new bulbs were then shielded with Zigurat Dark Sky Outdoor Sconces from AmeriTec Lighting. These modifications will be depicted on an interpretive panel to be placed within the park's visitor center, with the goal of educating the public as to changes they can make in their own homes and neighborhoods to reduce light pollution.

The other exterior lights within the park are in a permanent state of disuse. At the park's amphitheater, two unshielded and low wattage floodlights once existed for the purpose of event setup and take down. These proved redundant and unnecessary, however, as the entire facility can be illuminated simply by opening the backstage doors and using interior lighting. Assessments of other rarely used or broken fixtures, including floodlights at the ranger residence and a motion-triggered bulb at the park's entrance station, revealed all as equally extraneous. This inventory therefore not only resulted in the shielding and downgrading of certain fixtures, but an overall reduction of the number of exterior lights in Goblin Valley State Park.



Park Lighting Matrix

Ref. #	Photo	Details	Location (Height)	Fully Shielded?	Special Purpose >500 Lumens?	Lighting Guideline Conformity?
1		26w CFL Motion Sensor	Visitor Center Restroom Exterior, West (9 feet)	Yes	Yes	Yes
2		26w CFL Motion Sensor	Visitor Center Restroom Exterior, East (9 feet)	Yes	Yes	Yes
3		26w CFL Motion Sensor	Visitor Center Entrance (14 feet)	Yes	Yes	Yes
4		Twin 13w CFL	Entrance Station Exterior, Sensor Activated. (8 feet)	No	No	N/A – broken and planned for eventual removal.
5		26w CFL	Campground Men's Room Exterior (9 feet)	Yes	Yes	Yes
6		26w CFL	Campground Women's Room Exterior (9 feet)	Yes	Yes	Yes
7		26w CFL	Campground Showers Exterior (9 feet)	Yes	Yes	Yes
8		Unused Floodlight Socket	Amphitheater South (9 feet)	No	Yes	N/A – Unused
9		Unused Floodlight Socket	Amphitheater North (9 feet)	No	Yes	N/A – Unused
10		9w Incandescent	Ranger Residence West Doorway (8 feet)	Yes	No	Yes
11		9w Incandescent	Ranger Residence Middle Doorway (8 feet)	Yes	No	Yes
12		9w Incandescent	Ranger Residence East Doorway (8 feet)	Yes	No	Yes

Ref. #	Photo	Details	Application	Fully Shielded?	Special Purpose >500 Lumens?	Lighting Guideline Conformity?
13		Dual floodlight sockets	Ranger Residence Back Exterior, East. (9 feet)	No	Yes	N/A – Unused
14		Dual floodlight sockets	Ranger Residence Back Exterior, West. (9 feet)	No	Yes	N/A – Unused
15		Unknown bulb & wattage. Located atop inaccessible pole	Ranger Residence Parking Lot. Electrical wiring severed. (25 feet)	No	No	N/A – Broken, no plans to repair.

Goblin Valley State Park Outdoor Lighting Plan

I. Statement of Scope

At the time of this document's submission, the Utah State Parks central office in Salt Lake City is in the process of drafting a series of agency-wide outdoor lighting guidelines. These guidelines, expected to be completed by summer 2016, will act as policy for all units seeking recognition as international dark sky parks. This simple plan for the artificial lighting within Goblin Valley State Park should therefore be considered a local addendum to the broader policy, which will be submitted to the International Dark Sky Association upon completion. In any occurrence in which this plan conflicts with the agency guidelines, the stricter lighting policy will be adopted.

II. Relation to Area Lighting Policies

As of 2016, there are no specific lighting management plans in place within any jurisdiction around Goblin Valley State Park. The nearby towns of Hanksville and Green River lack such policies entirely. Emery County, which encompasses Goblin Valley State Park, does address lighting in two places as part of its 2009 Zoning Ordinances.¹ Cell towers must keep lighting to the minimum standards necessary to ensure safety and comply with Federal Aviation Administration (FAA) regulations (p. 115). Similarly, campgrounds and picnic areas, along with any associated commercial structures, must avoid any glare or lighting conditions that are "not compatible with the character of the area" (p. 122-123).

Wayne County, immediately to the south of Goblin Valley State Park, also addresses artificial lighting in its 2011 zoning ordinances.² The primary focus here is lighting on commercial signs, where strict regulations are in place to prevent the spread of glare onto adjacent properties. All sign lighting must be fully shielded, minimally lit, and lit only during hours of operation (p. 103). Additionally, street lighting facilities are listed as one of the many components that must be reviewed by the county commission before approving any new residential subdivision (p. 203-204).

While their requirements are largely subjective, Goblin Valley State Park is in compliance with the standards of both Wayne and Emery Counties. There are no lit signs within the park. The only lights generally visible at night are the shielded fixtures at the campground restroom, and no comment or complaint has ever been received that they in any way conflict with the "character of the area." This lighting management plan for Goblin Valley will in fact exceed the requirements of both counties by both placing restrictions on residential lighting, and by specifying limits on the lumens and Kelvin temperatures of fixtures throughout the park.

¹ <http://www.emerycounty.com/b&z/zoningordinance.pdf>

² http://www.waynecountyutah.org/userfiles/files/WAYNE%20COUNTY%20LAND%20USE%20ORDINANCES%20&%20RESOLUTIONS%201_1_2011.pdf

III. Relation to Existing Park Policy

The most recent resource management plan (RMP) for Goblin Valley State Park dates to 1999, and dark sky protection is not mentioned anywhere in the document. Due to the sheer number of changes to the park since its publication, merely amending the RMP to include night sky protection is not a reasonable option. The possibility of park expansion in coming years will necessitate the creation of a completely new RMP, though any such document could be as much as a decade away.

In order to show proof of commitment toward night sky protection, this application for dark sky designation includes a letter from Utah State Parks director Fred Hays, expressing his “support [for] the long term preservation of the wondrous night sky at Goblin Valley...” (see page v of this document). His sentiments will be echoed in a formal June 2016 resolution by the Board of Utah State Parks and Recreation: a nine-member, governor-appointed panel that oversees agency policy. This resolution will be submitted to the International Dark Sky Association, as will any future resource management plan approved specifically for Goblin Valley State Park.

IV. The Importance of Dark Sky Lighting in Parks

While parks and similarly protected places around the world promote their dark skies and the importance thereof, public land managers must remember that their facilities can become light sources of their own. Entrance stations, visitor centers, campgrounds, concession facilities, and staff residences are all generally lit after sunset to varying degrees. If left unchecked, these light sources can combine to create noticeable pollution of the night sky. As one example, the South Rim facilities of Grand Canyon National Park are visible both in nighttime satellite imagery,³ and in light pollution maps of the region⁴. Such light pollution does more than simply annoy human visitors. It can endanger many of the nocturnal animal species that the park is supposed to protect. Sleep cycles, hunting and migration cycles, and even reproductive behavior all have the potential to be adversely affected.⁵

V. Goblin Valley’s Plan for Dark Sky Lighting

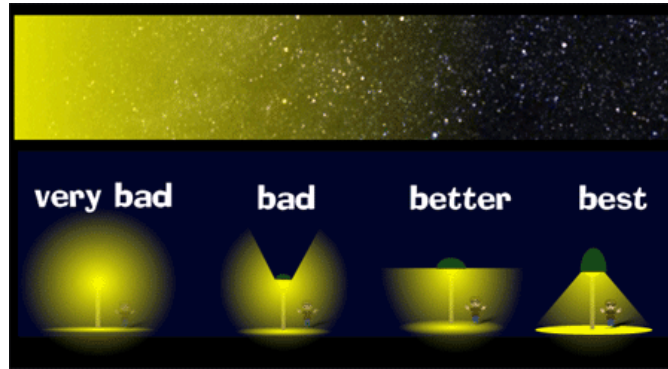
The current lighting at Goblin Valley State Park is compliant with standards set forth by the International Dark Sky Association. The property possesses only fifteen exterior lighting fixtures, six of which are in a permanent state of disuse. Low wattage, shielded bulbs adorn the front of the ranger residential complex. Brighter lights illuminate pedestrian walkways at both the visitor center and campground restroom

³ Natural Bridges National Monument. 2007. A Proposal to the International Dark Sky Association.

⁴ Danko, A. 2014. Grand Canyon Star Party (South Rim) Light Pollution Map. *ClearDarkSky.com Presents...* <http://cleardarksky.com/lp/GrndCynSPAZlp.html?Mn=binoculars>.

⁵ Vandernoot, Eric. 2014. *Light Pollution Harms the Environment*. Florida Atlantic University Department of Physics. <http://physics.fau.edu/observatory/lightpol-environ.html>

facility, but are also shielded and switched on only when necessary (either by motion sensor or fuse box switches accessible only by staff). As outlined in the diagram below, these shielded and downward facing lights not only prevent skyward pollution, but also project the strongest glow onto the areas most important for pedestrian safety.



Source: Maria Mitchell Association. 2015. *Protecting Nantucket's Dark Sky*.
<http://www.mariamitchell.org/get-involved/protecting-nantuckets-dark-night-sky>

In order to remain in compliance, any future expansion of park facilities will need to conform to the following lighting standards:

Residential

- Lights installed for use at the Goblin Valley State Park Ranger Residence will be shielded and will not exceed individual values of 500 lumens. Although brightness can vary due to the height of the fixture in question, this is the approximate amount of light emitted by a 40 watt incandescent, 11 watt compact fluorescent, or 8 watt LED bulb.⁶
- Unattended residential lights will have a curfew of 10:00pm. This corresponds to the time of park closure to day-use visitors, ensuring that those spending the night will enjoy a park free of light pollution.
- Temporary, unshielded light fixtures (such as those on a private camp-host trailer) will also have a curfew of 10:00pm.
- Exterior lights on any future rental yurt or cabin construction will conform to the same requirements as the staff residential area.

Public Facilities

- Public facilities in Goblin Valley State Park include the visitor center, campground restrooms, and any future expansion of visitor services that may

⁶ For charts detailing the lumens emitted by different lightbulb types, see <http://www.designrecycleinc.com/led%20comp%20chart.html> (Design Recycle, Inc. 2005) or [https://en.wikipedia.org/wiki/Lumen_\(unit\)](https://en.wikipedia.org/wiki/Lumen_(unit)) (Wikipedia 2015).

occur (for example, an expanded restroom at the Valley of Goblins Observation Point).

- Public building egresses are high use areas, and therefore require brighter lighting than found in the residential area. A maximum level of 1,800 lumens per lamp in these locations will be permitted.
- In addition to being shielded, any lighting fixture emitting more than 500 lumens must be used only when absolutely necessary for maintaining public safety. Timed motion sensor devices are the preferred method for accomplishing this, ensuring no continuous light after sunset.
- Beyond building egresses, all park trails, roads, and walkways will remain unlit.

Unshielded Floodlights

The lighting survey conducted during the winter of 2013/2014 revealed all floodlights within Goblin Valley State Park to be extraneous and unnecessary. Should future management determine otherwise, this document will need to be updated with an explanation of their decision, as well as a plan for mitigating light pollution.

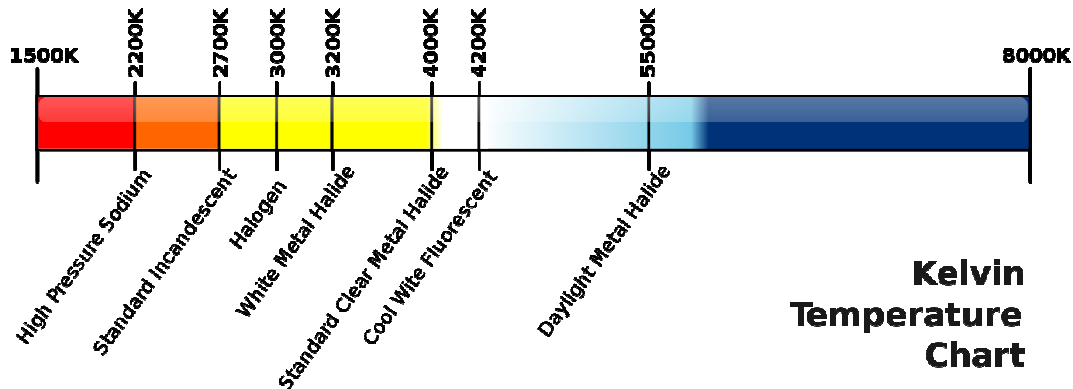
New Light Fixtures

It is the policy of Goblin Valley State Park not to install any new lighting fixtures beyond those required for mitigating clear public safety hazards (for example, the building egresses described above). In the event that a new, unforeseen hazard should arise, documentation must be added to this plan, describing...

- The nature of the hazard needing to be addressed.
- An explanation of why new light fixtures are the only way to solve the problem.
- The number and type of new fixtures to be installed, as well as their proposed location and height.
- A plan to mitigate light pollution from the new fixtures.

Color Temperature

In addition to lumen restrictions, no light within Goblin Valley State Park will exceed a color temperature of 4,000 Kelvin (K), as outlined in the chart below. All lights in the park are currently in compliance with this policy.



Above: The Kelvin temperature chart for lighting colors. **Source:** International Dark Sky Association. 2016. *The LED Practical Guide*. <http://darksky.org/lighting/led-practical-guide/>

Above the 4,000K threshold, cool white and blue light mimic daylight conditions. Not only does this cause unnecessary light pollution even when shielded, but such glare also disrupts the sleep cycles of any humans or other diurnal animals nearby through the halting of melatonin production in the pineal gland of the brain. This is the same well-documented problem that occurs when people use blue-lit electronics (laptops, tablets, etc) at bedtime.⁷ In one high profile case, the city of Davis, California spent \$350,000 to replace cool white LED lights with warmer colors after numerous citizen complaints.⁸ Because all of Goblin Valley's regularly used lights are in places where people will be trying to sleep, it is essential to keep all fixtures below the 4,000K threshold.

VI. Public Lighting Projects

The recent upgrades to Goblin Valley State Park's ranger residence triplex present a unique opportunity for dark sky interpretation. The building and its entranceway lighting are similar to apartment complexes and single-story homes found across the United States. Photographs taken before and after the upgrade will be placed onto an interpretive panel, revealing the dramatic reduction in light pollution that can be achieved by homeowners with only a minor investment in shielded fixtures. A photograph of this panel can be found in the "interpretation" section of the park's application for International Dark Sky Status.

⁷ Harvard Health Letter. 2015. *Blue Light has a Dark Side*. <http://www.health.harvard.edu/staying-healthy/blue-light-has-a-dark-side>.

⁸ CBS Sacramento. 2014. *Davis will spend \$350,000 to Replace LED Lights After Neighbor Complaints*. <http://sacramento.cbslocal.com/2014/10/21/davis-will-spend-350000-to-replace-led-lights-after-neighbor-complaints/>.

Regarding local community engagement, Goblin Valley State Park took advantage of its co-management status with Green River State Park: a smaller unit within the agency consisting of a golf course and campground in the center of the town of Green River, Utah. An informal lighting survey conducted of Green River State Park in September 2015 identified three fixtures on the clubhouse as being in need of shielding. All of these lights are clearly visible to the local population, who are by far the most frequent players on the golf course. After the shielding of these fixtures, the park added a small sign to the clubhouse front entrance that explains the modifications.

In conjunction with Goblin Valley State Park's educational outreach and anticipated media coverage surrounding the attainment of International Dark Sky Status, these public lighting projects will hopefully help to inspire similar modifications in communities throughout Southeastern Utah.

Right: The sign text reads "The exterior lights on this building have been shielded in order to decrease light pollution and improve the quality of Green River's night sky. To learn more, visit www.darksky.org."

