

Hovenweep National Monument  
Nomination Package

International Dark-Sky Park Designation Proposal  
March, 2014



photo courtesy of W. Pacholka

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## Letter Of Nomination

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

Nomination Committee:

I would like to nominate Hovenweep National Monument in southeast Utah as an International Dark Sky Park.

For the last four years I have been the Astronomy Interpretation Ranger at Natural Bridges National Monument, the first International Dark Sky Park. I have been involved with astronomy since 1963, and I did my first astronomy education program for the public in 1966. I consider it a great privilege to live and work in a world class dark sky environment, and I am grateful to work in astronomy education for the National Park Service.

Recently I made a trip to our sister park, Hovenweep National Monument. I left Natural Bridges late in the afternoon, and made a brief stop at the convenience store in the tiny Ute community of White Mesa. White Mesa is the last outpost of "civilization" on my route to Hovenweep.

Natural Bridges is an example of a healthy pinyon/juniper forest, and visitors have a good view of the Ponderosa forest on the ridge above the park. As you make the journey to Hovenweep, however, you leave the big forest and then the pygmy forest behind. The country transitions to a desert shrub environment with occasional drainages and small canyons where larger vegetation is found.

As I drove to Hovenweep I had the feeling of entering a vast, quiet open space, leaving civilization far behind. There are scattered residences, but traffic is sparse and human contact is minimal. As the trees are left behind, the horizon opens up, and the vistas become magnificent.

If you look carefully as you make the turn toward the Hovenweep Visitor's Center you

can catch a glimpse of some of the Ancestral Puebloan ruins in Little Ruin Canyon. This adds to the sensory experience and gives a further impression, an impression of traveling back in time to a place where the clutter of modern technology and the noise of civilization is unknown.

I had the opportunity to spend several hours of a winter evening under the dark skies of Hovenweep, surrounded by the solitude that is one of the major attributes of the park. A thin crescent moon was setting and the winter Milky Way was visible, stretching from Cepheus and Cassiopeia to Canis Major and beyond. Some modest light domes are visible on the horizon. Looking east and southeast toward Cortez/Farmington, the light dome extends up about 10 degrees, and to the south and Bluff the dome is a more modest 5 degrees (estimated).

After moonset, I spent some time following the Milky Way visually. It showed good detail down almost to the horizon. I would classify it as a Bortle Class 3 sky. Using my Sky Quality Meter, I obtained a magnitude at zenith of approximately 6.3. When the NPS night sky team did their more precise measurement in 2005 they obtained a ZLM of 6.6 and also called it a Bortle Class 3 sky.

Hovenweep is an island of solitude and darkness much needed by the over-stimulated nerves of modern city dwellers. While it does not quite have the pristine darkness of Natural Bridges, it nevertheless offers an excellent "blue zone" sky worthy of protection by the National Park Service and worthy of inclusion as an International Dark Sky Park.

Gordon Gower

Superintendent's Letter

**United States Department of the Interior NATIONAL PARK SERVICE  
Hovenweep and Natural Bridges National Monuments  
HC 60 Box 1 Lake Powell, UT. 84533**

To: International Dark Sky Association  
From: James P. Dougan, Superintendent  
Hovenweep and Natural Bridges National Monument  
Subject: Support for Dark Sky Designation

I am writing in support of Hovenweep National Monument's application for International Dark Sky designation. Located in a remote setting in southeast Utah, Hovenweep enjoys the luxury of stellar vistas, clean air, and night sky viewing unimpeded by artificial light. Our Management Plan recognizes dark skies as one of several integral resources that make Hovenweep National Monument unique. We have adopted energy conservation and efficient lighting as cornerstones to our public messaging about stewardship of resources in general and the night sky in particular. Public interpretation of the night sky will be an ongoing part of an integrated, comprehensive program that features ways the public can become more involved in conservation issues in their own home towns. I am pleased to present this application prepared by Natural Bridges National Monument's own Sky Ranger, Gordon Gower, and ask for your favorable consideration.

Sincerely,  
James P. Dougan  
Superintendent  
Natural Bridges and Hovenweep National Monuments  
435-692-1234 ext. 15  
Fax: 435-692-1111

## IDA Member Nomination

Dear IDA Dark-Sky Park Program,

I am pleased to be writing this letter to recommend Hovenweep National Monument 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. I believe Hovenweep meets the requirements for designation, but another IDA designation on the Colorado Plateau will not simply be another park with telescopes and glarebusters. Adding Hovenweep NM to the list of designated areas will bring a heightened sense of awareness to the night sky as a broad regional resource and Hovenweep's unique archaeology widens the breadth of values to which dark skies is aligned.

Hovenweep consists of a series of Ancestral Puebloan ruins that date to between 1200-1300 A.D. The park's website states, "There are many compelling stories told about Hovenweep. One story observes that several of the structures and rock art panels seem designed to mark major celestial events such as the summer solstice. While this is largely conjecture, the open skies of Hovenweep certainly draw one's attention, and fortunately the night sky is about as dark today as it was 700 years ago." While archaeologists do not now, and may never, know the original intention of the ruins, people today marvel at the possibilities of astronomical alignments. These ruins rest in a remote area straddling the border of Utah and Colorado. The remoteness of the park, as with much of the Colorado Plateau, is part of its value to those who journey to it. Part of what is amazing about the ruins is their remoteness, both in time and space, from that which is familiar to most peoples' daily lives. And yet there are elements that serve to bridge that gap, such as the sense of human presence on the landscape given by the carefully laid masonry and the doors and windows that remind us of our own familiar structures. The shimmering vault of night over Hovenweep also highlights the solitude and immensity of the surrounding landscape while providing a bridge to the familiar - our universal heritage of starry skies.

Gordon Gower, an NPS employee who conducts night sky interpretation at Natural Bridges, has informed me of some of the park's efforts to secure the IDA designation for Hovenweep. Park lighting is minimal and consists primarily of Glarebusters. Efforts towards establishing night sky interpretation at Hovenweep are concomitant with the remote nature and slow pace of visitation at the park, all of which are valued characteristics. The dark night sky has always been, and continues to be, a well-established reason for visiting such a remote outpost. Dark Sky Park designation will help ensure people continue to enjoy the night around the ruins in the future. Thanks and I look forward to your decision.

Sincerely,  
Kate Magargal  
IDA – Colorado Plateau Chapter Moab, Utah

## Description of Hovenweep National Monument



HOVENWEEP CASTLE NPS Photo/Neal Herbert

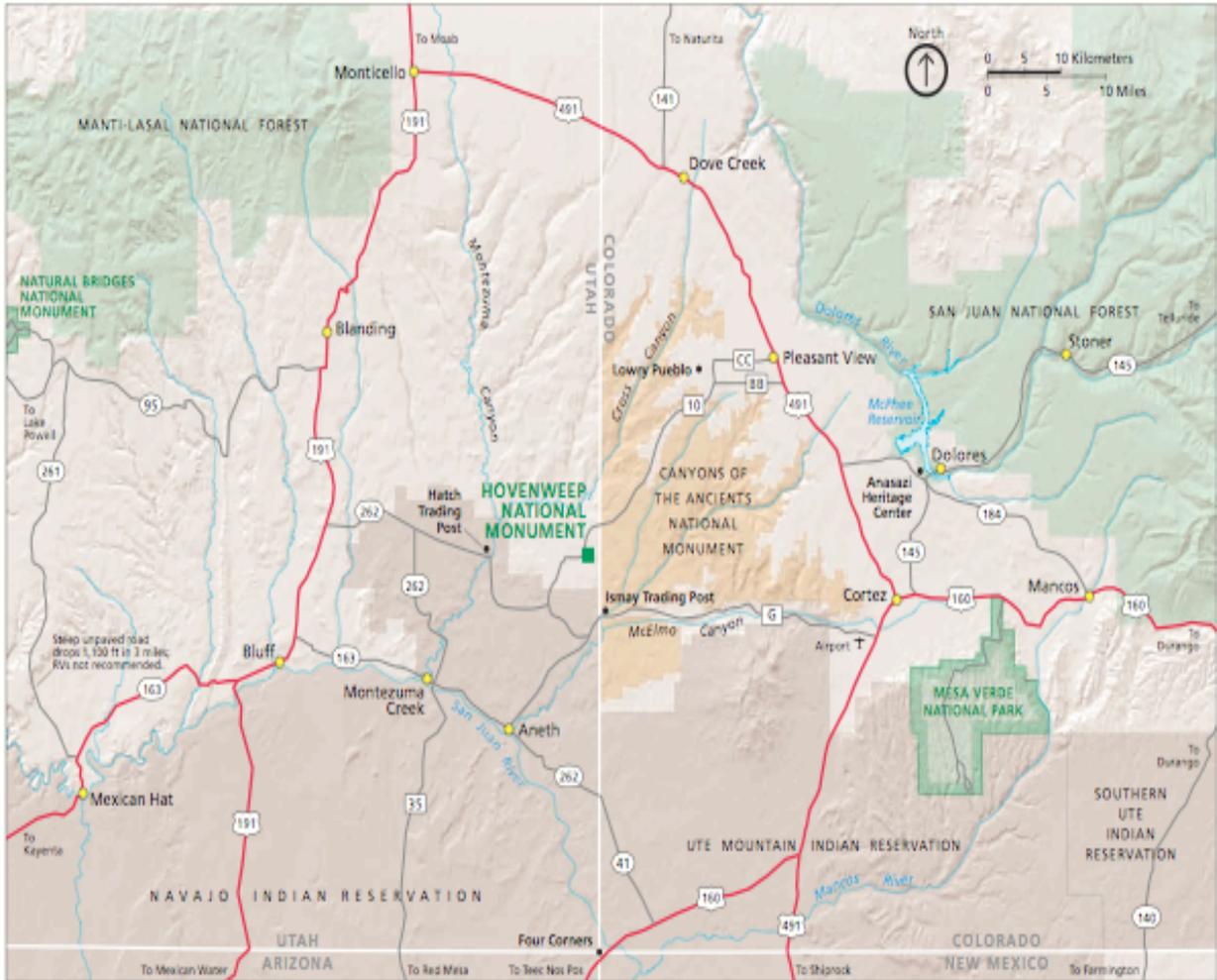
Hovenweep National Monument was established by presidential proclamation on March 2, 1923 to protect the ruins of ancestral Pueblo villages spread over a 20-mile expanse of mesa tops and canyons on both sides of the Utah-Colorado border. The multistory towers perched on canyon rims and balanced on boulders lead visitors to marvel at the skill and motivation of their builders. Hovenweep is noted for its solitude and undeveloped, natural character.

The word *Hovenweep* is a Paiute/Ute word that means “deserted valley” and was adopted by pioneer photographer William Henry Jackson in 1874. The Hopi people refer to the monument as Waakiki, which means “place of the refuges.”

The monument comprises 785 acres in six separate units: Square Tower, Cajon, Holly, Horseshoe/Hackberry, Cutthroat Castle, and Goodman point. Land surrounding Hovenweep belongs to the Federal Government (managed by the Bureau of Land Management), the Navajo Nation, the State of Utah, and private landowners.

Hovenweep is located about 42 miles west of Cortez, Colorado.

# Hovenweep Area Map



# Hovenweep Outlier Map

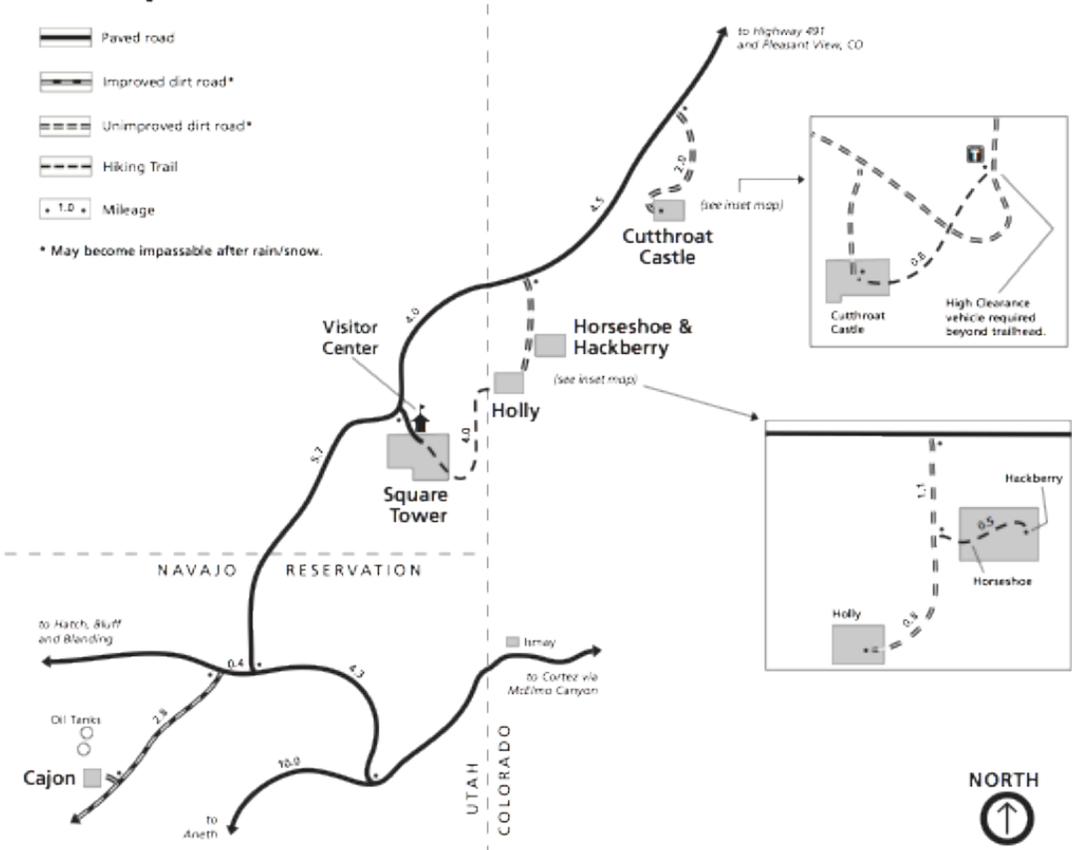
Hovenweep

National Park Service  
U.S. Department of the Interior

Hovenweep National Monument



## Outlier Map



## Night Sky Interpretation at Hovenweep

Hovenweep is an ideal location for visitors to seek solitude and to enjoy a night sky far superior to what they likely see at home. It is also a remote location with a small staff, and in the sparsely settled country around the Four Corners there are no astronomy clubs which could help with night sky programs.

The park does not close, allowing visitors to observe the night sky at their convenience.

The park has acquired a Celestron 11" Schmidt-Cassegrain Telescope as well as 10.5X70 binoculars for scanning the sky. A year ago a knowledgeable volunteer was able to hold several dark sky programs which received good attendance from the visitors in the campground. This year (2014) an experienced amateur astronomer will be holding night sky programs regularly at Hovenweep.

When Hovenweep was established in 1923 the NPS had not "discovered" the night sky and it is only in recent years that the NPS has realized that dark night skies are part of the resource it is to protect, celebrate, and interpret for the public. A new Long-Range Interpretive Plan for Hovenweep is now in final draft stages. It is significant that it contains this statement (for the first time in a Hovenweep interpretive plan)

Strive to preserve the natural soundscape, the dark night sky, and the viewsheds--all integral parts of the Hovenweep experience--whenever an interpretive medium or type of installation is selected (p. 6).

National Park Service  
U.S. Department of the Interior

Natural Resources Stewardship and Science  
Night Skies Program



# Hovenweep National Monument

## *Night Skies Preliminary Data Report*

February 2014

### Introduction

An assessment of natural lightscape existing conditions was performed near Square Tower Ruin in March of 2005, using methods of photometry developed by the National Park Service. This briefing serves as a preliminary data report and contains information useful for park planning.

### Methods

Data was collected using with a research-grade CCD camera and data reduction techniques allowing accurate calibration to both astronomical and engineering units of luminance and illuminance (Duriscoe, Luginbuhl, and Moore 2007). A mosaic of 104 images was assembled and covers the entire hemisphere of the sky at a resolution of about 0.06 degrees per pixel. Data processing methods were employed to capture the apparent background brightness or luminance of the night sky, and exclude individual stars. Methods of calibration with reference stars within the data images allow for the computation of atmospheric clarity as an extinction coefficient. Quantification of the effect of artificial or human-caused sources was performed by building a customized natural sky model that is registered with each image frame in the same units of luminance, and subtracting it from the observed data pixel by pixel (Duriscoe 2013).

A single data set for Hovenweep National Monument, Square Tower Ruin area, obtained in March of 2005, is reported on. Table 1 describes the location and some characteristics of the monitoring site.

**Table 1. Data Collection Site and Date**

### Results

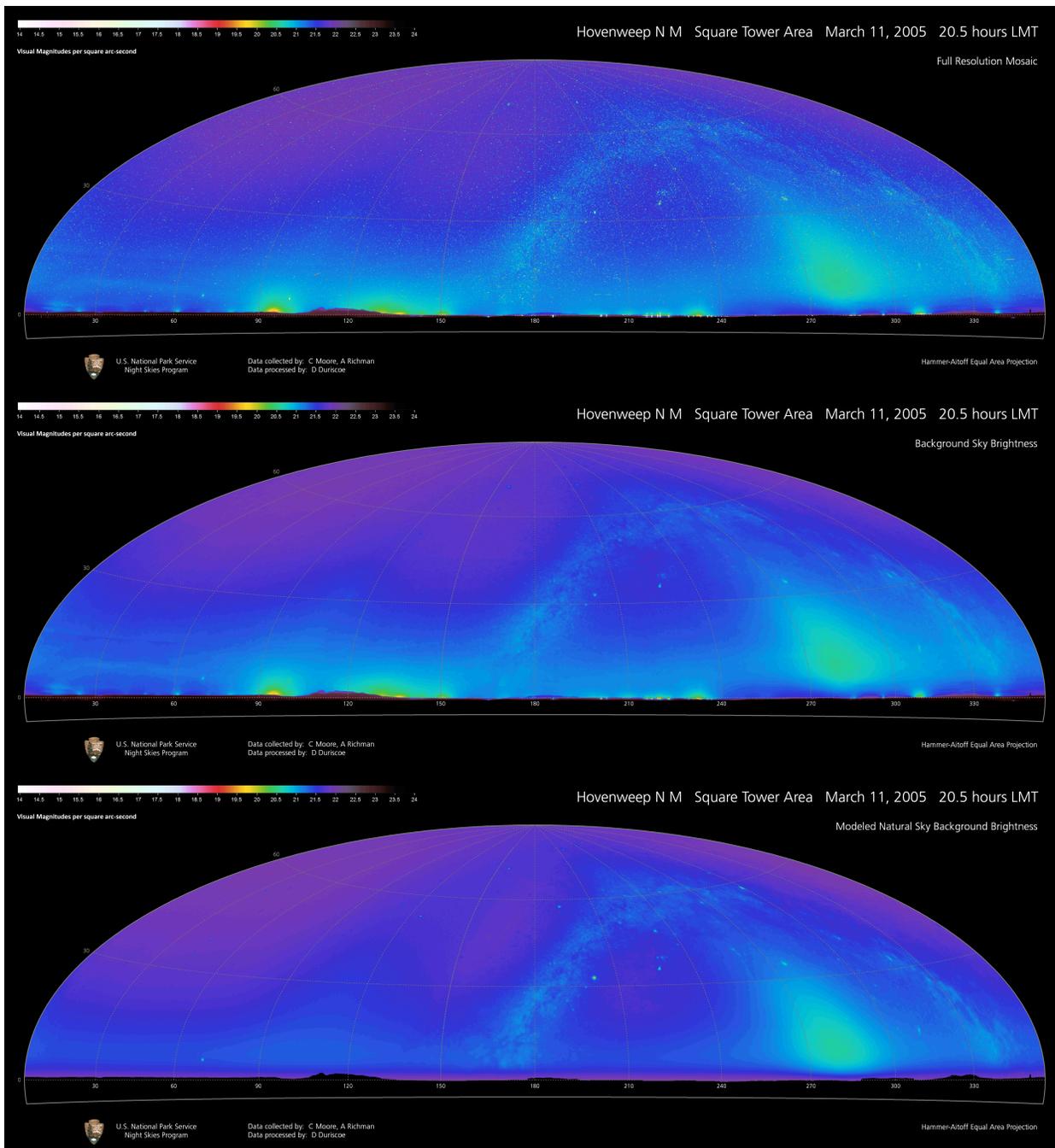
Photometric measurement of apparent sky brightness (or luminance) are most easily presented as a graphic of the image mosaic in false color, which is used to reveal the dynamic range in the monochrome images. The entire sky is represented with a Hammer-Aitoff equal area projection,

similar to wall maps of the world but including only the top hemisphere. This view allows artificial sources to be easily identified by their apparent azimuth from the observer's location, as well as minimizing distortion, especially areal distortion. In this manner the reader may obtain an at-a-glance impression of sky quality.

Figure 1 displays the mosaic and three steps in the analysis of artificial sources, including full resolution calibrated data (top) revealing individual stars and other fine details in the images, data with stars filtered out (second from top), the natural sky model (third from top), and the estimated artificial sky glow (bottom). The full resolution representation gives the most information on what a human observer would be likely to see after dark adaptation. The azimuthal scale along the bottom is accurately calibrated and allows for the identification of landscape features, such as Ute Peak at  $110^\circ$  and the Abajo Mountains at  $325^\circ$ .

Many more stars are revealed in the time exposure images than are visible to the unaided eye, but the obvious gradients of background sky brightness seen in the false color images may be easily perceived by observers in the field as variations in luminance from one part of the sky to another. The violet color near the zenith (top of the image) represents the natural background at  $21.85 \text{ mag arcsec}^{-2}$  or about  $190 \mu\text{cd m}^{-1}$ . At this location, the natural features of the night sky such as the Milky Way and Zodiacal Light (the triangular luminous patch extending from the horizon at azimuth  $280^\circ$ ) are readily revealed, indicative of very good sky quality. Figure 1 reveals numerous unshielded outdoor lights along the horizon from azimuth  $160\text{-}240^\circ$ , as well as domes of light from a few cities and towns caused by scattering and reflection of artificial light off of air molecules and atmospheric aerosols.

In the filtered representation of sky background brightness (second from top in Figure 1), the Milky Way and Zodiacal Light are more clearly revealed, as well as the city light domes. The next view down in Figure 1 illustrates the natural sky model, while the bottom view represents the subtraction of predicted natural sky brightness from observed background brightness, leaving the artificial sky glow. It can be seen that the artificial component was present in only a small fraction of the entire sky, extending in significant amounts to no more than 10 degrees above the horizon. Most of the violet color above this elevation may be attributed to artifacts of the natural sky model subtraction. Areas bright enough to be easily noticed as an artificial intrusion on the natural sky, however, were recorded. These include light domes at azimuth  $94^\circ$  (Cortez, Colorado),  $132^\circ$  (Farmington, New Mexico),  $231^\circ$  (Montezuma Creek, Utah),  $308^\circ$  (Blanding, Utah), and  $340^\circ$  (Monticello, Utah). The yellow-orange color in the core of the light dome of Cortez, in particular, is much brighter than the brightest part of the Milky Way or Zodiacal Light and represents the brightest area of the sky.



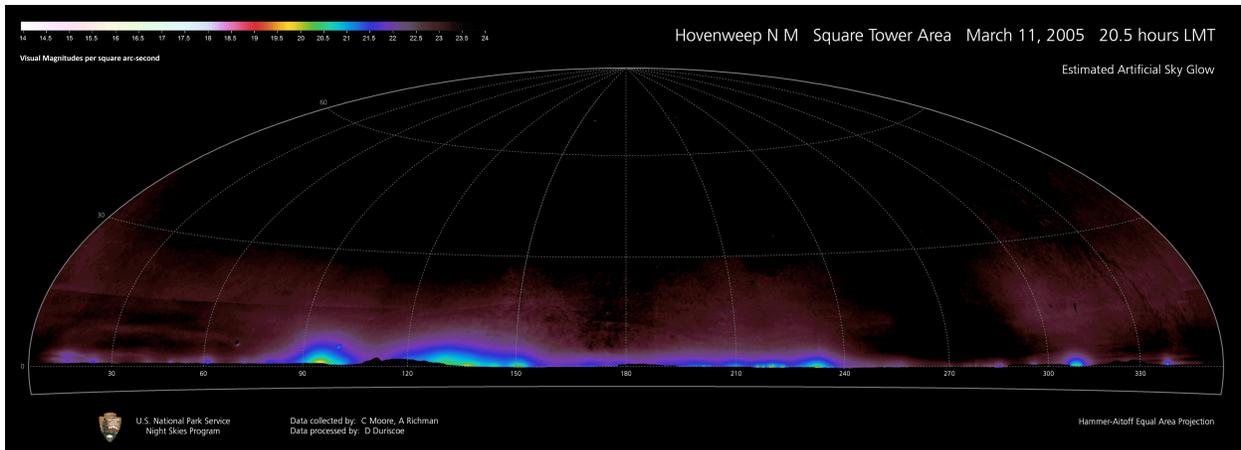


Figure 1. Illustration of all-sky photometry in Hammer-Aitoff projection with south at center, including the full resolution mosaic of images, the sky background brightness, the natural sky model, and estimated artificial sky glow. The false color representation is in V-mag arcsec<sup>-2</sup>, a logarithmic scale.

Numerically, the data contained in the image mosaics may be expressed in a number of different ways that describe sky quality quantitatively. Table 1 reports some statistics of luminance and illuminance derived from the observed background sky brightness, Table 2 reports statistics on the estimated artificial sky glow.

Table 2. Photometric statistics derived from the background sky brightness mosaic (all light sources to zenith angle 92), March 11, 2005, 20.5 hours Local Mean Time.

Average Sky Luminance		Zenith Sky Luminance		Brightest area of the Sky		Horizontal Illuminance mLux (±0.01)	Maximum Vertical Illuminance mLux (±0.01)
mag arcsec <sup>-2</sup>	μcd m <sup>-2</sup> (±8.0)	mag arcsec <sup>-2</sup>	μcd m <sup>-2</sup> (±20)	(mag arcsec <sup>-2</sup> )	μcd m <sup>-2</sup> (±20)		
21.42	293.3	21.85	197.4	19.01	2700	0.82	0.56

Table 3. Photometric statistics derived from estimated artificial sky glow mosaic (after subtraction of the natural sky model), including a comparison of each statistic to the median for a natural sky as a light pollution ratio (LPR). A value for any LPR of less than 0.1 (10%) may be considered a very minor to un-measurable effect on sky quality as observed by the unaided human eye. In the last column, the abbreviation ALR is used, indicating light pollution ratio of artificial to natural averaged over the entire sky.

Maximum Vertical Illuminance (±0.05 mLux)		Horizontal Illuminance (±0.05 mLux)		Sky Luminance					
mLux	LPR	mLux	LPR	Brightest		Zenith		Average	
				μcd m <sup>-2</sup> (±80)	LPR (skies*)	μcd m <sup>-2</sup> (±80)	LPR (skies*)	μcd m <sup>-2</sup> (±8)	ALR
0.04	0.11	0.04	0.05	2530	14.7	0	0	31.9	0.13

\*1 *sky* is set equal to the median darkest area of the natural sky, at 172 μcd m<sup>-2</sup> or 22.0 mag arcsec<sup>-2</sup>

Sky luminance at the zenith is often quoted as an indicator of sky quality (Cinzano and Falchi 2012). In addition, the following all-sky statistics provide a more sensitive and robust means of

quantifying visual sky quality: average sky luminance (zenith to horizon, all azimuths), horizontal illuminance, and maximum vertical illuminance. While luminance may be thought of as apparent surface brightness, illuminance is amount of light striking a surface at the observer's location. If the surface is oriented horizontally (like the ground), the measure is called horizontal illuminance. If oriented vertically, the measure is called vertical illuminance. The maximum vertical illuminance is the illuminance measured when a vertical surface is oriented in azimuth toward the area of the sky that is brightest.

Each of the four indicators described above may also be expressed at a ratio to natural reference conditions (Hollan 2008). The following values are taken as the median reference condition over the 11-year sunspot cycle: 1) zenith luminance  $22.0 \text{ mag arcsec}^{-2}$  or  $172 \text{ } \mu\text{cd m}^{-2}$ , 2) average all-sky luminance  $21.6 \text{ mag arcsec}^{-2}$  or  $250 \text{ } \mu\text{cd m}^{-2}$ , 3) horizontal illuminance  $0.80 \text{ mLux}$ , and 4) vertical illuminance  $0.40 \text{ mLux}$ . Data presented as a light pollution ratio (LPR) are the ratio of the relevant statistics from the estimated sky glow mosaic value to these values.

Table 2 lists measured values for these indicators from all sources of light, natural and artificial. It can be seen that all the values compare favorably with the natural reference condition described above. The maximum sky luminance is also listed, which is important to human vision. This is because dark adaptation may be hindered if objects above a certain luminance threshold are within the field of view. The value  $2700 \text{ } \mu\text{cd m}^{-2}$  is very close to the published threshold for scotopic vision of  $3000 \text{ } \mu\text{cd m}^{-2}$  (Stockman and Sharpe 2006). Even so, the data in Table 2 describe excellent sky quality.

Table 3 utilizes the statistics obtained from the estimated artificial sky glow mosaic to derive a light pollution ratio for each statistic to the reference natural condition (LPR). The brightest area of the sky, described above as being located in the light dome of Cortez, Colorado, is seen to be about 17 times brighter than the darkest natural sky background. Also, the maximum vertical illuminance, a very sensitive indicator, obtains an LPR of 0.11, or 11% above the natural background. Probably the most unbiased indicator of light pollution from sky glow is the statistic average sky luminance. The acronym ALR (average light pollution ratio) is used in Table 2, and we find a value of 0.13 for this location.

The air was reasonably clear on the night of these observations, as indicated by the extinction coefficient, which was calculated at  $0.18 \text{ mag/airmass}$ . For the elevation above sea level of this location, this may be considered more free of atmospheric aerosols than average, resulting in a daytime visibility of about 80 miles.

## Conclusions

This data demonstrates that there was very little light pollution impact to the Square Tower Ruin area of Hovenweep National Monument when the data were taken in 2005. Natural darkness and near pristine views of the night sky were available. Artificial sky glow at the zenith was not measurable, and the average artificial sky luminance, when expressed as a ratio to a natural reference condition, was measured at 0.13 or only 13% above natural. Light domes from a few cities are noticeable along the horizon, and, from hilltop locations, unshielded outdoor lights from distant developments are obvious. Yet, with some opportunistic blocking of these horizon

features, a visitor to Hovenweep may indeed experience a near-pristine night sky as the ancient inhabitants saw it.

## References

- Cinzano P. and Falchi F. 2012. The propagation of light in the atmosphere. MNRAS, 427:3337
- Duriscoe D.M., Luginbuhl C.B., Moore C.A. 2007. Measuring night-sky brightness with a wide field CCD camera. PASP 119:192-213
- Duriscoe DM 2013. Measuring anthropogenic sky glow using a natural sky brightness model. PASP 125:1370-1382.
- Hollan J 2008. What is light pollution and how do we quantify it? Workshop paper at Darksky 2007 conference, Brno, CZ. [http://amper.ped.muni.cz/hollan/light/lp\\_what\\_is.pdf](http://amper.ped.muni.cz/hollan/light/lp_what_is.pdf) accessed on December 27, 2010.
- Stockman A., Sharpe L.T. 2006. Into the twilight zone: the complexities of mesopic vision and luminous efficiency. Ophthal. Physiol. Opt. 26:225-239.

Gordon Gower  
8169 N Sage Vista  
Prescott Valley, AZ 86315

March 28, 2014

International Dark Sky Association  
Tucson, AZ

RE: Hovenweep National Monument Dark Sky Application

Until two weeks ago I was the “Sky Ranger” at Natural Bridges National Monument. Just before my retirement I made a trip to Hovenweep to make some additional dark sky measurements. I used my personal SQM, which is the older, narrow field-of-view model. I made the measurements after moon set, but there was a light haze covering the sky making a noticeable dimming of the sky. Here are my results of my middle reading:

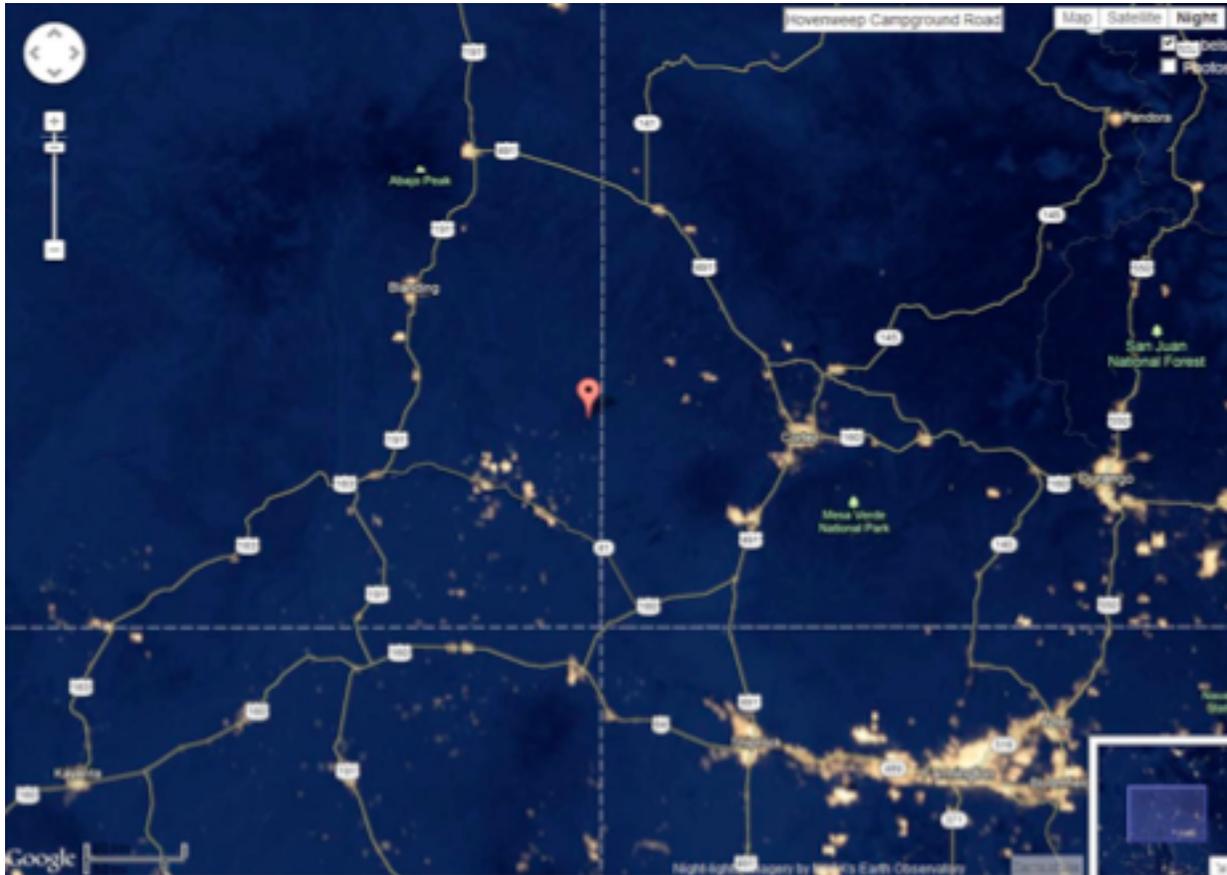
Date: 3/6/14  
Time: 0100  
SQM: 21.62

Hovenweep is still a very dark, remote location where visitors may enjoy a near pristine natural sky.

Regards,

Gordon Gower

# NASA Night Lights Imagery Four Corners Area



## Hovenweep National Monument--Light Inventory

This is a complete inventory of the lighting at Hovenweep. There are no non-conforming lights, and there are no plans to add additional lighting.

Light #	Photo	Fixtures	Application	Fully Shielded	Spec Purpose <1000 lumens	Conforms to guidelines
1	 <p>Well House</p>	13 W Glarebuster	Pump House	YES	NO	YES
2	 <p>HA-9 A Front Door</p>	13 W Glarebuster	Front Door Employee Housing	YES	NO	YES
3	 <p>HA-9 A Garage</p>	13 W Glarebuster	Garage Employee Housing	YES	NO	YES

Light #	Photo	Fixtures	Application	Fully Shielded	Spec Purpose <1000 lumens	Conforms to guidelines
4		13 W Glarebuster	Front Door Employee Housing	YES	NO	YES
5		13 W Glarebuster	Garage Employee Housing	Yes	NO	YES
6		13 W Glarebuster	Back Door Employee Housing	YES	NO	YES
7		13 W Glarebuster	Back Door Employee Housing	YES	NO	YES

Light #	Photo	Fixtures	Application	Fully Shielded	Spec Purpose <1000 lumens	Conforms to guidelines
8	 <p>HA-8 (66) Front Door</p>	13 W Glarebuster	Front Door Employee Housing	YES	NO	YES
9	 <p>HA-8 (66) Back Door</p>	13 W Glarebuster	Back Door Employee Housing	YES	NO	YES
10	 <p>HA-7 A Front Door</p>	13 W Glarebuster	Front Door Employee Housing	YES	NO	YES
11	 <p>HA-7 A Garage</p>	13 W Glarebuster	Garage Employee Housing	YES	NO	YES

Light #	Photo	Fixtures	Application	Fully Shielded	Spec Purpose <1000 lumens	Conforms to guidelines
12	 <p>HA-7 A Back Door</p>	<p>Twin floods</p> <p>Fixture located in alcove between buildings. On motion sensor</p>	<p>Back Door</p> <p>Employee</p> <p>Housing,</p> <p>Security for Maint. Shed to right of alcove</p>	YES	NO	YES
13	 <p>HA-7 B</p>	<p>13 W Glarebuster</p>	<p>Front Door</p> <p>Employee</p> <p>Housing</p>	YES	NO	YES
14	 <p>Campground Restrooms (Decommissioned)</p>	<p>NOT WORKING</p>	<p>Exterior Restroom</p> <p>Lighting</p>	NA	NA	NA
15	 <p>Visitor Center Entrance (1)</p>	<p>Recessed</p> <p>Under patio</p>	<p>Visitor's Center</p> <p>Patio Entrance</p>	YES	NO	YES

Light #	Photo	Fixtures	Application	Fully Shielded	Spec Purpose <1000 lumens	Conforms to guidelines
16		Recessed	Visitor's Center Patio Entrance Door	YES	NO	YES
17		Barrel Spot on motion sensor	Visitor's Center Back Door	YES	NO	YES



**United States Department of the  
Interior**

**NATIONAL PARK SERVICE**

**Hovenweep and Natural Bridges National**



In Reply Refer to:

March 26, 2014

Memo

To: John Barentine, PH.D., International Dark-Sky Association

From: Jim Dougan, Superintendent, Natural Bridges and Hovenweep National  
Monuments

Subject: Hovenweep National Monument Lighting Policy

As part of the comprehensive management plan for Hovenweep National Monument lighting is addressed as it relates to preserving the pristine night sky. Due to its remote location surrounded by the Navajo Reservation and BLM public lands Hovenweep preserves a primordial dark sky largely unaltered by modernity. The National Park Service wishes to keep it that way.

To that end only the artificial lighting necessary for safety is in use at the Monument. The use of the word safety is intended to mean safely walking through darkened areas (for instance, the VC patio area leading to the restrooms) where tripping in the dark is a possibility. Motion detectors limit the timing and duration of light needed in such situations. Inside the restrooms, timers turn indoor lights off after 5 minutes. For clarity, use of the term safety does not, in this context, refer to security. There are no “security” lights within Hovenweep National Monument.

All outdoor lighting devices use low-energy, low-impact bulbs with shields that direct the light to the ground where it is needed. As has been mentioned, motion detectors and timers are used to limit the timing and duration of lighting use to the minimum necessary. This is true both in the public use areas (VC complex and campground restrooms) as well as in the employee housing area.

Now and in the future, all requests for additional lighting will need to demonstrate that there is a need based upon visitor/staff safety that cannot be addressed by other means. Such requests will be evaluated on a case by case basis, always employing the minimum use concept. It is anticipated that when new technologies are available to further reduce the impacts of artificial lighting that they will be employed to assist future Park Managers to safeguard this valuable resource.

Please feel free to contact me with any questions or concerns that may arise.

Sincerely,

James P. Dougan, Superintendent

## Excerpts from NPS management documents that support dark night skies

NPS Management Policies, 2006

### 4.10 Lightscape Management

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, physiological processes of living organisms, and similar natural processes.

Green Parks Plan, 4/2012 ([www.nps.gov/greenparksplan](http://www.nps.gov/greenparksplan))

The NPS will reduce light pollution from park facilities with the goal of dark night sky preservation. (under the heading "Preserve Outdoor Values")

Night Sky ([www.nature.nps.gov/sound\\_night/](http://www.nature.nps.gov/sound_night/))

Starry night skies and natural darkness are important components of the special places the National Park Service protects. National parks hold some of the last remaining harbors of darkness and provide an excellent opportunity for the public to experience this endangered resource. The NPS is dedicated to protecting and sharing this resource for the enjoyment of current and future generations.

The NPS uses the term “natural lightscape” to describe resources and values that exist in the absence of human-caused light at night. Natural lightscapes are critical for nighttime scenery, such as viewing a starry sky, but are also critical for maintaining nocturnal habitat. Many wildlife species rely on natural patterns of light and dark for navigation, to cue behaviors, or hide from predators. Lightscapes can be cultural as well, and may be integral to the historic fabric of a place. Human caused light may be obtrusive in the same manner that noise can disrupt a contemplative or peaceful scene. Light that is undesirable in a natural or cultural landscape is often called “light pollution.”

#### Hovenweep General Management Plan (8/2011)

The clarity of night skies is important to visitor experience as well as to the ecological systems of the area. The lack of human-caused light not only makes the area excellent for star gazing, but also influences many species of animals....Furthermore, the dark sky of the monument allows visitors an opportunity to ponder the influences of the stars, planets, and earth’s moon on the Ancestral Puebloan way of life....Artificial light sources both within and outside the park have the potential to diminish the clarity of night skies. Even minor elements of artificial lighting within park boundaries could affect the pristine quality of local night skies. It is NPS policy that artificial light sources be the minimum necessary for safety and security and be designed so that artificial light sources be the minimum necessary for safety and security and be designed so that all light is directed downward and does not shine into the sky (104).



IN REPLY REFER TO:  
IMR-NR-A4415

United States Department of the Interior

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

JAN 31 2014



VIA ELECTRONIC MAIL: 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 National Park Service (NPS) Intermountain Region is pleased to support Hovenweep National Monument's nomination for International Dark Sky Park status. Hovenweep National Monument is located in one of the most remote regions in the continental United States, and offers an exceptional, unfettered view of the dark night skies over the Colorado Plateau. The dark skies of Hovenweep have immense value to cultural traditions and wildlife conservation in the region. In addition, Hovenweep International Dark Sky Park designation would assist in the conservation of dark night skies in the neighboring Navajo Indian Reservation and Ute Mountain Indian Reservation, as well as Canyons of the Ancients National Monument.

As an essential piece of the newly formed Colorado Plateau Dark Sky Cooperative, Hovenweep National Monument 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. Designation of Hovenweep as an International Dark Sky Park would bring further awareness and legitimacy to the Cooperative.

As a member of the International Dark Sky Association since July 2011, the Intermountain Region's Natural Resources Program continues to support the worldwide network of committed individuals who care deeply about preserving the beauty and heritage of our night skies. Recognition of Hovenweep National Monument's night sky quality and their efforts to conserve and promote dark night skies will benefit Monument visitors, nearby communities, and future generations. Should you have any questions, please contact Theresa Ely at 303-969-2653, or Nate Ament at 435-719-2349.

Tammy Whittington,  
Associate Regional Director, Resource Stewardship and Science  
Regional Science Advisor



## Colorado Plateau Dark Sky Cooperative

2282 S. West Resource Blvd  
Moab, UT 84532

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January 15, 2014

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 Hovenweep National Monument International Dark Sky Park nomination. Hovenweep National Monument 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 Hovenweep have immense value to cultural traditions and wildlife conservation in the region. In addition, Hovenweep International Dark Sky Park designation would assist in the conservation of dark night skies in the neighboring Navajo Indian Reservation and Ute Mountain Indian Reservation, as well as Canyons of the Ancients National Monument.

As an essential piece of the newly formed Colorado Plateau Dark Sky Cooperative, Hovenweep National Monument 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. Hovenweep Dark Sky Reserve designation would bring further awareness and legitimacy to the Cooperative.

We fully support the efforts of Hovenweep National Monument as they seek designation of the Hovenweep International Dark Sky Park. Such efforts to conserve dark skies will benefit Monument 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

# Colorado

Welcome Center Cortez  
928 E Main  
Cortez CO 81321

December 20, 2013

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

Dear IDA Board of Directors:

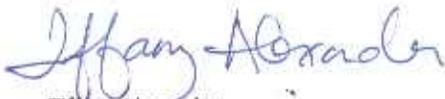
I am writing in support of Hovenweep National Monument's nomination for Dark-Sky designation. Like its sister park, Natural Bridges National Monument, Hovenweep possesses unusually clear, dark skies for night-time star viewing. Due to its isolated location far from towns, surrounded by the Navajo Reservation and Bureau of Land Management's Canyons of the Ancients, Hovenweep National Monument enjoys pristine night sky viewing with very few sources of artificial light.

Like Natural Bridges (both parks are managed as one unit with one Superintendent), Hovenweep has eliminated non-essential lighting in the park, interprets the night sky to park visitors, and has become known far and wide as a stellar location for star gazing. Its small campground and amphitheater and the courtyard beside the visitor center offer outstanding opportunities for amateur astronomers to set up telescopes and enjoy unfettered views of the heavens in an unparalleled setting. The remains of a once vibrant Ancestral Puebloan community surround the modern day adventurer. Park visitors can easily imagine other humans, from centuries past, gazing awestruck into the same universe while surrounded by ecosystems that have adapted to the natural rhythms of the moon and stars. Little has changed here since the time of the Ancients.

Unspoiled natural lightscapes have natural, cultural, and scenic importance and are managed by the National Park Service to preserve these values. This unusual resource is also an economic value to surrounding communities who benefit from tourism as they promote dark-sky values. All have an interest in promoting dark-sky opportunities in a world that has lost sight of the primordial world above.

Rest assured that the commitment made by the NPS to preserve, promote, and interpret the dark-sky resources of Hovenweep National Monument will only increase as pristine skies become less available elsewhere. Please give this nomination your utmost consideration.

Sincerely,



Tiffany Alexander  
Manager



# United States Department of the Interior

## NATIONAL PARK SERVICE

Mesa Verde National Park  
P.O. Box 8  
Mesa Verde, Colorado 81330

IN REPLY REFER TO:

December 31, 2013

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

To Whom It May Concern:

This letter is in support of Hovenweep National Monument's nomination for Dark-Sky designation. Like its sister park, Natural Bridges National Monument, Hovenweep possesses unusually clear, dark skies for night-time star viewing. Surrounded by the Navajo Reservation and Bureau of Land Management's Canyons of the Ancients, Hovenweep National Monument enjoys pristine night sky viewing with very few sources of artificial light.

Hovenweep has eliminated non-essential lighting in the park, interprets the night sky to park visitors, and has become known as a stellar location for stargazing. It offers outstanding opportunities for amateur astronomers to set up telescopes and enjoy unfettered views of the heavens in an unparalleled setting.

Unspoiled natural lightscapes have natural, cultural, and scenic importance and are managed by the National Park Service to preserve these values. This commitment to preserve, promote, and interpret the dark-sky resources of Hovenweep National Monument will only increase as pristine skies become less available elsewhere. Please give this nomination your utmost consideration.

Sincerely,

Cliff Spencer  
Superintendent

# San Juan County

*Utah's Canyon Country!*

## Economic Development & Visitor Services

Date 12/19/2013

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

Dear IDA Board of Directors:

I am writing in support of Hovenweep National Monument's nomination for Dark-Sky designation. Like its sister park, Natural Bridges National Monument, Hovenweep possesses unusually clear, dark skies for night-time star viewing. Due to its isolated location far from towns, surrounded by the Navajo Reservation and Bureau of Land Management's Canyons of the Ancients, Hovenweep National Monument enjoys pristine night sky viewing with very few sources of artificial light.

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Rest assured that the commitment made by the NPS to preserve, promote, and interpret the dark-sky resources of Hovenweep National Monument will only increase as pristine skies become less available elsewhere. Please give this nomination your utmost consideration.

Sincerely,



**UTAH**  
LIFE ELEVATED

117 South Main Street - P.O. Box 490 - Monticello, UT 84535  
435-587-3235, Exr: 5006

[www.utahscanyoncountry.com](http://www.utahscanyoncountry.com) ~ [www.sanjuancounty.org](http://www.sanjuancounty.org)