

Kaibab Paiute Reservation Dark Sky Community Application



Photo courtesy of Pete Kearns

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Executive Summary

The Kaibab Band of Paiute Indians intends to become the first ever tribal government to be a recognized International Dark Sky Community. With designation, the Kaibab Paiutes will serve as an example in leading the way for other tribal sovereign nations interested in protecting night sky, nocturnal wildlife and their cultural heritage, promoting health benefits, and increasing ecotourism opportunities.

The 120,840 acre Kaibab Indian Reservation is located on the Arizona Strip, straddling Coconino County and Mohave County in Arizona and the border with Utah. The Kaibab Indian Reservation hosts five tribal villages and is currently home to about 330 community members.

Miles away from urban areas, the Kaibab Indian Reservation is home to pristine dark night skies that are very important to Paiute culture and history. The night sky is home to countless traditional stories. Protecting our night skies while creating economic development will not only preserve our pristine views to share with the world, but also keep our traditions strong.

Commitment to the preservation of night skies has been demonstrated by the creation and implementation of a light plan, retrofitting the campground with night sky friendly lighting, and working in partnership with Pipe Spring National Monument to reduce the Monument's outdoor lighting levels. Future retrofitting of residences, information sharing and education, working with partners, and monitoring are just some of the directions the Kaibab Band of Paiute Indians will continue to explore and implement as part of a continuing commitment to night sky protection.

This proposal is to formally recognize the Kaibab Band of Paiute Indians Dark Sky Community with the following objectives:

- Recognize the Kaibab Indian Reservation's pristine night sky resources
- Recognize the partnerships that the Tribe may forge with multiple federal agencies, sister-Tribes of the Southern Paiute, and local communities
- Implement a light plan to enhance natural light throughout the Kaibab Paiute Dark Sky Community
- Provide interpretation, education, and public access to allow visitors to experience these exceptional dark skies.

This proposal seeks to become a designated Dark Sky Community by the International Dark-Sky Association to be known as “Thunder Mountain Pootsee Night Sky”. Having a recognized Dark Sky Tribal Community would be a true milestone for Tribal community involvement in dark sky efforts and tribal recognition everywhere. It is our strong desire to take action against light pollution, preserve our pristine nightscapes, maintain the canvas of our traditional stories, and provide a sanctuary for dark sky solitude for generations to come.



Section 1.

International Dark-Sky Association Member Nomination & Tribal Supporting Letter & Resolution





United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Grand Canyon-Parashant National Monument
345 East Riverside Drive
St. George, Utah 84790
www.blm.gov/az/



September 30, 2014

In Reply Refer To:
1120/A3815 (AZ030)

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

To the International Dark-Sky Association (IDA) Board of Directors:

As a recent addition to the network of IDA night sky places, the Grand Canyon-Parashant National Monument enthusiastically nominates the Kaibab Band of Paiute Indians to become a recognized International Dark Sky Community, the first ever tribal government to do so. With designation, the Kaibab Paiutes will serve as an example in leading the way for other tribal sovereign nations interested in protecting night sky and their cultural heritage.

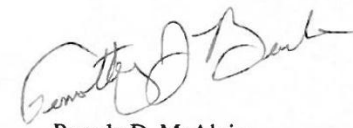
["Why the Moon Paints Her Face Black"](http://www.capitolreefnha.org/product.cfm?id=0FBB40B3-CC45-C4A7-715AA2DF5841928D) a Southern Paiute Sky Story as told by Eleanor Tom, an Elder from the Cedar City Band of the Paiute Indian Tribe of Utah and transcribed by Chloe Valentine Brent, is a recent Association of Partners for Public Lands award winning publication (<http://www.capitolreefnha.org/product.cfm?id=0FBB40B3-CC45-C4A7-715AA2DF5841928D>) and a significant project that promotes cultural preservation of the Southern Paiute language through a story focused on the night sky. Other tribal nations also have important sky stories that could be lost if pristine night skies are not preserved for future generations.

The Parashant International Night Sky Province is committed to preserving important night sky resources and having a tribal partner on the Arizona Strip will further enhance the protection and preservation of the incredible night skies on the Colorado Plateau. Pipe Spring National Monument, a National Park Service site surrounded by the Kaibab Reservation lands, is also a strong advocate for night sky preservation and provides a perfect venue to deliver interpretive programs. This powerful partnership will create opportunities to further educate the public regarding this rapidly disappearing resource and how we can all work together to restore it.

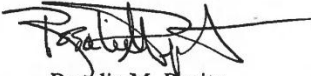
Visitors from around the world will be attracted to the area and the Kaibab Paiute Campground and RV Park would be a perfect base of operations for astro-tourism, exploring Parashant, Pipe Spring and the surrounding public lands, to provide a unique visitor experience rarely available in our modern lighted world. Night sky friendly lighting has recently been installed in the campground and Pipe Spring National Monument facilities are in the process of being retrofitted.

This designation will recognize some of the darkest skies in the United States and represents the continuation of partnerships with federal agencies, tribes and local communities. We strongly endorse this nomination for the Kaibab Paiute IDA Dark Sky Community and look forward to working with the tribe to bring awareness and appreciation for the importance of night sky resources.

Sincerely,



Pamela D. McAlpin
BLM Monument Manager



Rosalie M. Pepito
NPS Superintendent

Kaibab Band of Paiute Indians

RESOLUTION OF THE GOVERNING BODY OF THE KAIBAB BAND OF PAIUTE INDIANS

K-68-14

APPROVAL OF TRIBAL LIGHT MANAGEMENT PLAN

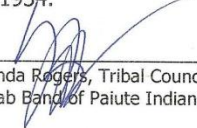


- WHEREAS,** the Kaibab Paiute Tribe is an Indian Tribe as defined under the Indian Reorganization Act of June 18, 1934 as amended and operates and functions in accordance with the terms and conditions of the Kaibab Ordinances and Resolutions; and
- WHEREAS,** the Tribal Council is the recognized governing body responsible and authorized by the constitution to exercise all of the powers possessed by the band; and
- WHEREAS,** the quality of life on the Kaibab Indian Reservation depends on the quality of the environment; and
- WHEREAS,** the Kaibab Band of Paiute Indians through the environmental program is seeking International Dark Sky Statues through the International Dark Sky Association to promote economic and cultural development consistent with tribal cultural environmental values and tradition; and
- WHEREAS,** the Kaibab Paiute Tribal Council has reviewed the proposed Tribal Light Management Plan; and

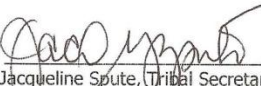
NOW THEREFORE BE IT RESOLVED that the Kaibab Band of Paiutes hereby certifies and approves the Tribal Light Management Plan for the benefit of the Band and its people.

CERTIFICATION

I hereby certify that the foregoing resolution was regularly adopted by the Kaibab Paiute Tribal Council on **November 20, 2014** at a regular meeting at which a quorum was present with **4 Favor, 0 Abstain, 2 Absent, 0 Opposed**, pursuant to the Authority vested in the Kaibab Paiute Tribal Council of Article VI, Section 1 (a) of the Tribal Constitution and By-Laws ratified by the Tribe on June 20, 1987 and approved by the Secretary of the Interior on July 14, 1987 pursuant to Section 16 of the Act of June 18, 1934.


Yolanda Rogers, Tribal Council Treasurer
Kaibab Band of Paiute Indians

Attest:


Jacqueline Spute, Tribal Secretary
Kaibab Band of Paiute Indians

Tribal Affairs

HC 65 Box 2
Fredonia, Arizona 86022

Phone (928) 643-7245
Fax (888) 939-3777



Kaibab Band of Paiute Indians



November 3, 2014

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

VIA: IDA Board of Directors:

I, Roland Maldonado, Chairperson of the Kaibab Band of the Paiute Indians submit this letter to support the Kaibab Paiute Tribe Dark Sky Community Nomination in order to formally recognize the pristine dark skies of this region. Kaibab Paiute reservation is located in one of the most remote locations of the lower 48 states and is the historical homeland of the Southern Paiutes. Most of this area remains undeveloped with provisions in the Reservation Resource Management Plan emphasizing limited human influence and use, in these isolated areas to include no paved roads, limited facilities, and limited structures. Kaibab Paiute reservation is meant to be preserved for as the cultural homeland, natural resources, and untouched qualities. We acknowledge the immense value dark skies bring to our traditions, conservation of wildlife, and to future generations.

In conclusion, I fully support the ongoing efforts to establish the Kaibab Paiute Tribe Dark Sky Community. Any effort that can help conserve our dark night skies will benefit our younger generations, our visitors, and the tribal community at large.

Sincerely,

A handwritten signature in black ink, appearing to read "Roland Maldonado", is written over a horizontal line.

Roland Maldonado,
Tribal Chairperson

Tribal Affairs

HC 65 Box 2
Pipe Spring, Arizona 86022

Phone (928) 643-7245
Fax (928) 643-7260

Section 2.

Community Information



The Kaibab Indian Reservation is located on the Arizona Strip, about 50 miles north of the Grand Canyon. Reservation lands total 120,840 acres, spanning Coconino County and Mohave County in Arizona and bordering Utah (Figure 2-1). Established in 1934 under the Indian Reorganization Act, the Kaibab Indian Reservation hosts five tribal villages and is currently home to about 330 community members.

The Kaibab Band is a division of the Southern Paiute which consists of eight other sister-bands, Cedar Band, Indian Peaks Band, Kanosh Band, Koosharem Band, Shivwits Band, Las Vegas Band, Moapa Band and San Juan Band, all of which have individual identities and communities. The Kaibab Band of Paiute Indians, as it is formally known, is also referred to as “Kaibab Band”, “Kaibab Paiute”, “Kaibab Paiute Tribe” or, in this document, “Tribe”.

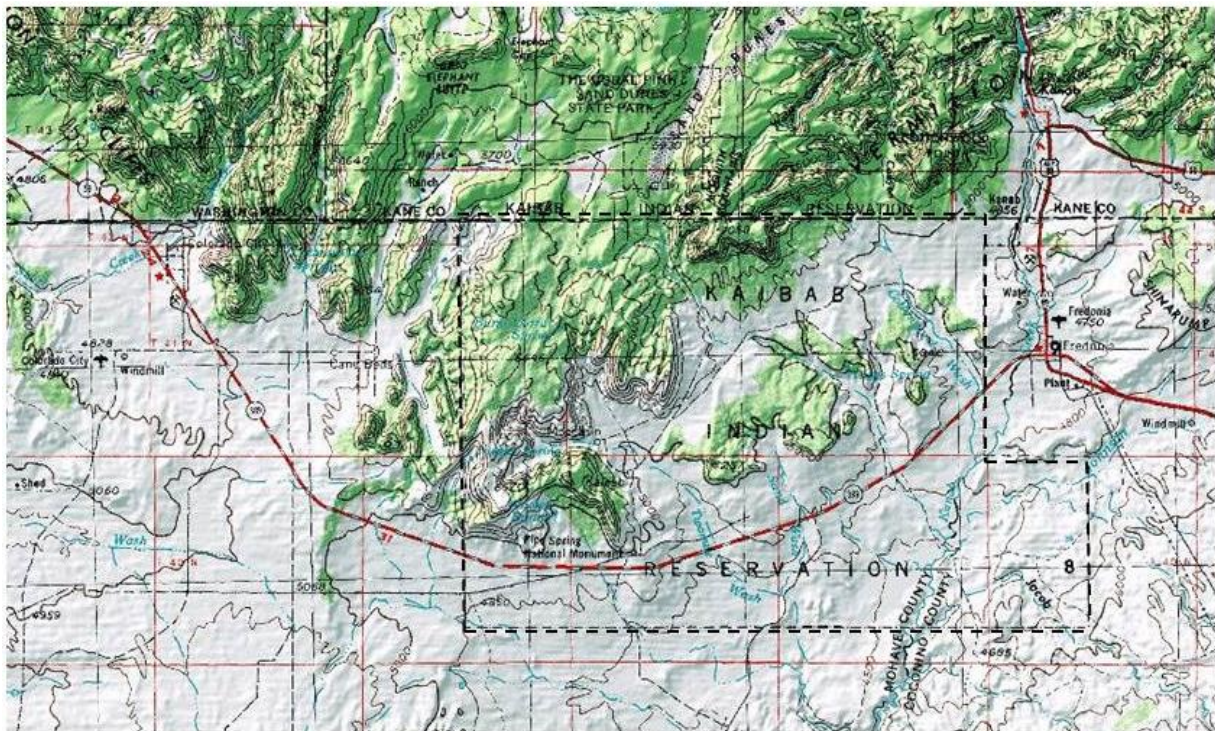


Figure 2-1. Location of Kaibab Paiute Indian Reservation.

The Kaibab Paiute Reservation spans semi-arid to alpine lands, dominated by pinyon pine and juniper, with many natural springs and several ephemeral washes that feed into the Colorado River. The Reservation is surrounded by federal lands managed by the Bureau of Land Management. A 40 acre National Park Service managed site, Pipe Spring National Monument, and the small privately owned community of Moccasin are located within the Reservation boundaries.

Commercial areas within the Reservation include the Pipe Spring National Monument visitor center and administrative site, a recreational vehicle (RV) park/campground,

and a gas station/convenience store, all of which are owned and operated by the Kaibab Paiute Tribe. Tribal owned and operated buildings also include the Tribal Headquarters, Tribal Court, Tribal Gym, Tribal Community Building and the Early Learning Center. The Kaibab Paiute Tribe also owns a 1,600 acre fruit orchard and is very involved with maintaining traditional gardening.

Significance of Night Skies

Night sky stories are an important part of the cultural heritage of the Southern Paiute people and preservation of these stories can only be achieved through a strong education program. "Why the Moon Paints Her Face Black" a Southern Paiute Sky Story as told by Eleanor Tom, an Elder from the Cedar City Band of the Paiute Indian Tribe of Utah and transcribed by Chloe Valentine Brent, is a significant project that promotes cultural preservation of the Southern Paiute language through a story focused on the night sky. (<http://www.capitolreefnha.org/product.cfm?id=0FBB40B3-CC45-C4A7-715AA2DF5841928D>)

In the words of one tribal member,

Southern Paiute have looked to the night skies since time immemorial. The stars hold the stories of ancestors, heroes and legends. Like today's televisions and computers there is much to see during different seasons. There are moving stars and non-moving stars for the different stories. The Southern Paiute continue to use the night sky for guides and storytelling.

Section 3.

Success in Light Pollution Control



Successful preservation of night skies stems from efforts to promote community awareness and completing projects that preserve the natural darkness. The Kaibab Paiute Reservation has an ongoing history of maintaining community awareness with annual “star stories” of night skies which are culturally permitted during the winter months, as well as being cognizant of implementing dark sky friendly lighting in various locations. In addition their partner, Pipe Spring National Monument, has been successful with public events highlighting bat ecology and astronomy events. The following projects outline the past and ongoing efforts to maintain these exceptional dark skies and bring further awareness to the Kaibab community and public visitors.

Completed Lighting Projects

Kaibab Paiute Reservation Campground

A near completed project located along the main corridor of the reservation, this campground will serve up to 75 campers and RVs (Figure 3-1). This campground is intended to serve public visitors and offers utilities such as electricity, sewer, and a laundry facility. The highlight of this campground is the permanent dark sky friendly lighting available at each camp site providing an example of night sky stewardship and exemplifying the dark sky experience (Figure 3-2).



Figure 3-1. Kaibab Paiute Reservation Campsite (still under construction)



Figure 3-2. Example Kaibab Paiute Reservation campsite shielded camp light

Located at the center of this campground is the laundry facility, providing an ideal location to install a dark sky awareness display. This campground will be completed by Fall 2015.

Pipe Spring National Monument

Pipe Spring National Monument is also located along the main corridor of the reservation and is adjacent to the above mentioned campground. Lighting inventory in July 2014 identified several non-compliant outdoor light fixtures. Recent retrofits in September 2014 have remedied these light fixtures with IDA compliant fixtures (IDA logo present on packaging) along with low lumen light bulbs (less than 400 lumens for porch lighting, and 1000 lumens for motion triggered floodlights). (Table 3-1, Figures 3-3 through 3-8)

Table 3-1. 2014 Pipe Springs Light Inventory: Before-and-After Retrofits

| Initial Lighting Inventory: | Post Retrofit Lighting Inventory: |
|--|--|
| 4 High pressure Sodium lights on Visitor Building (2 in the front entrance, and 2 in the main rear area) | 4 Dark Sky LED light fixtures on Visitor Building (2 in the front entrance, and 2 in the main rear area) |
| 4 Halogen flood light style lights on Administrative Building | 4 Halogen flood light style lights on Administrative Building on light curfew after business hours |
| 4 Spherical style porch lights in trailer/housing area | 4 Shielded 2700k LED porch lights in trailer/housing area |
| 4 Flood light style Patio lights in trailer/housing area | 4 Shielded flood light style with 3000k LED and motion triggers in trailer/housing area |



Figure 3-3. Before: High pressure sodium light at Pipe Spring National Monument Visitor Center



Figure 3-4. After: LED light at Pipe Spring National Monument Visitor Center



Figure 3-5. After: Door lighting retrofit at Pipe Spring National Monument Visitor Center



Figure 3-6. After: Door lighting retrofit at Pipe Spring National Monument Housing



Figure 3-7. After: Motion triggered flood lighting retrofit at Pipe Spring National Monument Housing



Figure 3-8. After: Motion triggered flood lighting retrofit at Pipe Spring National Monument Housing

Kaibab Paiute Reservation Billboards

Along State Highway 389, which bisects the Kaibab Paiute Reservation from east to west, there are four standard size billboards advertising the Kaibab service station and other commercial locations (Figure 3-9). These billboards once had upward directed light producing sky glow. Since 2012, all illumination for the billboards has been discontinued and will remain so in accordance with the Light Plan.



Figure 3-9. Example of non-illuminated Kaibab Paiute Reservation billboard

Kaibab Paiute Reservation Residential and Tribal Building Dark Sky Friendly Lighting - Existing Compliance

The Kaibab Paiute Reservation encompasses 86 residential structures and 8 commercial/government structures. Each residential structure has 2 outdoor lights. Of these 172 lights, half are already shielded or using low wattage energy saver light bulbs. Of the commercial/government structures, there are 8 parking lot or outdoor fixtures and 35 street lights. Two are currently dark sky friendly fixtures. In addition, 75 new dark sky friendly lighting fixtures are associated with the campground. In combination, 56% of the lighting on the Kaibab Paiute Reservation is already dark sky friendly.

Completed Outreach Projects

Pipe Spring National Monument Night Events (2007-2014)

Pipe Spring National Monument offers a series of night time events encompassing ecological, astronomical and cultural topics such as their annual “Winsor Castle by Night”. This event takes place in early December and opens the Monument’s historical buildings into the night hours, with no electricity, to allow guided tours for visitors demonstrating the experience of natural darkness as it would have been in the pioneer era (Figure 3-10).



Figure 3-10. Winsor Castle, Pipe Spring National Monument

Several nights each summer, National Park Service staff along with Southern Utah University bat biologists and in conjunction with Kaibab Paiute Reservation, host “Dark Wings at Pipe Spring”. Presentations with a public audience include demonstrations of bat trapping for research purposes (Figure 3-11) and the importance of natural

darkness to nocturnal wildlife. Typically a telescope is set up to allow visitors to interact with a National Park Service ranger and experience the available astronomy.



Figure 3-11. *Myotis californicus*, displayed at Pipe Spring National Monument during “Dark Wings at Pipe Spring”

Section 4.

Community Commitment & Future Outreach Projects



Night Sky Education and Information

Education and information regarding night sky protection and efficient lighting techniques are an essential component of the Kaibab Dark Sky Community designation to promote cultural heritage, human health benefits, nocturnal habitat preservation and overall enjoyment of disappearing night sky resources.

Education programs can also boost ecotourism opportunities on the reservation. The Kaibab Campground and RV Park is conveniently located in close proximity to Pipe Spring National Monument where visitors can participate in night sky related interpretive programs currently being conducted. Southern Paiute cultural youth camps sponsored by federal agencies also include astronomy lessons.

Publications, Websites and Signs

Information specifically devoted to night sky protection will be posted on the tribal website and could be included in a tribal newsletter. Signage identifying the Kaibab Dark Sky Community and IDA logos will be placed along State Highway 389 at the reservation boundary to notify the public and recognize the night sky protection efforts. An exhibit could also be installed and/or information posted on a kiosk in the campground to promote night sky related activities and events.

Programs and Activities

The Kaibab Environmental Program plans to work with the Education Department to coordinate at least two night sky awareness events each year. Night and daytime astronomy opportunities may be sought in tribal settings, such as open house events to introduce the benefits of protecting night sky to tribal members. Programming possibilities are numerous including hosting a winter youth camp with elders sharing sky stories. The tribe also hosts the annual Sounds of Thunder Mountain Pow-wow and Celebration in August where activities and/or information booths could be included. During these events, star, moon, solar, or naked eye viewing may be made available and interpretive components such as constellation tours, storytelling and basic night sky information may be pursued.

Astronomy activities presented by Bryce Canyon National Park staff are currently included in the curriculum for the annual Kwiyaamuntsi Youth Camp (ages 13-15) and could also easily be incorporated into the annual Yevingkarere Youth Camp (ages 10-12) hosted by Parashant National Monument (Figure 4-1).



Figure 4-1. Yevingkarere Youth Camp, a current successful partnership project between Southern Paiute tribal members, Parashant National Monument and Pipe Spring National Monument.

Pipe Spring National Monument does several night sky protection related programs including a highly regarded bat study demonstration and lecture series; nocturnal insect survey presentations; star parties including naked-eye astronomy, constellation tours and telescope viewing with operators provided by Dixie State University Astronomy Club; and a well-attended annual historical themed Evening at Winsor Castle tour during the first week of December. Pipe Spring National Monument has committed to continuing interpretive and educational programs in conjunction with the Tribe (see letter of commitment from Pipe Spring National Monument dated November 14, 2014). Parashant National Monument located on the Arizona Strip has recently been designated as an IDA Dark Sky Park and would also be willing to partner with the tribe and Pipe Spring National Monument to increase awareness and appreciation of night sky resources.

Partnerships

The Kaibab Band of Paiute Indians will continue to pursue formal arrangements and promote further awareness of this IDA Dark Sky Community. Partnerships with other tribes, local communities, National Park Service units such as Pipe Spring and

Parashant National Monuments, Zion and Bryce Canyon National Parks and State Parks may also be pursued.

Additional efforts to form a partnership with the developing Southwest Science Center in Apple Valley, UT, which plans to include an Astronomical Observatory Complex and Performing Arts Center will be considered, as well as partnerships with local Astronomical Societies and University Astronomical Clubs.

Information and Education Planning

The following table (4-1) illustrates the stages of the various educational and partnership components promoting night sky protection.

Table 4-1. Yearly educational goals associated with the Kaibab Dark Sky Community.

| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|--------|--------|--------|--------|--------|
| Develop logo and install signage | x | | | | |
| Develop relationships with local astronomy groups/pursue partnerships with Pipe Spring and Parashant National Monuments | x | x | x | x | x |
| Create and update website pages | | x | x | x | x |
| Conduct educational programming | | x | x | x | x |
| Create newsletter | x | | | | |

Section 5.

Alternate Dark Sky Community Name



Provisional Dark Sky Community logo for Kaibab Paiute Reservation

In recognition of the status of the Kaibab Band of Paiute Indians as a sovereign nation, the roles Thunder Mountain and night sky play in Kaibab Paiute culture, and the unique language spoken by Southern Paiutes, the Kaibab Paiute Reservation Dark Sky Community wishes to be known as “Thunder Mountain Pootsee Nightsky”.

Section 6.

Night Sky Quality



November 2001 Leonid Meteor Shower as seen at Pipe Spring National Monument. Credit: Kim A. Hyatt

Weather and Climate

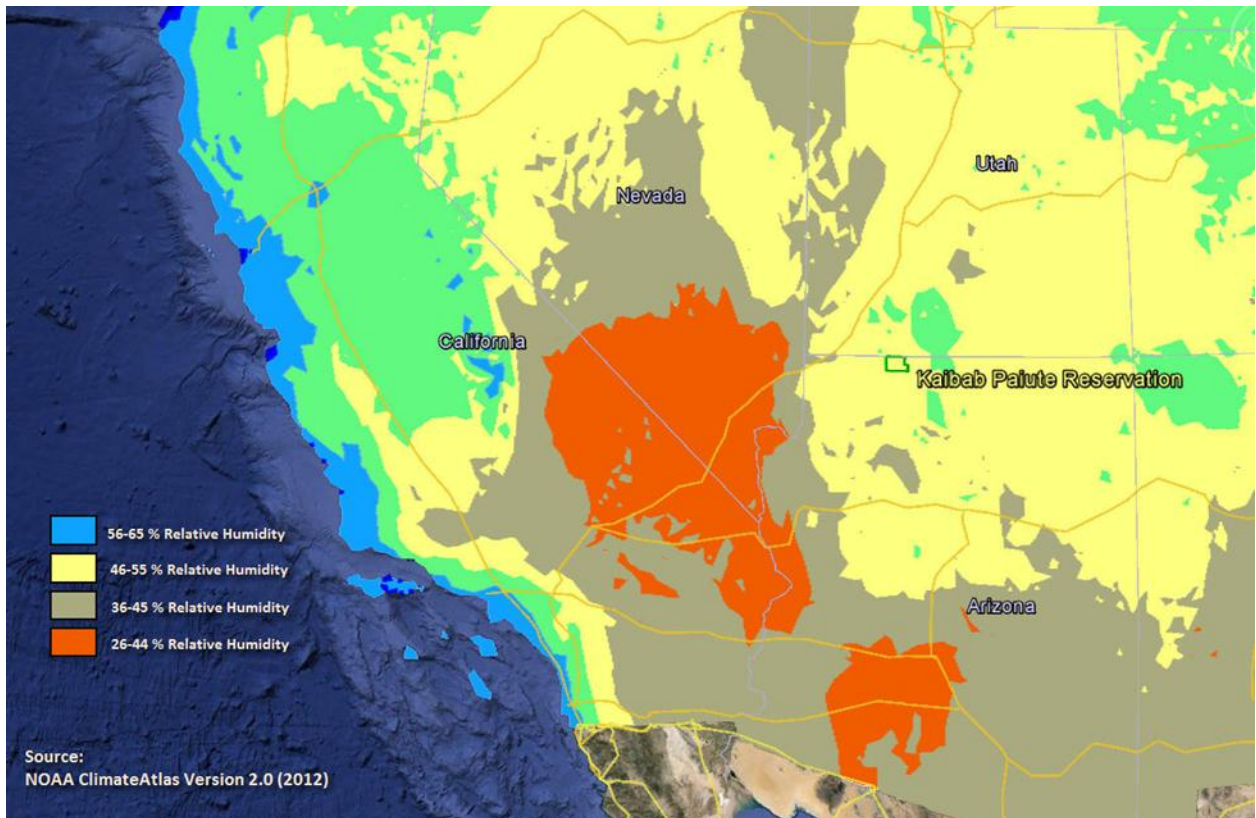


Figure 6-1. Western United States decadal relative humidity average

Weather and climate are integral to the quality of night skies due to various factors such as humidity and temperature and wind patterns, all of which can produce water vapor and dust scatter under certain circumstances. Low humidity with little cloud cover produces ideal night skies. Considering humidity, Kaibab Paiute Reservation is favorably located in the drier regions of the United States, with an annual average of 46-55% humidity (Figure 6-1).

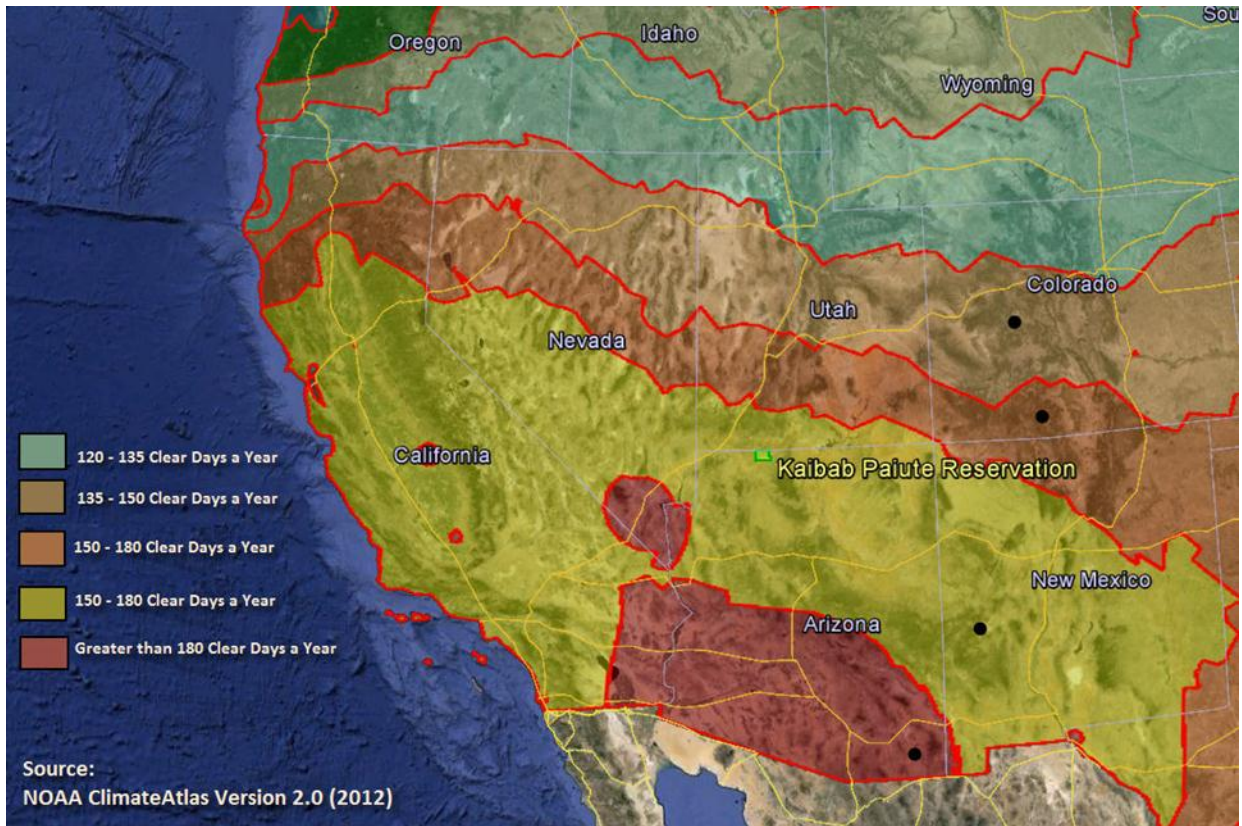


Figure 6-2. Western United States decadal clear day average.

The Kaibab Paiute Reservation has a combination of versatile topography along with an intercontinental dry climate for several optimal clear days per year. Rainfall and humidity amounts also vary widely 10-14 inches in the Eastern Colorado Plateau portion. Overall, this Dark Sky Community is expected to enjoy 150-180 clear days each year, as defined by the National Weather Service, for optimal night skies (Figure 6-2). The two dominant weather patterns tend to be high pressure Mojave Desert/Great Basin climate patterns during fall, winter, and spring with a significant monsoon pattern during the summer.

Visibility and Isolation from Light Pollution

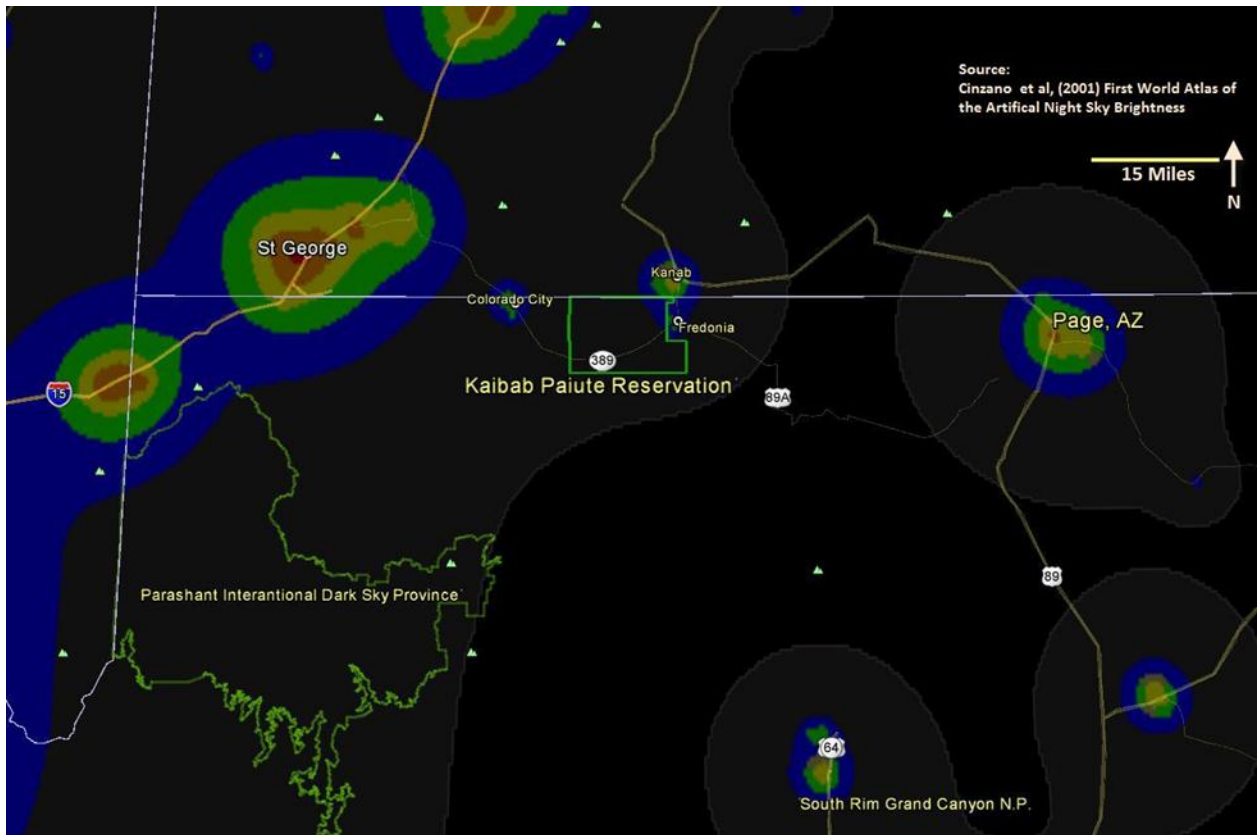


Figure 6-3. Light intensity model developed by Cinzano in 2001. Note the disruption in natural light levels along with the adjacent urban centers of Colorado City, AZ and Kanab, UT.

The 2001 Cinzano model (Figure 6-3) illustrates the effect local urban centers have on the proposed Kaibab Paiute Dark Sky Community. It becomes evident that most of the light sources stem from the adjacent communities of Kanab, UT and Colorado City, AZ. These urban centers are expected to grow. With increased local populations and greater awareness of the Kaibab Paiute Reservation recreation possibilities, visitation is also expected to increase. To maintain these dark sky characteristics and offer a unique experience for visitors that cannot be had at nearby crowded, bustling national parks such as Zion National Park or Grand Canyon National Park, Kaibab Paiute Reservation enacted a light ordinance to reduce light levels and promote dark sky awareness through educational activities.

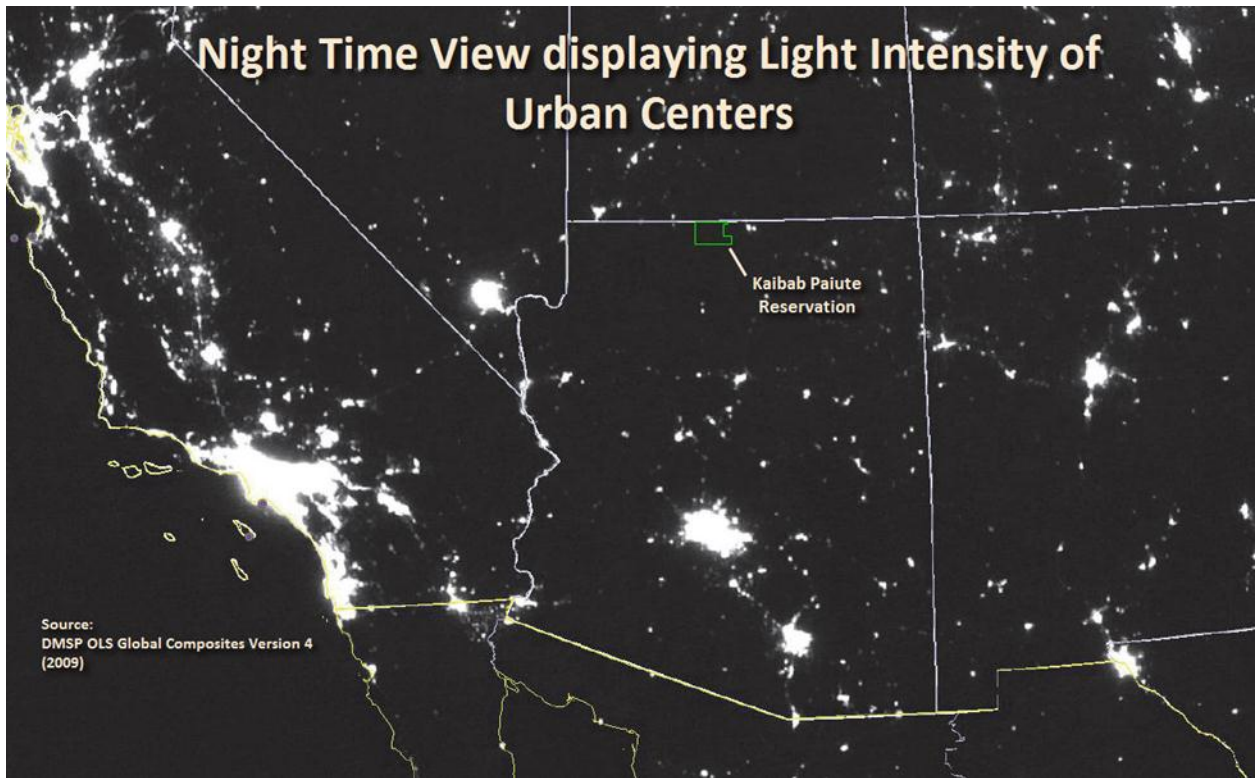


Figure 6-4. Night time view of the western United States. Note the proximity of Kaibab Paiute Dark Sky Community to several urban centers as well as a large area with minimal to no effect on dark skies.

Isolation from urban centers is necessary to ensure the quality of night skies. The proposed Kaibab Paiute Dark Sky Community is located in a remote section in the southwestern United States. However, light sources from Las Vegas, NV, and smaller townships such as Kanab, UT and Colorado City, AZ do affect the amount of light pollution visible (Figure 6-4). Fortunately topography provides natural shielding for this proposed Dark Sky Community as most direct light sources are obscured by the surrounding cliffs and mountain ranges. The most significant light source emitter, St. George, UT, is 50 miles due west from the Kaibab Paiute Dark Sky Community boundary and is shielded by the Vermilion Cliffs. The nearest urban centers, Kanab, UT and Colorado City, AZ do produce light domes that are encroaching on this proposed Dark Sky Community. The most significant attribute of this proposed Dark Sky Community are the surrounding federal and state lands including the Bureau of Land Management (BLM) Arizona Strip District, BLM Utah Saint George District, and the US Forest Service Kaibab National Forest. These provide a limited-development buffer around the proposed Dark Sky Community as well as opportunities to partner and collaborate.

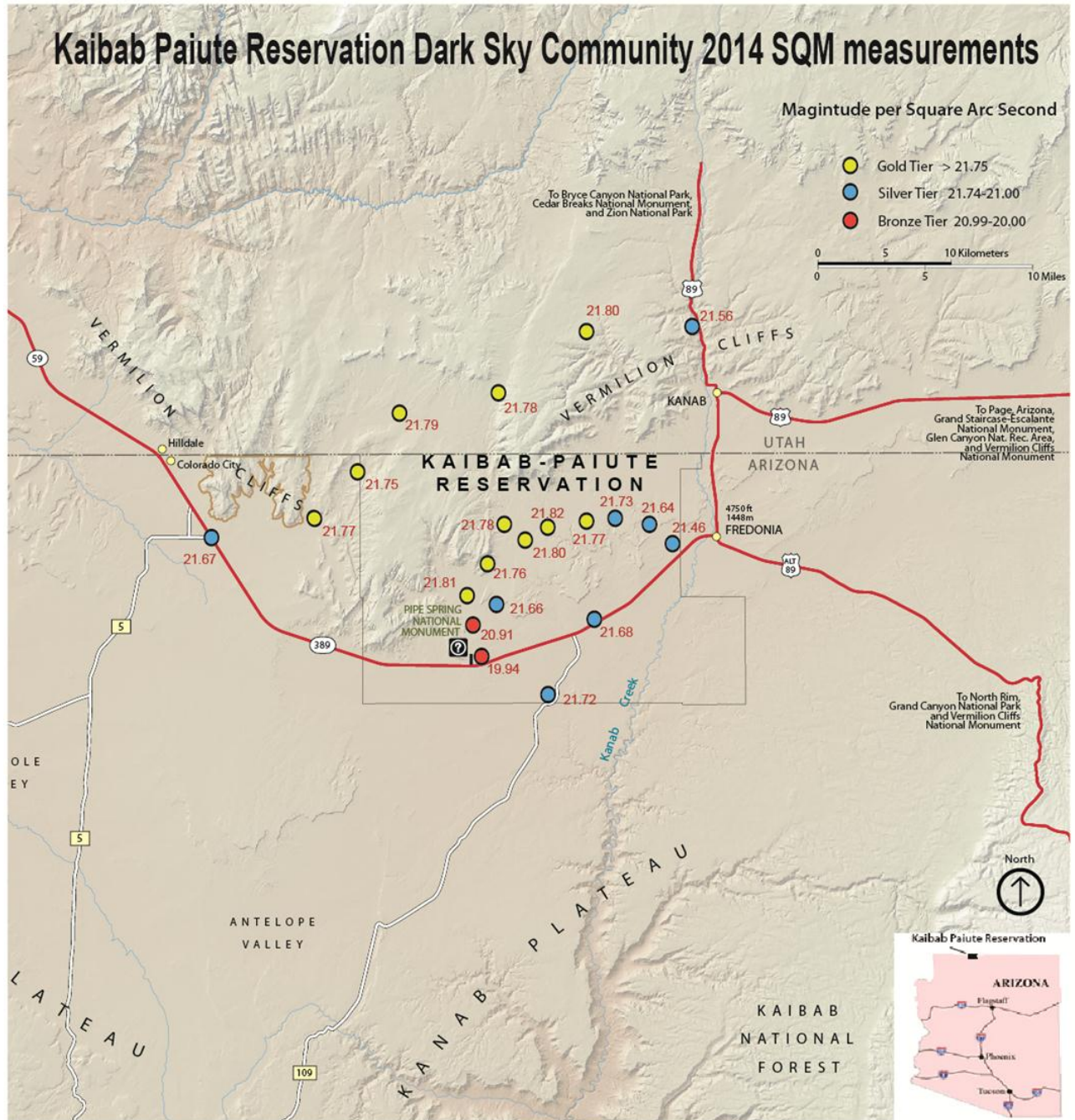


Figure 6-5. Unihedron sky quality measurements July 2014. Sky Quality Meter (SQM) sampling protocol is included in Appendix A

This map (Figure 6-5) represents 130 data points taken with a standard field Unihedron Sky Quality Instrument from July 2014. The data points reflect the changing light levels from reservation light sources and neighboring urban centers. Light measurements indicate Bronze Tier Skies within the more populated regions of the reservation, with Gold Tier Skies remaining on the outskirts.

Table 6-1. Detailed data of the July 2014 SQM measurements.

| Kaibab Paiute Reservation Dark Sky Community SQM measurements | | | | | | | | | | | | | | |
|---|----------|---------------------------------|---------|----------|-----------|--------------|----------|------|------------------|------------------|------------------|------------------|------------------|---------------------|
| Sample Number | | GPS (UTM - NAD 83 - Zone: 12 S) | | | Time (MT) | Surface Temp | Air Temp | Rh % | SQM ₁ | SQM ₂ | SQM ₃ | SQM ₄ | SQM ₅ | SQM _{mean} |
| Date YYMMDD | Sample # | Elevation (ft) | Easting | Northing | 24hr | Celsius | | | | | | | | |
| 2014-07-29 | 1 | 4870 | 345177 | 4080619 | 2146 | 29.2 | 27 | 33.1 | 19.91 | 19.95 | 19.92 | 19.94 | 19.96 | 19.94 |
| 2014-07-29 | 2 | 4925 | 345186 | 4080992 | 2150 | 27.9 | 25.7 | 25.8 | 20.93 | 20.95 | 20.88 | 20.90 | 20.91 | 20.91 |
| 2014-07-29 | 3 | 4968 | 345637 | 4081298 | 2155 | 25.3 | 26 | 34 | 21.91 | 21.79 | 21.82 | 21.77 | 21.77 | 21.81 |
| 2014-07-29 | 4 | 4970 | 345425 | 4084156 | 2210 | 26.3 | 26 | 36.3 | 21.87 | 21.66 | 21.53 | 21.50 | 21.72 | 21.66 |
| 2014-07-29 | 5 | 4970 | 344791 | 4084704 | 2216 | 28.3 | 25.2 | 27.5 | 21.84 | 21.76 | 21.71 | 21.74 | 21.74 | 21.76 |
| 2014-07-29 | 6 | 4995 | 346472 | 4086912 | 2230 | 19.3 | 24.3 | 38.2 | 21.83 | 21.75 | 21.81 | 21.77 | 21.73 | 21.78 |
| 2014-07-29 | 7 | 5018 | 350191 | 4091041 | 2245 | 20.2 | 24.2 | 35.1 | 21.91 | 21.77 | 21.79 | 21.76 | 21.76 | 21.80 |
| 2014-07-29 | 8 | 4975 | 352875 | 4091985 | 2300 | 22.7 | 25.6 | 33.8 | 21.91 | 21.80 | 21.80 | 21.78 | 21.79 | 21.82 |
| 2014-07-29 | 9 | 4838 | 357676 | 4093318 | 2315 | 22.3 | 24.9 | 42.5 | 21.85 | 21.85 | 21.69 | 21.77 | 21.69 | 21.77 |
| 2014-07-29 | 10 | 4776 | 359325 | 4092083 | 2328 | 21.8 | 25.1 | 40.7 | 21.84 | 21.70 | 21.73 | 21.69 | 21.67 | 21.73 |
| 2014-07-29 | 11 | 4725 | 359787 | 4090695 | 2337 | 19.9 | 25 | 40.7 | 21.66 | 21.62 | 21.69 | 21.63 | 21.61 | 21.64 |
| 2014-08-01 | 12 | 4963 | 325890 | 4090759 | 2347 | 26.9 | 22.7 | 47.3 | 21.44 | 21.46 | 21.54 | 21.46 | 21.39 | 21.46 |
| 2014-08-01 | 13 | 5348 | 334373 | 4096560 | 2 | 22.9 | 21.9 | 44 | 21.77 | 21.67 | 21.64 | 21.64 | 21.65 | 21.67 |
| 2014-08-01 | 14 | 5833 | 345434 | 4100159 | 17 | 25 | 21.1 | 50.8 | 21.69 | 21.67 | 21.68 | 21.67 | 21.68 | 21.68 |
| 2014-08-01 | 15 | 5867 | 353279 | 4116807 | 37 | 24.8 | 22.1 | 40.9 | 21.94 | 21.77 | 21.72 | 21.70 | 21.70 | 21.77 |
| 2014-08-01 | 16 | 4902 | 364358 | 4098907 | 102 | 25.6 | 22.01 | 44.3 | 21.72 | 21.77 | 21.79 | 21.75 | 21.74 | 21.75 |
| 2014-08-01 | 17 | 4682 | 363487 | 4089948 | 117 | 25.5 | 21.7 | 46.4 | 21.60 | 21.68 | 21.54 | 21.50 | 21.50 | 21.56 |
| 2014-08-01 | 18 | 4660 | 361093 | 4088424 | 124 | 22.2 | 21.9 | 53.8 | 21.84 | 21.78 | 21.76 | 21.77 | 21.79 | 21.79 |
| 2014-08-01 | 19 | 4695 | 353121 | 4082695 | 137 | 21.1 | 20.4 | 65.6 | 21.80 | 21.76 | 21.77 | 21.77 | 21.78 | 21.78 |
| 2014-08-01 | 20 | 4547 | 350673 | 4077594 | 148 | 19.4 | 21.6 | 61.4 | 21.86 | 21.78 | 21.79 | 21.78 | 21.79 | 21.80 |
| 2014-08-01 | 21 | 4909 | 337027 | 4081302 | 212 | 24.8 | 22.5 | 48.4 | 21.70 | 21.73 | 21.78 | 21.71 | 21.69 | 21.72 |

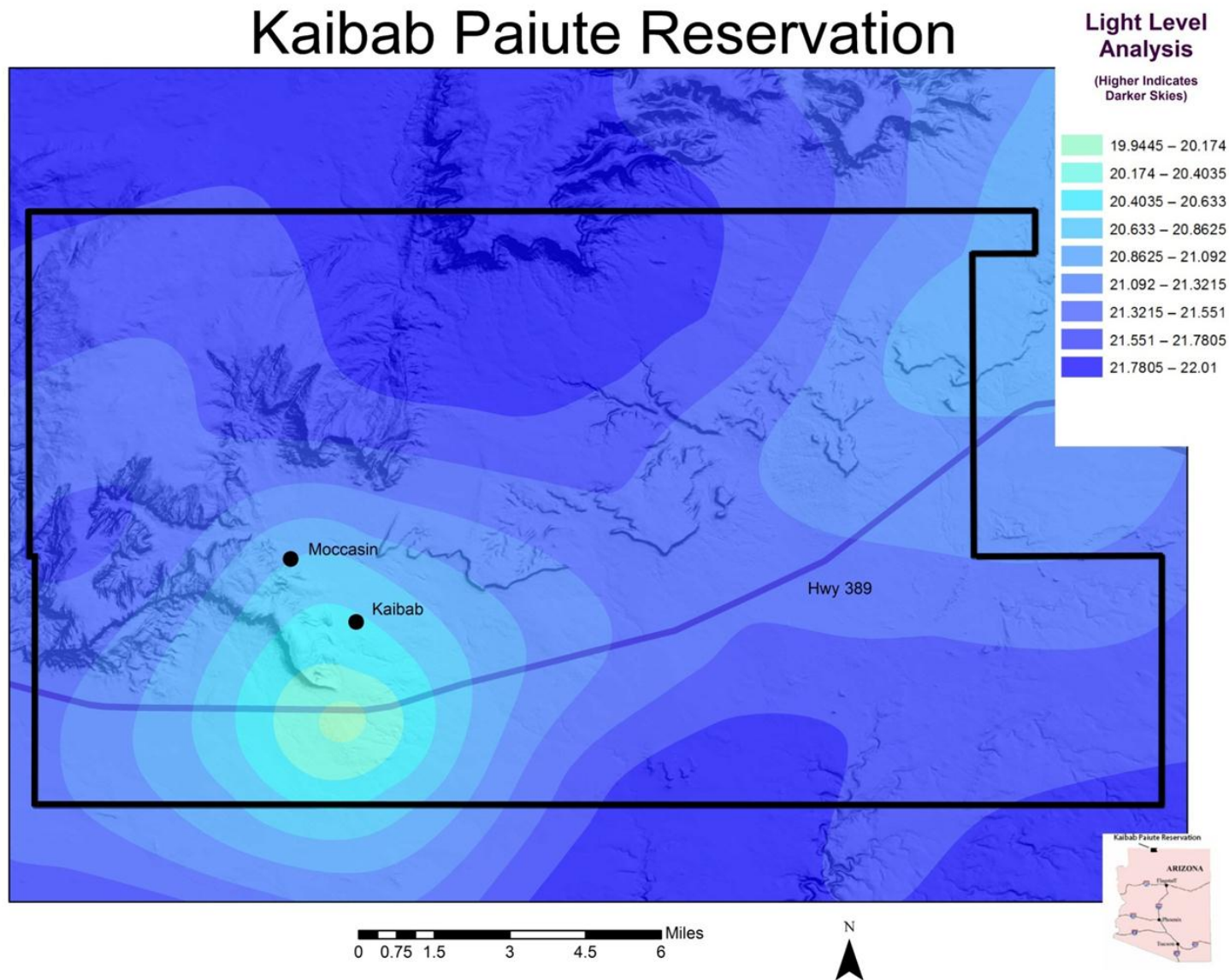


Figure 6-6. Interpolation of July 2014 SQM data. Compilation of 21 data points. Full dataset is provided in Table 6-1.

Using interpolation of the Sky Quality Meter (SQM) dataset (Table 6-1) gives the ability to illustrate the contours of dark sky magnitude. This contoured graphic (Figure 6-6) highlights the western portion as being most affected by the Colorado City, AZ light dome. Also revealing is the concentration of light from the commercial center of Kaibab Paiute Reservation with a gas station/convenience store. It is also evident from this data set that the light domes have greater extent over plateaus versus mountain ranges and cliff fronts. Overall monitoring of this internal spread of light from residential and commercial zones will be a priority for enhancing night skies. Community outreach will be an additional tool to work with the neighboring urban centers of Colorado City, AZ and Kanab, UT as their light domes begin to encroach.

Section 7.

Light Plan



A detailed light plan was approved by Tribal Council November 20, 2014. It is attached as Appendix B.

Section 8.

Letters of Support



Letters of support have been received from all departments of the Kaibab tribal government, 4 federal partners, 3 universities, Colorado Plateau Dark Sky Cooperative, a public utility, and a non-profit interest group.



United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Arizona Strip District Office
345 East Riverside Drive
St. George, Utah 84790
www.blm.gov/az/



September 4, 2014

In Reply Refer To:
1120/A3815 (AZ030)

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

Dear Board of Directors:

The Bureau of Land Management (BLM) Arizona Strip District is a proud partner and close neighbor with the Kaibab Band of Paiute Indians. Public lands of the Arizona Strip border the Kaibab Reservation on three sides. We enthusiastically support their efforts to become the first ever International Dark-Sky Association (IDA) sanctioned Tribal International Dark Sky Community.

This designation will enable the Kaibab Paiute Tribe to become a model for other tribal sovereign nations interested in protecting night skies and cultural traditions. It should also be noted that such an action would significantly aid in preserving the Colorado Plateau night skies and prevent encroaching light sources to the benefit of human health and the protection of wildlife resources.

The Tribal Campground and RV Park are conveniently located to support public visitation and encourage night sky enthusiasts to experience the amazing Arizona Strip night sky on reservation lands, as well as the recently designated Parashant International Night Sky Province, co-managed by BLM. A Kaibab Paiute Dark Sky Community designation by IDA has the full support of the Arizona Strip District. Thank you for your consideration of this recommendation.

Sincerely,

Timothy J. Burke
District Manager



**United States Department of the Interior
NATIONAL PARK SERVICE
BRYCE CANYON NATIONAL PARK
Highway 63, #1 Park Road
PO Box 640201
Bryce Canyon, UT 84764-0201**



September 2, 2014

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

To the International Dark-Sky Association (IDA) Board of Directors:

Bryce Canyon National Park fully supports the application of the Kaibab Band of Paiute Indians to be recognized as an International Dark Sky Community, the first ever tribal government to seek this designation. With designation, the Kaibab Paiute Band will serve as an example, helping lead the way for other tribes interested in protecting night sky and their cultural heritage.

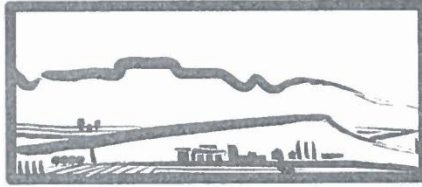
Communities and land managers are increasingly recognizing the importance of night sky protection across the Colorado Plateau for conservation of not only the night sky resource itself, but also other natural and cultural resources associated with dark night skies. Having a tribal partner will further enhance the protection of the incredible night skies on the Colorado Plateau and create opportunities to further educate the public regarding this rapidly disappearing resource and how we can work together to restore it. With some of the darkest skies in the nation, visitors from around the world will be attracted to the area. The Kaibab Paiute Campground and RV Park would be an excellent base for learning about the tribal Dark Sky Community and its cultural importance, as well as for exploring the recently designated Parashant International Night Sky Province, providing a unique visitor experience rarely available in our increasingly urban, lighted world.

This designation will recognize some of the darkest skies in the United States and represents the continuation of partnerships among tribes, local communities and federal agencies. We strongly support this nomination for the Kaibab Paiute IDA Dark Sky Community and look forward to supporting the tribe in boosting awareness and appreciation for the importance of night sky resources in their community and beyond.

Sincerely,

Jeff Bradybaugh
Superintendent





CITIZENS FOR DIXIE'S FUTURE

August 20, 2014

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

To the IDA Board of Directors:

As Executive Director of Citizens for Dixie's Future (a grassroots coalition of local citizens dedicated to preserving the quality of life in our area) I am writing this letter to support the Kaibab Paiute Tribe Dark Sky Community nomination in order to formally recognize the pristine dark skies of this region.

The Kaibab Paiute Tribe is known for being a leader in environmental conservation issues, deriving from the recognition that landscape-based culture and environment are synonymous. The natural night sky of Kaibab – secluded from any large urban areas – is one of the few realms left that, today, is substantially the same as it has been for time and all eternity, the landscape of all our ancestors. This place of respite for all life to function following the circadian rhythms that are naturally meant to govern existence is, likewise, critical for cultural tradition and deserves preservation of the highest order.

In conclusion, any efforts that can help conserve these dark night skies will benefit Tribal communities, seasonal visitors, all regional wildlife, and the growing effort across the Colorado Plateau to maintain our dark night sky heritage. Citizens for Dixie's Future applauds and fully supports the efforts of the Kaibab Band of Paiute Indians as they seek nomination of the Kaibab Paiute Tribe Dark Sky Community.

Sincerely,

A handwritten signature in blue ink, appearing to read "LeAnn Skrzynski". The signature is fluid and cursive, with a large initial "L" and "S".

LeAnn Skrzynski
Executive Director
Citizens for Dixie's Future



Colorado Plateau Dark Sky Cooperative

2282 S. West Resource Blvd

Moab, UT 84532

November 21, 2014

VIA ELECTRONIC COPY ONLY- NO HARD COPY TO FOLLOW

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

Dear IDA Board of Directors:

The Colorado Plateau Dark Sky Cooperative is pleased to support the Kaibab Paiute Tribe International Dark Sky Community nomination. The Kaibab Paiute Tribal Reservation 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 Kaibab Paiute lands have immense value to astronomical viewing, cultural resources, and wildlife conservation in the region. In addition, Kaibab Paiute International Dark Sky Community designation would assist in the conservation of dark night skies in the adjacent Pipe Spring National Monument, neighboring Parashant International Night Sky Province, Zion National Park, Grand Canyon National Park, and other adjacent tribal and BLM lands. The Kaibab Paiute Tribe has shown exceptional leadership in their commitment to conserving natural darkness, and we anticipate their success will set an outstanding example for other communities and tribal governments to follow.

As an essential piece of the newly formed Colorado Plateau Dark Sky Cooperative, the Kaibab Paiute Tribe 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. Kaibab Paiute International Dark Sky Community designation would bring further awareness and legitimacy to the Cooperative.

We fully support the efforts of the Kaibab Paiute Tribe as they seek designation of the Kaibab Paiute International Dark Sky Community. Such efforts to conserve dark skies will benefit residents, 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



A Touchstone Energy® Cooperative
The power of human connections®

August 20, 2014

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

To the IDA Board of Directors:

I am writing this letter as a representative of Garkane Energy to support the Kaibab Band of Paiute Indians' Dark Sky Community nomination in order to formally recognize the pristine dark skies of this region. The Kaibab Paiute Indian Reservation, secluded from any large urban areas, offers a distinct night sky experience that connects cultural and communal involvement in the name of dark skies; an effort that is comparable to no other community in the area. Having the greater part of the reservation undeveloped provides an immaculate opportunity for night sky knowledge that is able to be preserved for future generations to come. Furthermore, we acknowledge the immense value dark skies bring to cultural tradition and the conservation of wildlife and natural resources.

In conclusion, we support the efforts of the Kaibab Band of Paiute Indians as they seek nomination of the Kaibab Paiute Tribe Dark Sky Community.

Sincerely,

A handwritten signature in black ink, appearing to read "Dan McClendon", is written over a light blue circular stamp.

Dan McClendon
General Manager



LOA
800-747-5403

KANAB
888-644-5206

COLORADO CITY/HILDALE
435-874-2810

HATCH
888-735-4288

Kaibab Band of Paiute Indians

November 3, 2014



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

VIA: IDA Board of Directors:

I, Lorraine Ben, Tribal Trust Director of the Kaibab Band of the Paiute Indians submit this letter to support the Kaibab Paiute Tribe Dark Sky Community Nomination in order to formally recognize the pristine dark skies of this region. Kaibab Paiute reservation is located in one of the most remote locations of the lower 48 states and is the historical homeland of the Southern Paiutes. Most of this area remains undeveloped with provisions in the Reservation Resource Management Plan emphasizing limited human influence and use, in these isolated areas to include no paved roads, limited facilities, and limited structures. Kaibab Paiute reservation is meant to be preserved for as the cultural homeland, natural resources, and untouched qualities. We acknowledge the immense value dark skies bring to our traditions, conservation of wildlife, and to future generations.

In conclusion, I fully support the ongoing efforts to establish the Kaibab Paiute Tribe Dark Sky Community. Any effort that can help conserve our dark night skies will benefit our younger generations, our visitors, and the tribal community at large.

Sincerely,

A handwritten signature in black ink, appearing to read 'L. Ben', with a long horizontal flourish extending to the right.

Lorraine Ben,
Tribal Trust Director

Tribal Affairs

HC 65 Box 2
Pipe Spring, Arizona 86022

Phone (928) 643-7245
Fax (928) 643-7260

Kaibab Band of Paiute Indians



November 3, 2014

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

VIA: IDA Board of Directors:

I, Charley Bullets, Tribal Cultural Resource Director of the Kaibab Band of the Paiute Indians submit this letter to support the Kaibab Paiute Tribe Dark Sky Community Nomination in order to formally recognize the pristine dark skies of this region. Kaibab Paiute reservation is located in one of the most remote locations of the lower 48 states and is the historical homeland of the Southern Paiutes. Most of this area remains undeveloped with provisions in the Reservation Resource Management Plan emphasizing limited human influence and use, in these isolated areas to include no paved roads, limited facilities, and limited structures. Kaibab Paiute reservation is meant to be preserved for as the cultural homeland, natural resources, and untouched qualities. We acknowledge the immense value dark skies bring to our traditions, conservation of wildlife, and to future generations.

In conclusion, I fully support the ongoing efforts to establish the Kaibab Paiute Tribe Dark Sky Community. Any effort that can help conserve our dark night skies will benefit our younger generations, our visitors, and the tribal community at large.

Sincerely,

Charley Bullets,
Tribal Cultural Resource Director

Tribal Affairs

HC 65 Box 2
Pipe Spring, Arizona 86022

Phone (928) 643-7245
Fax (928) 643-7260

Kaibab Band of Paiute Indians



November 3, 2014

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

VIA: IDA Board of Directors:

I, Danny Bullets Jr., Director of the Kaibab Band of the Paiute Indians Wildlife, Fisheries and Parks Department submit this letter to support the Kaibab Paiute Tribe Dark Sky Community Nomination in order to formally recognize the pristine dark skies of this region. Kaibab Paiute reservation is located in one of the most remote locations of the lower 48 states and is the historical homeland of the Southern Paiutes. Most of this area remains undeveloped with provisions in the Reservation Resource Management Plan emphasizing limited human influence and use, in these isolated areas to include no paved roads, limited facilities, and limited structures. Kaibab Paiute reservation is meant to be preserved for as the cultural homeland, natural resources, and untouched qualities. We acknowledge the immense value dark skies bring to our traditions, conservation of wildlife, and to future generations.

In conclusion, I fully support the ongoing efforts to establish the Kaibab Paiute Tribe Dark Sky Community. Any effort that can help conserve our dark night skies will benefit our younger generations, our visitors, and the tribal community at large.

Sincerely,

A handwritten signature in black ink that reads "Danny Bullets Jr." with a stylized flourish at the end.

Danny Bullets Jr,
Director Tribal Wildlife, Fisheries and Parks Department

Tribal Affairs

HC 65 Box 2
Pipe Spring, Arizona 86022

Phone (928) 643-7245
Fax (928) 643-7260

Kaibab Band of Paiute Indians



November 3, 2014

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

VIA: IDA Board of Directors:

I, Amanda Bundy, Tribal Human Resource Director of the Kaibab Band of the Paiute Indians submit this letter to support the Kaibab Paiute Tribe Dark Sky Community Nomination in order to formally recognize the pristine dark skies of this region. Kaibab Paiute reservation is located in one of the most remote locations of the lower 48 states and is the historical homeland of the Southern Paiutes. Most of this area remains undeveloped with provisions in the Reservation Resource Management Plan emphasizing limited human influence and use, in these isolated areas to include no paved roads, limited facilities, and limited structures. Kaibab Paiute reservation is meant to be preserved for as the cultural homeland, natural resources, and untouched qualities. We acknowledge the immense value dark skies bring to our traditions, conservation of wildlife, and to future generations.

In conclusion, I fully support the ongoing efforts to establish the Kaibab Paiute Tribe Dark Sky Community. Any effort that can help conserve our dark night skies will benefit our younger generations, our visitors, and the tribal community at large.

Sincerely,

A handwritten signature in cursive script that reads "Amanda Bundy".

Amanda Bundy,
Tribal Education Director

Tribal Affairs

HC 65 Box 2
Pipe Spring, Arizona 86022

Phone (928) 643-7245
Fax (928) 643-7260

Kaibab Band of Paiute Indians



November 3, 2014

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

VIA: IDA Board of Directors:

I, Shirla Bundy, Financial Director of the Kaibab Band of the Paiute Indians submit this letter to support the Kaibab Paiute Tribe Dark Sky Community Nomination in order to formally recognize the pristine dark skies of this region. Kaibab Paiute reservation is located in one of the most remote locations of the lower 48 states and is the historical homeland of the Southern Paiutes. Most of this area remains undeveloped with provisions in the Reservation Resource Management Plan emphasizing limited human influence and use, in these isolated areas to include no paved roads, limited facilities, and limited structures. Kaibab Paiute reservation is meant to be preserved for as the cultural homeland, natural resources, and untouched qualities. We acknowledge the immense value dark skies bring to our traditions, conservation of wildlife, and to future generations.

In conclusion, I fully support the ongoing efforts to establish the Kaibab Paiute Tribe Dark Sky Community. Any effort that can help conserve our dark night skies will benefit our younger generations, our visitors, and the tribal community at large.

Sincerely,

A handwritten signature in blue ink, reading "Shirla Bundy".

Shirla Bundy,
Tribal Financial Director

Tribal Affairs

HC 65 Box 2
Pipe Spring, Arizona 86022

Phone (928) 643-7245
Fax (928) 643-7260

Kaibab Band of Paiute Indians



November 3, 2014

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

VIA: IDA Board of Directors:

I, Dr. Dennis Day, Director of the Kaibab Band of the Paiute Indians Community Health Representative Department (CHR) submit this letter to support the Kaibab Paiute Tribe Dark Sky Community Nomination in order to formally recognize the pristine dark skies of this region. Kaibab Paiute reservation is located in one of the most remote locations of the lower 48 states and is the historical homeland of the Southern Paiutes. Most of this area remains undeveloped with provisions in the Reservation Resource Management Plan emphasizing limited human influence and use, in these isolated areas to include no paved roads, limited facilities, and limited structures. Kaibab Paiute reservation is meant to be preserved for as the cultural homeland, natural resources, and untouched qualities. We acknowledge the immense value dark skies bring to our traditions, conservation of wildlife, and to future generations.

In conclusion, I fully support the ongoing efforts to establish the Kaibab Paiute Tribe Dark Sky Community. Any effort that can help conserve our dark night skies will benefit our younger generations, our visitors, and the tribal community at large.

Sincerely,

A handwritten signature in blue ink, appearing to read "Dennis Day", is written over a circular stamp.

Dr. Dennis Day
Director of Tribal CHR Department

Tribal Affairs

HC 65 Box 2
Pipe Spring, Arizona 86022

Phone (928) 643-7245
Fax (928) 643-7260

Kaibab Band of Paiute Indians



November 3, 2014

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

VIA: IDA Board of Directors:

I, Penny Keller, Substance Abuse Director of the Kaibab Band of the Paiute Indians submit this letter to support the Kaibab Paiute Tribe Dark Sky Community Nomination in order to formally recognize the pristine dark skies of this region. Kaibab Paiute reservation is located in one of the most remote locations of the lower 48 states and is the historical homeland of the Southern Paiutes. Most of this area remains undeveloped with provisions in the Reservation Resource Management Plan emphasizing limited human influence and use, in these isolated areas to include no paved roads, limited facilities, and limited structures. Kaibab Paiute reservation is meant to be preserved for as the cultural homeland, natural resources, and untouched qualities. We acknowledge the immense value dark skies bring to our traditions, conservation of wildlife, and to future generations.

In conclusion, I fully support the ongoing efforts to establish the Kaibab Paiute Tribe Dark Sky Community. Any effort that can help conserve our dark night skies will benefit our younger generations, our visitors, and the tribal community at large.

Sincerely,

A handwritten signature in cursive script, appearing to read 'Penny Keller', is written over a horizontal line.

Penny Keller,
Substance Abuse Director

Tribal Affairs

HC 65 Box 2
Pipe Spring, Arizona 86022

Phone (928) 643-7245
Fax (928) 643-7260

Kaibab Band of Paiute Indians



November 3, 2014

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

VIA: IDA Board of Directors:

I, Roland Maldonado, Cultural Preservation Director of the Kaibab Band of the Paiute Indians submit this letter to support the Kaibab Paiute Tribe Dark Sky Community Nomination in order to formally recognize the pristine dark skies of this region. Kaibab Paiute reservation is located in one of the most remote locations of the lower 48 states and is the historical homeland of the Southern Paiutes. Most of this area remains undeveloped with provisions in the Reservation Resource Management Plan emphasizing limited human influence and use, in these isolated areas to include no paved roads, limited facilities, and limited structures. Kaibab Paiute reservation is meant to be preserved for as the cultural homeland, natural resources, and untouched qualities. We acknowledge the immense value dark skies bring to our traditions, conservation of wildlife, and to future generations.

In conclusion, I fully support the ongoing efforts to establish the Kaibab Paiute Tribe Dark Sky Community. Any effort that can help conserve our dark night skies will benefit our younger generations, our visitors, and the tribal community at large.

Sincerely,



Roland Maldonado,
Tribal Cultural Preservation Director

Tribal Affairs

HC 65 Box 2
Pipe Spring, Arizona 86022

Phone (928) 643-7245
Fax (928) 643-7260

Kaibab Band of Paiute Indians



November 3, 2014

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

VIA: IDA Board of Directors:

I, Latosha Mayo, Tribal Human Resource Director of the Kaibab Band of the Paiute Indians submit this letter to support the Kaibab Paiute Tribe Dark Sky Community Nomination in order to formally recognize the pristine dark skies of this region. Kaibab Paiute reservation is located in one of the most remote locations of the lower 48 states and is the historical homeland of the Southern Paiutes. Most of this area remains undeveloped with provisions in the Reservation Resource Management Plan emphasizing limited human influence and use, in these isolated areas to include no paved roads, limited facilities, and limited structures. Kaibab Paiute reservation is meant to be preserved for as the cultural homeland, natural resources, and untouched qualities. We acknowledge the immense value dark skies bring to our traditions, conservation of wildlife, and to future generations.

In conclusion, I fully support the ongoing efforts to establish the Kaibab Paiute Tribe Dark Sky Community. Any effort that can help conserve our dark night skies will benefit our younger generations, our visitors, and the tribal community at large.

Sincerely,

A handwritten signature in black ink, appearing to read 'Latosha Mayo', is written over a horizontal line.

Latosha Mayo,
Tribal Human Resource Director

Tribal Affairs

HC 65 Box 2
Pipe Spring, Arizona 86022

Phone (928) 643-7245
Fax (928) 643-7260

Kaibab Band of Paiute Indians



November 3, 2014

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

VIA: IDA Board of Directors:

I, Wayne Nelson, Tribal Economic Development Director of the Kaibab Band of the Paiute Indians submit this letter to support the Kaibab Paiute Tribe Dark Sky Community Nomination in order to formally recognize the pristine dark skies of this region. Kaibab Paiute reservation is located in one of the most remote locations of the lower 48 states and is the historical homeland of the Southern Paiutes. Most of this area remains undeveloped with provisions in the Reservation Resource Management Plan emphasizing limited human influence and use, in these isolated areas to include no paved roads, limited facilities, and limited structures. Kaibab Paiute reservation is meant to be preserved for as the cultural homeland, natural resources, and untouched qualities. We acknowledge the immense value dark skies bring to our traditions, conservation of wildlife, and to future generations.

In conclusion, I fully support the ongoing efforts to establish the Kaibab Paiute Tribe Dark Sky Community. Any effort that can help conserve our dark night skies will benefit our younger generations, our visitors, and the tribal community at large.

Sincerely,

A handwritten signature in dark ink, appearing to read "Wayne Nelson", is written over a faint, larger version of the same signature.

Wayne Nelson,
Tribal Economic Development Director

Tribal Affairs

HC 65 Box 2
Pipe Spring, Arizona 86022

Phone (928) 643-7245
Fax (928) 643-7260

Kaibab Band of Paiute Indians

November 3, 2014



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

VIA: IDA Board of Directors:

I, Meghann Olson, Water Resources Director of the Kaibab Band of the Paiute Indians submit this letter to support the Kaibab Paiute Tribe Dark Sky Community Nomination in order to formally recognize the pristine dark skies of this region. Kaibab Paiute reservation is located in one of the most remote locations of the lower 48 states and is the historical homeland of the Southern Paiutes. Most of this area remains undeveloped with provisions in the Reservation Resource Management Plan emphasizing limited human influence and use, in these isolated areas to include no paved roads, limited facilities, and limited structures. Kaibab Paiute reservation is meant to be preserved for as the cultural homeland, natural resources, and untouched qualities. We acknowledge the immense value dark skies bring to our traditions, conservation of wildlife, and to future generations.

In conclusion, I fully support the ongoing efforts to establish the Kaibab Paiute Tribe Dark Sky Community. Any effort that can help conserve our dark night skies will benefit our younger generations, our visitors, and the tribal community at large.

Sincerely,

A handwritten signature in cursive script, reading "Meghann Olson".

Meghann Olson,
Water Resource Director

Tribal Affairs

HC 65 Box 2
Pipe Spring, Arizona 86022

Phone (928) 643-7245
Fax (928) 643-7260

Kaibab Band of Paiute Indians



November 3, 2014

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

VIA: IDA Board of Directors:

I, Paul Roundy, Facility Maintenance Director of the Kaibab Band of the Paiute Indians submit this letter to support the Kaibab Paiute Tribe Dark Sky Community Nomination in order to formally recognize the pristine dark skies of this region. Kaibab Paiute reservation is located in one of the most remote locations of the lower 48 states and is the historical homeland of the Southern Paiutes. Most of this area remains undeveloped with provisions in the Reservation Resource Management Plan emphasizing limited human influence and use, in these isolated areas to include no paved roads, limited facilities, and limited structures. Kaibab Paiute reservation is meant to be preserved for as the cultural homeland, natural resources, and untouched qualities. We acknowledge the immense value dark skies bring to our traditions, conservation of wildlife, and to future generations.

In conclusion, I fully support the ongoing efforts to establish the Kaibab Paiute Tribe Dark Sky Community. Any effort that can help conserve our dark night skies will benefit our younger generations, our visitors, and the tribal community at large.

Sincerely,

Paul Roundy
Paul Roundy,
Facility Maintenance Director

Tribal Affairs

HC 65 Box 2
Pipe Spring, Arizona 86022

Phone (928) 643-7245
Fax (928) 643-7260

Kaibab Band of Paiute Indians



November 3, 2014

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

VIA: IDA Board of Directors:

I, Ronica Spute, Tribal Administrator of the Kaibab Band of the Paiute Indians submit this letter to support the Kaibab Paiute Tribe Dark Sky Community Nomination in order to formally recognize the pristine dark skies of this region. Kaibab Paiute reservation is located in one of the most remote locations of the lower 48 states and is the historical homeland of the Southern Paiutes. Most of this area remains undeveloped with provisions in the Reservation Resource Management Plan emphasizing limited human influence and use, in these isolated areas to include no paved roads, limited facilities, and limited structures. Kaibab Paiute reservation is meant to be preserved for as the cultural homeland, natural resources, and untouched qualities. We acknowledge the immense value dark skies bring to our traditions, conservation of wildlife, and to future generations.

In conclusion, I fully support the ongoing efforts to establish the Kaibab Paiute Tribe Dark Sky Community. Any effort that can help conserve our dark night skies will benefit our younger generations, our visitors, and the tribal community at large.

Sincerely,

A handwritten signature in black ink, appearing to read "Ronica Spute", is written over a horizontal line.

Ronica Spute
Tribal Administrator

Tribal Affairs

HC 65 Box 2
Pipe Spring, Arizona 86022

Phone (928) 643-7245
Fax (928) 643-7260



United States Department of the Interior

NATIONAL PARK SERVICE
Lake Mead National Recreation Area
601 Nevada Way
Boulder City, NV 89005



IN REPLY REFER TO:

September 3, 2014

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

Dear International Dark-Sky Association (IDA) Board of Directors:

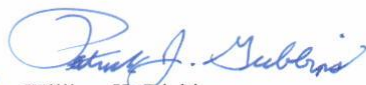
Lake Mead National Recreation Area strongly supports the Kaibab Band of Paiute Indians application to become a recognized International Dark Sky Community, the first ever tribal government to do so. With designation, the Kaibab Paiute tribe will serve as an example in leading the way for other tribal sovereign nations interested in protecting night sky. This program will insure the integrity of their cultural heritage, while economic development opportunities.

The Kaibab Paiute Campground and RV Park could be a perfect base of operations for exploring the recently designated Parashant International Night Sky Province and the surrounding area. Visitors from around the world will be attracted to the area and be provided a unique experience, rarely available in our modern lit world.

This designation will recognize some of the darkest skies in the United States and represents the continuation of partnerships with federal and state agencies, tribes, businesses and local communities across the Colorado Plateau. The National Park Service encourages community-based models of conservation of dark skies, and is working to establish a Colorado Plateau Dark Sky Cooperative by 2016, in time to celebrate its centennial. Having a committed tribal partner in the Cooperative is an important step to ensuring success and sustainability.

As the champion of the National Park Service Starry, Starry Night centennial initiative, to establish America's first Dark Sky Cooperative, I fully support this nomination for the Kaibab Paiute IDA Dark Sky Community. I look forward to working together with the tribe to bring awareness and appreciation for the importance of night sky resources. If you have any questions or concerns, please do not hesitate to contact me at 702.293.8921.

Sincerely,

For 
William K. Dickinson
Superintendent



United States Department of the Interior

NATIONAL PARK SERVICE
Pipe Spring National Monument
HC 65 Box 5
Fredonia, AZ 86022



IN REPLY REFER TO:

September 5, 2014

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

To the International Dark-Sky Association (IDA) Board of Directors:

Pipe Spring National Monument supports the Kaibab Band of Paiute Indians application to become a recognized International Dark Sky Community, the first ever tribal government to do so. With designation, the Kaibab Paiutes will serve as an example in leading the way for other tribal sovereign nations interested in protecting night sky and their cultural heritage.

Pipe Spring is located within the Kaibab Reservation and works very closely with the tribe on a number of important projects, including resource management and conservation. More specifically, the Monument will join with the Tribe in dark sky preservation. Currently, we are working to retrofit existing lighting on buildings to protect night sky resources and promote efficient lighting techniques.

Pipe Spring routinely conducts extensive interpretive and education programs, including several night sky related events. Tribal community and visitor participation are always welcomed at these programs. With the current completion of the rehabilitation and upgrading of the Tribe's campground and RV park adjacent to the Monument, attendance at these nighttime programs is expected to increase dramatically. Dark sky education and preservation will be enhanced through the IDA designation and continuation of such programs.

This designation will recognize some of the darkest skies in the United States and represents the continuation of the strong partnership between Pipe Spring National Monument and the Kaibab Band of Paiute Indians. We strongly support this nomination for the Kaibab Paiute International Dark Sky Community and look forward to working with the tribe to foster awareness and appreciation for the importance of night sky resources.

Sincerely,

John W. Hiscock
Superintendent





United States Department of the Interior

NATIONAL PARK SERVICE
Pipe Spring National Monument
HC 65 Box 5
Fredonia, AZ 86022



IN REPLY REFER TO: 7 A 2 (PISP)

November 14, 2014

Mr. Roland Maldonado
Chairman
Kaibab Band of Paiute Indians
Tribal Affairs Building
HC 65 Box 2
Pipe Spring, Arizona 86022

Dear Chairman Maldonado:

It has come to our attention that the Tribal Council will be considering further action in advancing its nomination of the Kaibab Band of Paiute Indians Dark Sky Community with the International Dark Sky Association (IDA), at its Council meeting on November 20th. We would like to take this opportunity to further support the Tribe in advancing such a nomination, and to inform the Tribe that Pipe Spring National Monument is prepared to advocate and join in such designation efforts as a part of the proposed Dark Sky Community, or associated dark sky park.

We have previously provided a letter of support to the Kaibab Band Environmental Program Director, Daniel Bullets in September, to potentially be included with the Tribe's nomination.

Mr. Bullets, with the assistance of Ms. Maiya Osife of the Bureau of Land Management and Grand Canyon Parashant National Monument, have briefed us on the process and our potential involvement.

In response to a lighting survey compiled by Eathan McIntyre, Physical Science Technician at Grand Canyon Parashant National Monument in August, 2014, Pipe Spring National Monument has already replaced or retrofitted all lighting on the Monument, and associated with the Monument – Kaibab Band of Paiute Indians partnership Visitor Center and Cultural Museum, to comply with IDA Dark Sky requirements. This work was conducted in September, 2014 at an approximate materials and labor cost of \$1,548.

In support of the Community, and park designation, we are also prepared to continue long standing night sky interpretive and educational programs at the Monument and expand such programs in cooperation with the Tribe, and other partners. The Monument has routinely offered "star parties" and astronomy programs a couple of times each year at the Visitor Center and on the Monument. These programs have included opportunities for the community and general public to engage in viewing of night skies with the aid of telescopes and hear different cultural perspectives on night skies, stars, constellations, planets, the moon, and other astronomical features and phenomena.

We are pleased to support any effort on the part of the Tribe to proceed with its Dark Sky Community designation, and are interested in hearing more about the timing of such continued efforts in order to be



appropriately co-designated as part of the IDA Dark Sky Community, or with related IDA park specific designation.

Sincerely,



John W. Hiscock
Superintendent

cc: Carmen Bradley, Vice-Chair, Kaibab Band of Paiute Indians
Ronica Spote, Tribal Administrator, Kaibab Band of Paiute Indians
Daniel Bullets, Environmental Program Director, Kaibab Band of Paiute Indians
Maiya Osife, Management Assistant, Grand Canyon Parashant National Monument





College of Liberal Arts and Sciences
Department of Anthropology

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Portland, Oregon 97207-0751 503-725-3905 fax
jspoon@pdx.edu

October 23, 2014

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

To the IDA Board of Directors:

Greetings. I am writing this letter as the representative of the Anthropology Department at Portland State University to support the Kaibab Band of Paiute Indians' Dark Sky Community nomination. This nomination will formally recognize the pristine dark skies of this region. The Kaibab Paiute Indian Reservation, secluded from any large urban areas, offers a distinct night sky experience that connects culture and ecology in the name of dark skies. Dark skies provide opportunities for intergenerational ecological knowledge transmission. Dark skies also assist in perpetuating cultural traditions and the conservation of wildlife and natural resources.

In sum, we fully support the efforts of the Kaibab Band of Paiute Indians as they seek nomination of the Kaibab Paiute Tribe Dark Sky Community. Any efforts that can help conserve dark night skies will benefit tribal communities and our seasonal visitors.

Sincerely,

A handwritten signature in black ink, appearing to be 'JS' or 'Jeremy Spoon'.

Jeremy Spoon, PhD
Assistant Professor/Research Associate
Portland State University/The Mountain Institute



*Provost Faculty Fellow for Academic Affairs
Associate Professor of Biology*

351 W. University Blvd.
Cedar City, Utah 84720
office (435) 865-8699
fax (435) 586-7921
email TaylorJr@suu.edu

Wednesday, October 15, 2014

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

To the IDA Board of Directors:

I am writing this letter as a representative of Southern Utah University to support the Kaibab Band of Paiute Indians' Dark Sky Community nomination in order to formally recognize the pristine dark skies of this region. The Kaibab Paiute Indian Reservation, secluded from any large urban areas, offers a distinct night sky experience that connects cultural and communal involvement in the name of dark skies; an effort that is comparable to no other community in the area. Having the greater part of the reservation undeveloped provides an immaculate opportunity for night sky knowledge that is able to be preserved for future generations to come. Furthermore, we acknowledge the immense value dark skies bring to cultural tradition and the conservation of wildlife and natural resources.

In conclusion, we fully support the efforts of the Kaibab Band of Paiute Indians as they seek nomination of the Kaibab Paiute Tribe Dark Sky Community. Any efforts that can help conserve our dark night skies will benefit our tribal communities and our seasonal visitors.

Sincerely,

A handwritten signature in blue ink, appearing to read "John R. Taylor".

John R. Taylor

*Provost Faculty Fellow for Academic Affairs
Associate Professor of Biology*



School of Anthropology
Bureau of Applied Research in Anthropology

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P.O. Box 210030
Tucson, AZ 85721-0030 USA
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<http://anthropology.arizona.edu>

October 28, 2014

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

To the IDA Board of Directors:

I am writing this letter as a faculty member within the Bureau of Applied Research in Anthropology of the School of Anthropology at the University of Arizona. I have worked with the Kaibab Band of Paiute Indians since 1991 and am very pleased to write in support of the Tribe's Dark Sky Community nomination in order to formally recognize the pristine dark skies of the Kaibab Paiute Indian Reservation. This Reservation, secluded from any large urban areas, offers a distinct night sky experience. In addition, maintaining dark skies, and avoiding artificial light at night, represents an important cultural tradition for Southern Paiute people.

Because the majority of the Kaibab Paiute Indian Reservation is undeveloped, the region offers an exceptional opportunity for gathering information about the night sky that can then be preserved for future generations. I fully support the efforts of the Kaibab Band of Paiute Indians as they seek nomination as the Kaibab Paiute Tribe Dark Sky Community. Any efforts that can help conserve our dark night skies will benefit the tribal communities on the Reservation, members of the neighboring communities, and seasonal visitors.

Sincerely,

A handwritten signature in cursive script, reading 'Diane E. Austin'.

Diane E. Austin, PhD
Professor and Director





United States Department of the Interior

NATIONAL PARK SERVICE

Zion National Park
Springdale, UT 84767



September 5, 2014

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

To the International Dark-Sky Association (IDA) Board of Directors:

Zion National Park supports the Kaibab Band of Paiute Indians application to become a recognized International Dark Sky Community, the first ever tribal government to do so. With designation, the Kaibab Band will serve as an example in leading the way for other tribal sovereign nations interested in protecting night sky and their cultural heritage. Zion National Park routinely works with the Kaibab Band on numerous resource management issues due to the fact that the Tribe is traditionally affiliated with the lands encompassed in the Park.

Zion National Park is committed to preserving dark night skies and is an important public lands partner in the Colorado Plateau Dark Sky Cooperative currently being established. We would warmly welcome having a tribal partner in the area to further enhance the protection and preservation of our rapidly disappearing night skies. Zion hosts nearly 3 million visitors per year, and if even a portion of those visitors travel through the nearby Kaibab Paiute Reservation to experience the incredible night skies on the Arizona Strip, the educational message and preservation efforts focused on night sky protection will potentially be spread far and wide across the globe.

This important designation will recognize some of the darkest skies in the United States and represents the continuation of partnerships with federal agencies, tribes and local communities. Zion strongly supports this nomination for the Kaibab Paiute IDA Dark Sky Community and looks forward to working with the tribe to bring awareness and appreciation for the importance of night sky resources.

Sincerely,

John W. Hiscock
Acting Superintendent



Appendix A:

Night Sky Data Collection Protocol

Goal: To acquire light intensity data that will allow a geospatial model of the Parashant Night skies

1. Schedule your outing 4 weeks in advanced using the Starry Starry Night projected viewing times. Also be cognizant of cloudy conditions and only continue on the clearest nights. Select a travel itinerary and be sure to email your travel objectives .
2. Double check the equipment list to make sure you have all your items:
 - Safety vest
 - Tripod
 - Air Temp/RH sensor
 - Laser infra-red temp sensor
 - Datasheets
 - Pen
 - Clipboard
 - Personal Head Lamps
 - Sky Quality Meter
 - Back up 9 Volt batteries
 - Protocol
 - Camera
 - GPS
 - Handheld Radio,
 - SAT Phone
 - • Water, Food, First Aid
3. Ensure the vehicle, headlights, and tires are in working order.
4. At your initial stop begin by parking the vehicle at a suitable spot on the road shoulder. Turn off engine and all vehicle lights. Don on your Safety Vest.
5. Begin your data sheet entry by creating a new sample number using the date: yymmdd, road #, and sample #.
(For example: 130722-1069-3)
6. From your vehicle clock, record the time (which should be local Utah Time)
7. Set up the Tripod with the Sky Quality Meter (SQM) and the Temp/Rh sensor on the road surface approximately 5-10 yds in **front** of the truck. Make sure the tripod directs the instruments towards the zenith of the sky. (The very center of the upmost portion of the sky) Avoid getting the Milky Way directly and aim slightly away to one side.

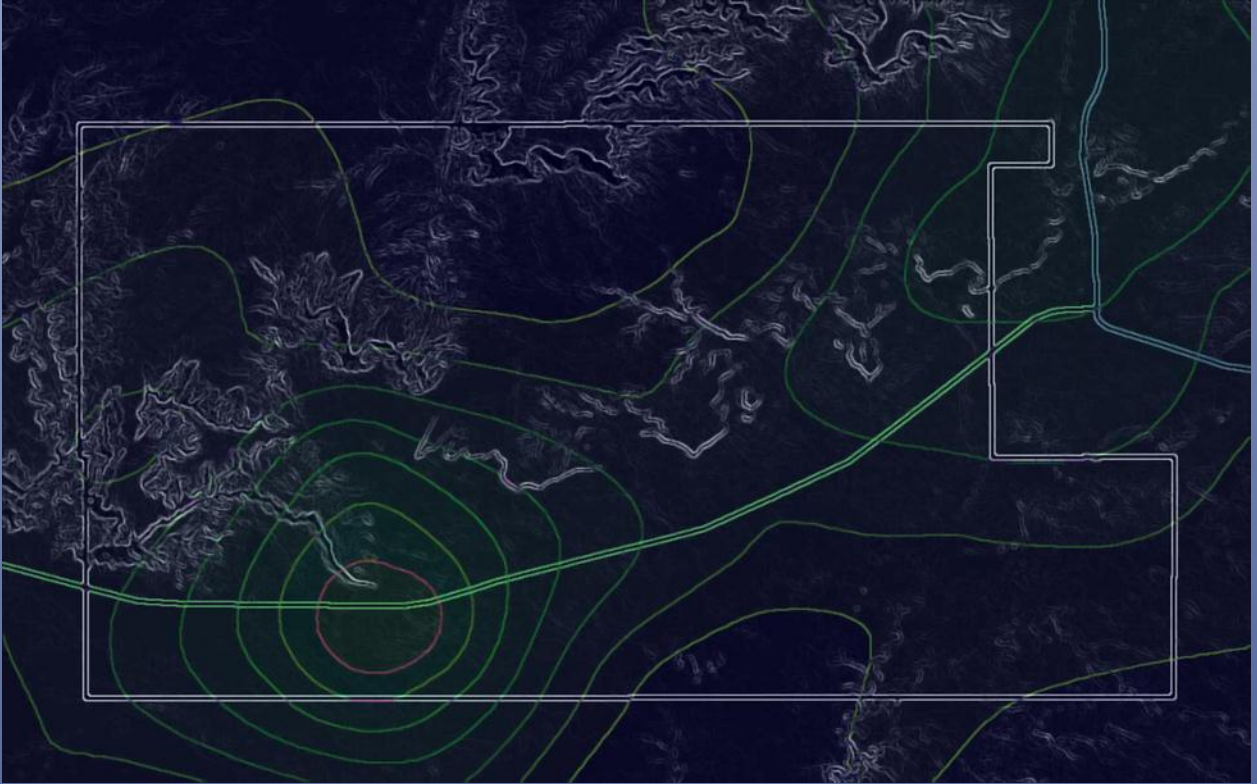
NOTE: If a vehicle is approaching, quickly retrieve the tripod, go to a safe location and make sure you are visible to the driver. Allow the vehicle to pass by and the dust to settle.

8. Record from your GPS: Altitude, Easting, and Northing onto your datasheet. (Make sure your GPS is using UTM and is in NAD83)
9. Record from the handheld laser thermometer the ground surface temperature measurements from an area below the tripod.
10. Once 10 minutes have transpired since turning off the vehicle engine, allowing for dust to settle, begin recording the air temperature and the air humidity as the sensor sits on the tripod.
11. **TURN OFF ALL LIGHT SOURCES** --Begin taking SQM measurements.- a total of 5. Depress the red button while the device is orientated towards the sky Zenith. Record the resulting measurements.
12. Complete the data entry for your location, pack up your equipment, and proceed to your next survey point, 3.1 miles (5km) down the road.
13. Repeat Steps 4-12 at your next stop.
14. At your next availability enter your field data into a digital copy of the spreadsheet.

Appendix B.

Kaibab Paiute Reservation Approved Light Plan





Tribal Light Management Plan

Approved Light Plan

2014

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I. Preamble - Kaibab Indian Reservation Light Plan

The purpose of this Plan is to provide regulations for outdoor lighting which will:

1. Permit the use of outdoor lighting that does not exceed the minimum levels recommended for night-time safety, utility, security, productivity, enjoyment, and commerce.
2. Minimize adverse impacts of lighting such as light trespass, and obtrusive light.
3. Curtail light pollution, reduce skyglow and improve the nighttime environment for astronomy.
4. Help protect the natural environment from the adverse effects of night lighting from gas or electric sources.
5. Conserve energy and resources to the greatest extent possible.
6. Help protect and preserve the dark nights for continued cultural and traditional uses, to include storytelling, navigation, and food harvesting.

II. Lighting Zones

The Lighting Zone (LZ) shall determine the limitations for lighting as specified in this plan. The Lighting Zones shall be as follows:

LZ-0: No ambient lighting

Is defined as areas where the natural environment will be seriously and adversely affected by lighting. Impacts could include disturbing the biological cycles of flora and fauna and/or detracting from human enjoyment and appreciation of the natural environment. Human activity is subordinate in importance to nature. The vision of human residents and users is adapted to the darkness, and they expect to see little or no lighting.

When not needed, lighting should be extinguished.

LZ-1: Low ambient lighting

Is defined as areas where lighting might adversely affect flora and fauna or disturb the character of the area. The vision of human residents and users is adapted to low light levels. Lighting may be used for safety and convenience but it is not necessarily uniform or continuous. After curfew, most lighting should be extinguished or reduced as activity levels decline.

LZ-2: Moderate ambient lighting

Is defined as areas of human activity where the vision of human residents and users is adapted to moderate light levels. Lighting may typically be used for safety and convenience but it is not necessarily uniform or continuous. After curfew, lighting may be extinguished or reduced as activity levels decline.

LZ-3: Moderately high ambient lighting

Is defined as areas of human activity where the vision of human residents and users is adapted to moderately high light levels. Lighting is generally desired for safety, security and/or convenience and it is often uniform and/or continuous. After curfew, lighting may be extinguished or reduced in most areas as activity levels decline.

Maps of Lighting Zones within Kaibab Paiute Reservation

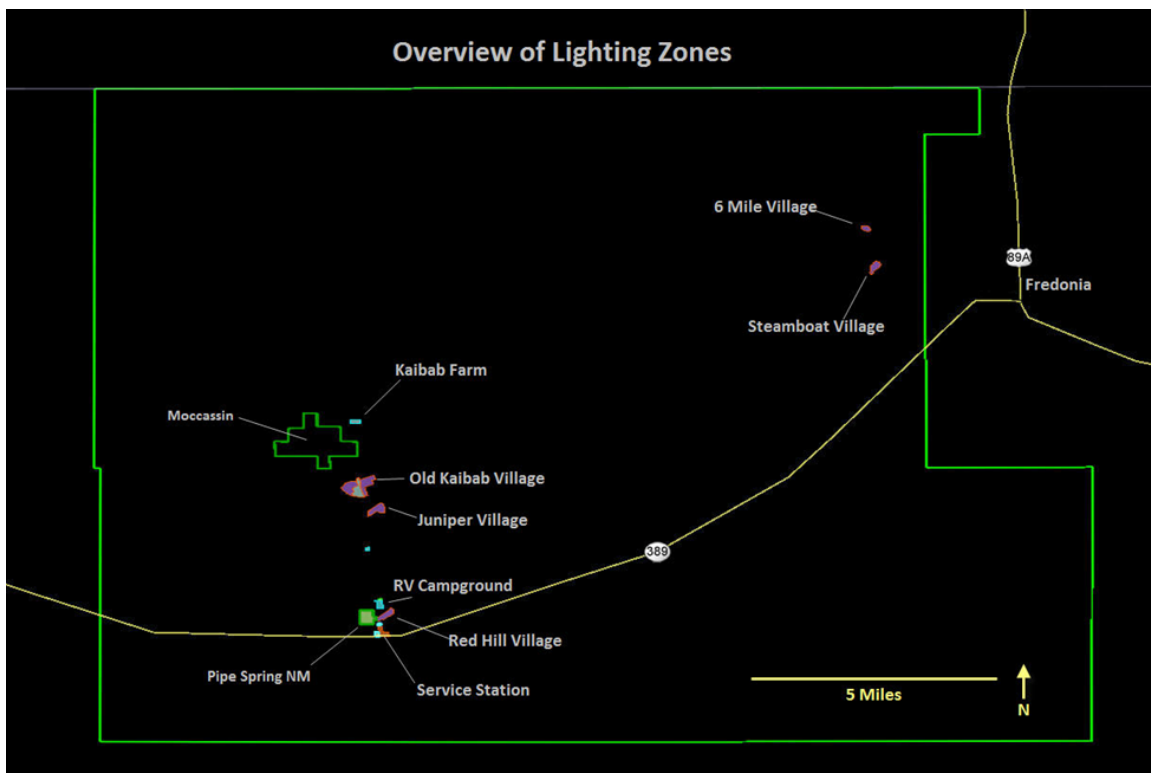


Figure 1. Lighting Zone overview.

Overview of the various lighting zones with 5 residential zones (purple): Red Hill Village, Juniper Village, Old Kaibab village, 6 Mile Village, and Eagle Village (formally known as Steamboat Village) (Figure 1). There is one commercial zone near the main entrance that consists of a service station and shopette (orange). The remaining zones are Tribal buildings including the RV campground(blue), and Pipe Spring National Monument (green). By default any area outside of these defined zones are considered

LZ-0, which are undeveloped, natural areas. The following figures (2-8) show a series of detailed views of the Lighting Zones.



Figure 2. Main Entrance into Kaibab Paiute Reservation. This illustration displays the only commercial zone along with various Tribal Buildings.

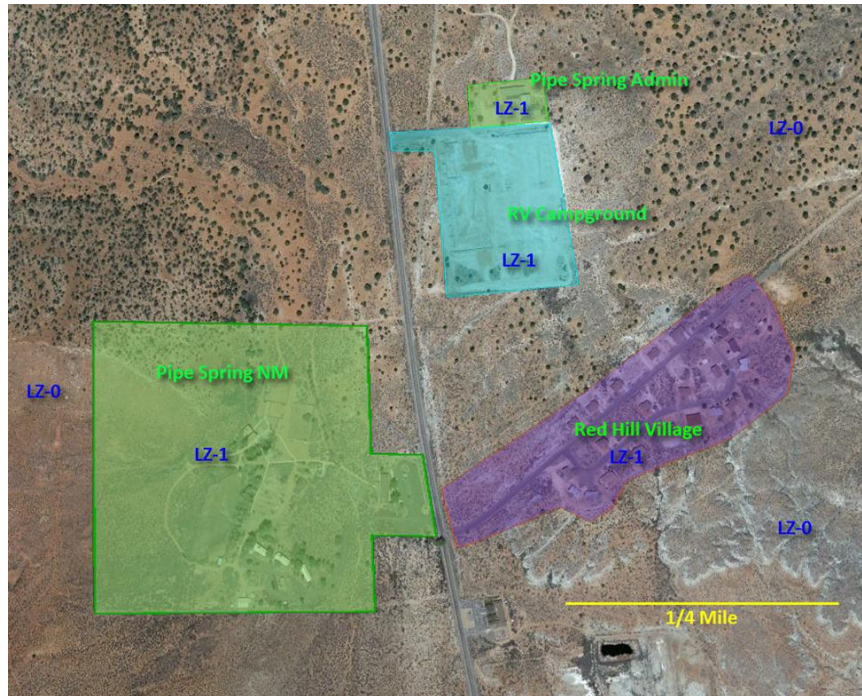


Figure 3. This map illustrates the 40 acre park unit, Pipe Spring National Monument and the Red Hill Village residential zone. The RV campground and Pipe Spring National Monument administrative buildings are in close vicinity.

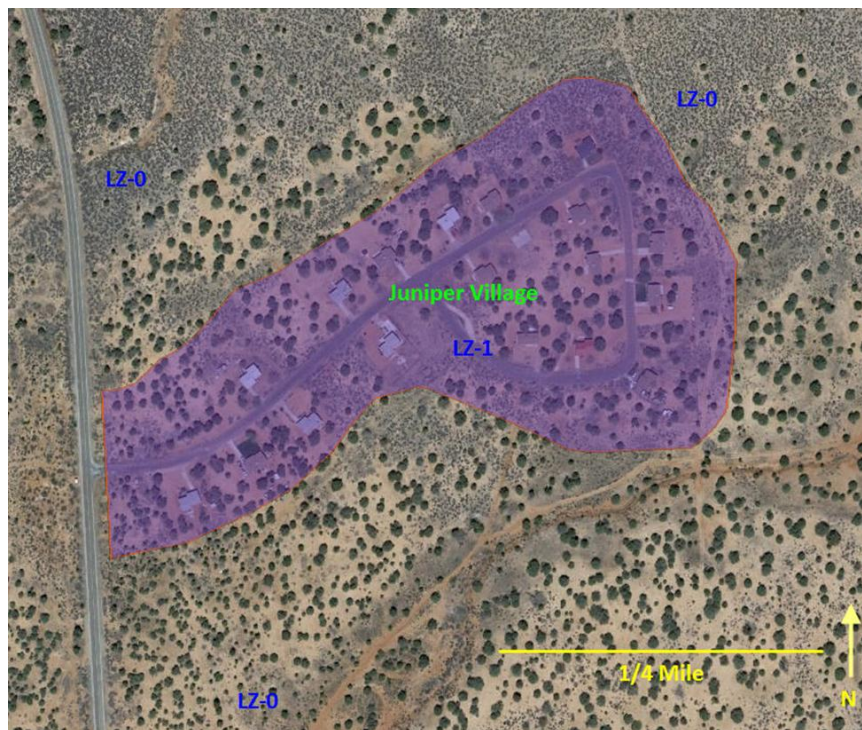


Figure 4. One of the residential zones located along the main conduit is Juniper Village with 19 houses and 7 street lights.

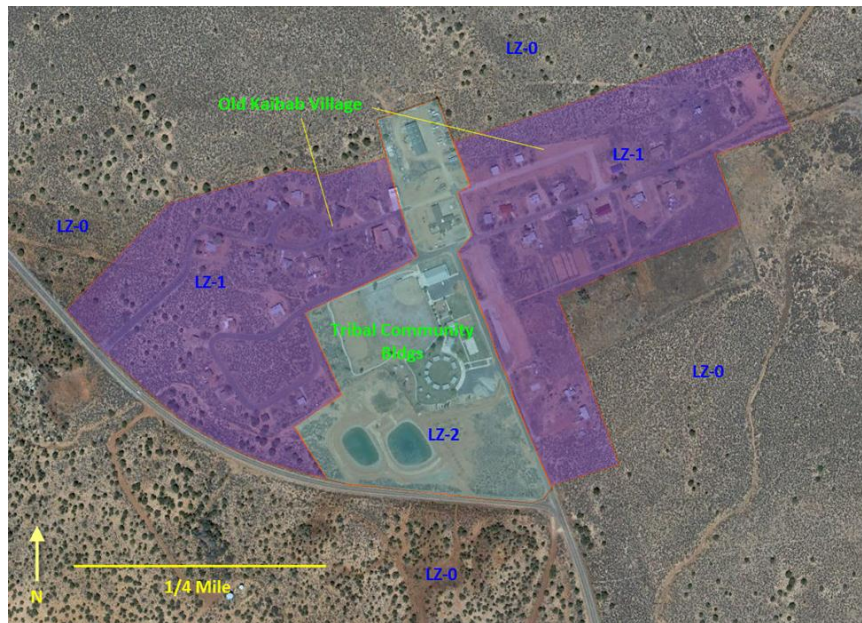


Figure 5. The largest residential zone is Old Kaibab Village with 53 houses, and 14 street lights. This residential zone is bisected by Tribal Community buildings, industrial work houses, and park facilities.

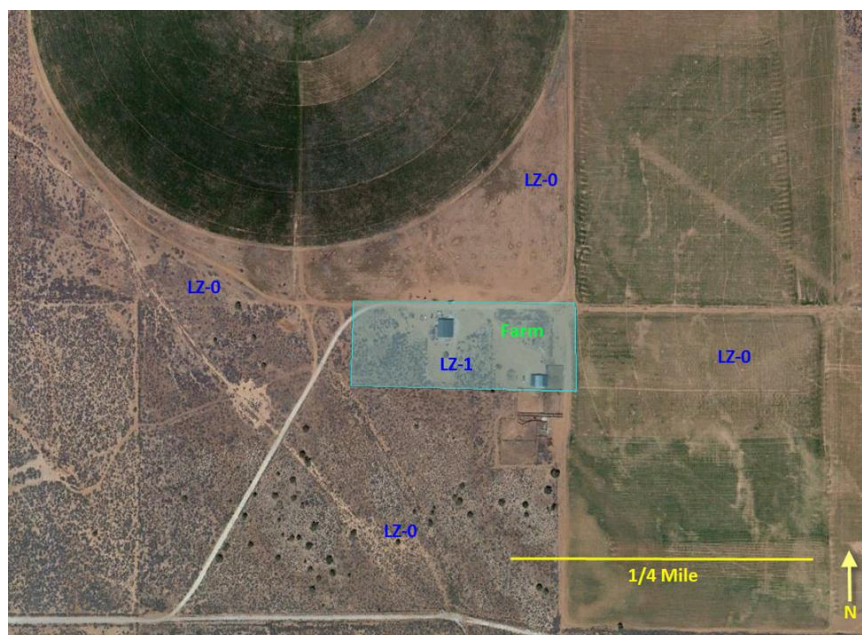


Figure 6. The tribal farm, a rural zone along the outskirts of the Kaibab Paiute Reservation.

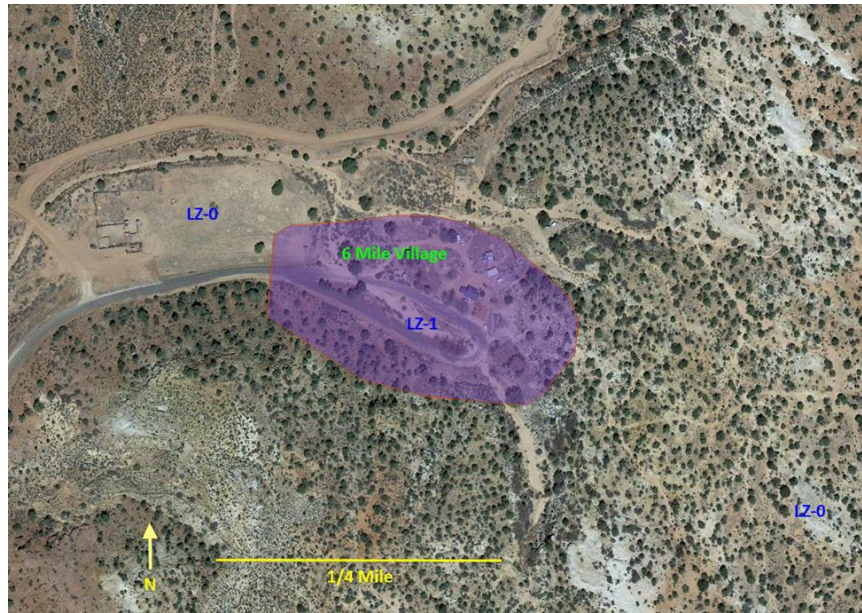


Figure 7. 6 Mile Village is the smallest of the residential zones with only 6 structures.

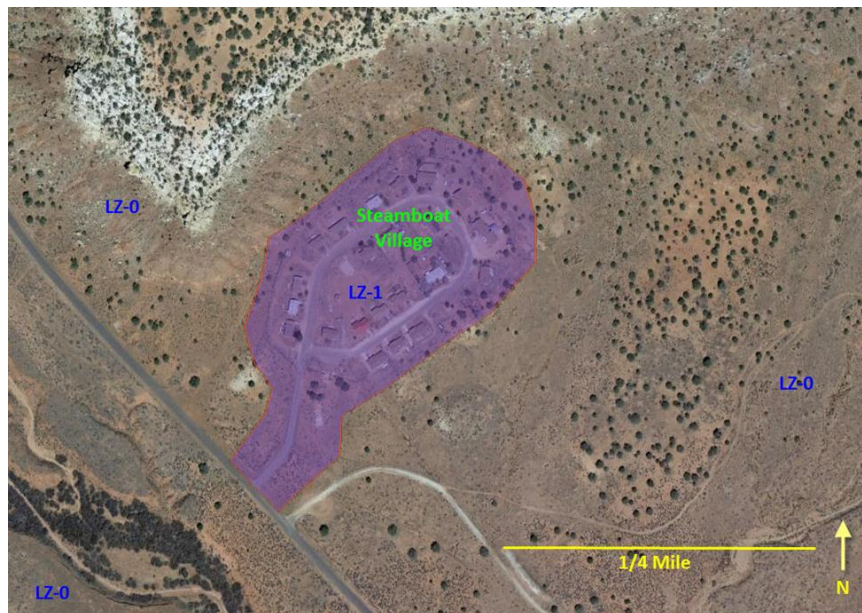


Figure 8. Eagle Village (formally known as Steamboat Village) has 23 houses and is the most eastern residential zone.

III. General Requirements for All Outdoor Lighting

Applicability

All outdoor lighting installed after the date of effect of this Plan shall comply with the stated requirements. This includes, but is not limited to, new lighting, replacement lighting, or any other lighting whether attached to structures, poles, the earth, or any other location, including lighting installed by any third party. A reference table is provided to compare watts and lumens (Table 1).

Table 1. Reference comparison of watts and lumens for incandescent bulbs

| WATTS | LUMENS |
|-------|--------|
| 40 | 450 |
| 60 | 800 |
| 75 | 1,100 |
| 100 | 1,600 |
| 150 | 2,600 |

Lighting Control Requirements

1. Automatic Switching Requirements

Controls shall be provided that automatically extinguish all outdoor lighting when sufficient daylight is available using a control device or system such as a photoelectric switch, astronomic time switch or equivalent functions from a programmable lighting controller, building automation system or lighting energy management system, all with battery or similar backup power or device.

2. Light Curfew for Non-Residential Zones and Tribal Buildings

The tribe shall establish curfew time(s) for non-residential structures after which total outdoor lighting lumens shall be reduced by at least 50% or extinguished. Light curfews will go into effect one hour after

the close of business for tribal facilities, restaurants, and major entertainment facilities such as community parks. The tribe may elect to have no curfew for facilities with 24 hour operations, or to extend the curfew time to meet specific needs.

The intent is to reduce or eliminate lighting after a given time. Benefits include reduced environmental impact, longer hours of improved astronomy, energy savings, and improved sleeping conditions for residents.

Areas without street lights or with very low ambient light levels should consider turning off all non-emergency lighting.

3. Exceptions to Non-residential Light Curfew

Upon completion of lighting reductions retrofits, the following are permissible:

- a. When the outdoor lighting consists of only one light fixture.
- b. Code required lighting for steps, stairs, walkways, and building entrances.
- c. When in the opinion of the Tribe, lighting levels must be maintained.
- d. Motion activated lighting.
- e. Lighting governed by special use permit in which times of operation are specifically identified.
- f. Businesses that operate on a 24 hour basis.

Restrictions on Total Amount of Unshielded Lighting within all Zones

The unshielded lighting of all outdoor lighting shall not exceed the total site lumen limit (Table 2). The total site lumen limit shall be determined using either the Parking Space Method or the Hardscape Area Method (Table 3) for non-residential areas or by total lumens for residential areas (Table 8). Only one method shall be used per permit application, and for sites with existing lighting, existing lighting shall be included in the calculation of total installed lumens.

The total installed lumens are calculated as the sum of the lumens for all light fixtures.

All lighting fixtures over 3000 lumens initial lamp output (or equivalent wattages) will require to be fully-shielded or have a full-cutoff standard allowing only indirect lighting.

Table 2 - Allowed Total unshielded Lumens per Zone for Outdoor Lighting, Note: (lms = lumens)

| LZ-0 | LZ-1 | LZ-2 | LZ-3 |
|-----------------------------|------------------------------|-----------------------------|-----------------------------|
| 0.1 lms per SF of Hardscape | 0.25 lms per SF of Hardscape | 1.5 lms per SF of Hardscape | 2.0 lms per SF of Hardscape |

IV. Street Lighting Plan

Street and roadway lighting is one of the world's largest causes of artificial skyglow.

The purpose of this Plan is to control the light pollution of street lighting, including all collectors, local streets, alleys, sidewalks and bike- ways, as defined by ANSI/IES RP-8 Standard Practice for Roadway and Street Lighting (IES is the Illuminating Engineering Society of North America) and in a manner consistent with this Lighting Plan.

1. Definitions

Roadway or Highway lighting is defined as lighting provided for freeways, expressways, limited access roadways. The primary purpose of roadway or highway lighting is to help the motorist remain on the roadway and help with the detection of obstacles within and beyond the range of the vehicle's headlights.

Street lighting is defined as lighting provided for major, collector, and local roads where pedestrians and cyclists are generally present. The primary purpose of street lighting is to help the motorist identify obstacles, provide adequate visibility of pedestrians and cyclists, and assist in visual search tasks, both on and adjacent to the roadway.

2. Scope

Applies to all street lighting not governed by regulations of federal, state, or other superseding jurisdiction.

Exception: lighting systems mounted less than 10.5 feet above street level and having less than 1000 initial lumens each.

3. Light Shielding and Distribution

All street lighting shall have shielded light fixtures to ensure no light is emitted above 90 degrees of the horizon.

Exception: Ornamental street lighting for specific districts or projects shall be permitted by special permit only, and shall meet the requirements of Table 4 below without the need for external field-added modifications.

V. Requirements for Non-Residential Outdoor Lighting

This section addresses Tribal Buildings and non-residential lighting. The intent is to:

- Limit the amount of light that can be used
- Minimize glare by controlling the amount of light that tends to create glare
- Minimize sky glow by controlling the amount of uplight
- Minimize the amount of off-site impacts or light trespass

The lumen allowances defined in Table 3 (Parking Space Method or Hardscape Area Method) will provide basic lighting (parking lot and lighting at doors and/or sensitive security areas) that is consistent with the selected lighting zone. Additional lumen allowances for specific sites are addressed in Table 4.

Table 3. Allowed Total Lumens per Site for Non-residential Outdoor Lighting. Per Parking Space Method may only be applied to properties with up to 10 parking spaces (including handicapped accessible spaces). Note: (lms = lumens, SF = Square feet)

| Method | LZ-0 | LZ-1 | LZ-2 | LZ-3 |
|-------------------|-------------------------------|-----------------------------------|-------------------------------|-------------------------------|
| Parking Space | 350 lms/parking space | 490 lms/parking space | 630 lms/parking space | 840 lms/parking space |
| Hardscape Area | 0.5 lumens/SF of Hardscape | 1.25 lumens/SF of Hardscape | 2.5 lumens/SF of Hardscape | 5.0 lumens/SF of Hardscape |

Table 4 - Additional Lumen Allowances for Site Specific Uses (Lumens per Square Foot unless otherwise noted)

| Lighting Application | LZ-0 | LZ-1 | LZ-2 | LZ-3 |
|--|------|-------|-------|-------|
| Commercial Buildings. This allowance is lumens per square foot for the total area within the property line. In order to qualify for this allowance, light fixtures must be located under the canopy. | 0 | 3 | 6 | 12 |
| Tribal Community Property. This allowance is lumens per square foot of Tribal non-residential structures. | 0 | 6 | 12 | 24 |
| Outdoor Dining. This allowance is lumens per square foot for the total illuminated hardscape of outdoor dining. In order to use this allowance, light fixtures must be within 2 mounting heights of the hardscape area of outdoor dining | 0 | 1 | 5 | 10 |
| Drive Up Windows. This allowance is lumens per drive-up window. In order to use this allowance, luminaires must be within 20 feet of the center of the window. | 0 | 2,000 | 4,000 | 8,000 |
| Vehicle Service Station Hardscape. This allowance is lumens per square foot for the total illuminated hardscape area less area of buildings, area under canopies, area off property, or areas obstructed by signs or structures. In order to use this allowance, light fixtures must be illuminating the hardscape area and must not be within a building below a canopy, beyond property lines, or obstructed by a sign or other | 0 | 4 | 8 | 16 |

In the following example (Table 5), three types of light fixtures are used to light a parking area and building entry in a light commercial area. Two of these three light fixtures use metal lamps: 70 watt wall mounted area lights and 150 watt pole mounted area lights. The total lumens for the site is equal to 247,840. The allowable lumens are based on the lighting zone and the total hardscape area. Referencing Table 3, the allowed lumens are 2.5/SF for LZ-2. Multiplying this by the total hardscape square footage gives a value of 250,000 lumens allowed. Because this value is greater than the value calculated for the site, the project complies.

Table 5: Example of a Tribal Building Meeting Light Compliance:

| SITE ALLOWED TOTAL Example LUMENS | |
|---|-------------------|
| <i>Site Description</i> | <i>Office 101</i> |
| <i>Lighting Zone</i> | LZ-2 |
| <i>Hardscape Area (SF)</i> | 100,000 |
| <i>Allowed Lumens per SF of Hardscape (Table C)</i> | 2.5 |
| <i>Site Allowed Total Lumens (lumens per SF) x (hardscape area)</i> | 250,000 |

| EXAMPLE - COMPLIANCE CHART | | | |
|------------------------------------|------------|---------------|--------------|
| <i>Lamp Descriptions</i> | <i>QTY</i> | <i>Lumens</i> | <i>Total</i> |
| 70 W Metal Halide | 8 | 3,920 | 31,360 |
| 150 W Metal Halide | 20 | 9,600 | 192,000 |
| 18 W LED | 24 | 1,020 | 24,480 |
| TOTAL INITIAL LUMINAIRE LUMENS | | | 247,840 |
| SITE ALLOWED TOTAL INITIAL LUMENS* | | | 250,000 |
| PROJECT IS COMPLIANT? | | | YES |

VI. Requirements for Residential Outdoor Lighting

General Requirements

For all properties, including multiple residential properties, all outdoor light fixtures shall not exceed the allowed lumen output in Table 6. Refer to Map section on identified residential zones.

Over-lighting

All residential outdoor lighting shall adhere to Table 6 lumen limits and have shielded light fixtures to ensure no light is emitted above 90 degrees of the horizon.

Table 6 - Residential Lighting

| Lighting Application | LZ-0 | LZ-1 | LZ-2 | LZ-3 |
|---|-------------|-------------|-------|-------|
| Maximum Allowed Lumens for Unshielded light fixtures at one entry only | Not allowed | 420 | 630 | 630 |
| Maximum Allowed Lumens for each Fully Shielded light fixtures | 630 | 1,260 | 1,260 | 1,260 |
| Maximum Allowed Lumens for each Unshielded light fixture excluding main entry | Not allowed | 315 | 315 | 315 |
| Maximum Allowed Lumens for each Landscape Lighting | Not allowed | Not allowed | 1050 | 2100 |
| Maximum Allowed Lumens for each Shielded Directional Flood Lighting | Not allowed | Not allowed | 1,260 | 1,260 |
| Maximum Allowed Lumens for each Low Voltage Landscape Lighting | Not allowed | Not allowed | 525 | 525 |

VII. Lighting by Special Permit Only

This section addresses types of lighting that are intrusive or complex in their impacts and need a higher level of scrutiny and/or site sensitivity.

Upon special permit issued by the tribe, lighting not complying with the technical requirements of this plan but consistent with its intent may be installed for complex sites or uses or special uses including, but not limited to, the following applications:

1. Sports facilities, including but not limited to unconditioned rinks, open courts, fields, and stadiums.
2. Construction lighting.
3. Lighting for industrial sites having special requirements, such as manufacturing or storage, shipping piers, etc.
4. Parking structures.
5. Parks
6. Ornamental and architectural lighting of bridges, public monuments, statuary and public buildings.

To obtain such a permit, applicants shall demonstrate the proposed lighting installation:

The applicant has sustained every reasonable effort to mitigate the effects of light on the environment and surrounding properties, supported by a signed statement describing the mitigation measures. Applicant employs lighting controls to reduce lighting at a Project and/or has a specific Curfew time to be established in the Permit.

The Tribe shall review each such application. A permit may be granted if, upon review, the Tribe believes that the proposed lighting will not create unwarranted glare, sky glow, or light trespass.

VIII. Existing Lighting

Phasing in the Light Plan (Amortization) allows existing lighting to gradually and gracefully come into compliance. Substantial changes or additions to existing properties are considered the same as new construction, and must comply. Lighting installed prior to the effective date of this plan shall comply with the following.

1. Amortization

On or before December 31, 2018, all outdoor lighting shall comply with this Code.

2. New Uses or Structures, or Change of Use

Whenever there is a new use of a property (zoning or variance change) or the use on the property is changed, all outdoor lighting on the property shall be brought into compliance with this Plan before the new or changed use commences.

3. Additions or Alterations

If an addition occurs on a property, lighting for the entire property shall comply with the requirements of this Code. Any new lighting shall meet the requirements of this Plan.

4. Resumption of Use after Abandonment

If a property with non-conforming lighting is abandoned for a period of six months or more, then all outdoor lighting shall be brought into compliance with this Plan before any further use of the property occurs.

XI. Enforcement and Penalties

Lighting conformance will be maintained by the assigned Tribal Environmental Director to include verification of Light Plan compliance within all Tribal light zones.

Tribal council will be promptly notified of any lighting infractions and will rectify the non-compliance to include alternate lighting, permits, or other method ensuring compliance to this Light Plan.

Education of dark skies will be utilized as a key tool in promoting compliance.

All contracts and with builders or developers will contain a clause, acknowledging in writing, that he or she is familiar with the lighting requirements and will submit a lighting plan to the tribal council for approval.

X. Future actions and Master Lighting Plan

Master Lighting Plan

The tribe shall develop a Master Lighting Plan which will cover:

1. Goals of street lighting in the jurisdiction by Lighting Zone
2. Assessment of the safety and security issues in the jurisdiction by Lighting Zone
3. Environmentally judicious use of resources by Lighting Zone
4. Energy use and efficiency by Lighting Zone
5. Curfews to reduce or extinguish lighting when no longer needed by Lighting Zone
6. Policy indicating where, when, and under what circumstances new public outdoor lighting (street lighting and lighting on other public property and rights-of-way) is warranted and will be permitted
7. Adaptive controls and curfews to be employed in all future installations of public outdoor lighting.

Warranting

The tribe shall establish a warranting process to determine whether lighting is required. Such warranting process shall not assume the need for any lighting nor for continuous lighting unless conditions warrant the need. Lighting shall only be installed where warranted.

XI. Definitions

Definitions are typically generally added to any code when new code sections are added. The definitions are legally required and play a significant role in the interpretation of the plan and code.

| | |
|--------------------------|---|
| Emergency conditions | Generally, lighting that is only energized during an emergency; lighting fed from a backup power source; or lighting for illuminating the path of egress solely during a fire or other emergency situation; or, lighting for security purposes used solely during an alarm. |
| Footcandle | The unit of measure expressing the quantity of light received on a surface. One footcandle is the luminance produced by a candle on a surface one foot square from a distance of one foot. |
| Forward Light | For an exterior luminaire, lumens emitted in the quarter sphere below horizontal and in the direction of the intended orientation of the luminaire. |
| Fully Shielded Luminaire | A luminaire constructed and installed in such a manner that all light emitted by the luminaire, either directly from the lamp or a diffusing element, or indirectly by reflection or refraction from any part of the luminaire, is projected below the horizontal plane through the luminaire's lowest light-emitting part. |
| Glare | Lighting entering the eye directly from luminaires or indirectly from reflective surfaces that causes visual discomfort or reduced visibility. |
| Hardscape | Permanent hardscape improvements to the site including parking lots, drives, entrances, curbs, ramps, stairs, steps, medians, walkways and non-vegetated landscaping that is 10 feet or less in width. Materials may include concrete, asphalt, stone, gravel, etc. |

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| Hardscape Area | The area measured in square feet of all hardscape. Refer to Hardscape definition. |
| IDA | International Dark-Sky Association |
| IESNA | Illuminating Engineering Society of North America |
| Impervious Material | Sealed to severely restrict water entry and movement |
| Industry Standard Lighting Software | Lighting software that calculates point-by- point luminance that includes reflected light using either ray-tracing or radiosity methods. |
| Lamp | A generic term for a source of optical radiation (i.e. “light”), often called a “bulb” or “tube”. Examples include incandescent, fluorescent, high-intensity discharge (HID) lamps, and low pressure sodium (LPS) lamps, as well as light-emitting diode (LED) modules and arrays. |
| Landscape Lighting | Lighting of trees, shrubs, or other plant material as well as ponds and other landscape features. |
| LED | Light Emitting Diode |
| Light Pollution | Any adverse effect of artificial light including, but not limited to, glare, light trespass, sky- glow, energy waste, compromised safety and security, and impacts on the nocturnal environment. |
| Light Trespass | Light that falls beyond the property it is intended to illuminate. |
| Lighting | “Electric” or “man-made” or “artificial” lighting. See “lighting equipment”. |
| Lighting Equipment | Equipment specifically intended to provide gas or electric illumination, including but not limited to, lamp(s), luminaire(s), ballast(s), poles, posts, lens(s), and related structures, electrical wiring, and other necessary or auxiliary components. |
| Lighting Zone | An overlay zoning system establishing legal limits for lighting for particular parcels, areas, or districts in a community. |
| Low Voltage Landscape Lighting | Landscape lighting powered at less than 15 volts and limited to luminaires having a rated initial luminaire lumen output of 525 lumens or less. |
| Lumen | The unit of measure used to quantify the amount of light produced by a lamp or emitted from a luminaire (as distinct |

| | |
|---------------------------|--|
| | from “watt,” a measure of power consumption). |
| Luminaire | The complete lighting unit (fixture), consisting of a lamp, or lamps and ballast(s) (when applicable), together with the parts designed to distribute the light (reflector, lens, diffuser), to position and protect the lamps, and to connect the lamps to the power supply. |
| Outdoor Lighting | Lighting equipment installed within the property line and outside the building envelopes, whether attached to poles, building structures, the earth, or any other location; and any associated lighting control equipment. |
| Partly shielded luminaire | A luminaire with opaque top and translucent or perforated sides, designed to emit most light downward. |
| Pedestrian Hardscape | Stone, brick, concrete, asphalt or other similar finished surfaces intended primarily for walking, such as sidewalks and pathways. |
| Photoelectric Switch | A control device employing a photocell or photodiode to detect daylight and automatically switch lights off when sufficient daylight is available. |
| Property line | The edges of the legally-defined extent of privately owned property. |
| Relative photometry | Photometric measurements made of the lamp plus luminaire, and adjusted to allow for light loss due to reflection or absorption within the luminaire. Reference standard: IES LM-63. |
| Repair(s) | The reconstruction or renewal of any part of an existing luminaire for the purpose of its ongoing operation, other than relamping or replacement of components including capacitor, ballast or photocell. Note that retrofitting a luminaire with new lamp and/or ballast technology is not considered a repair and for the purposes of this plan the luminaire shall be treated as if new. “Repair” does not include normal relamping or replacement of components including capacitor, ballast or photocell. |
| Replacement Lighting | Lighting installed specifically to replace existing lighting that is sufficiently broken to be beyond repair. |
| Sales area | Uncovered area used for sales of retail goods and materials, |

| | |
|--------------------------------|---|
| | including but not limited to automobiles, boats, tractors and other farm equipment, building supplies, and gardening and nursery products. |
| Seasonal lighting | Temporary lighting installed and operated in connection with holidays or traditions. |
| Shielded Directional Luminaire | A luminaire that includes an adjustable mounting device allowing aiming in any direction and contains a shield, louver, or baffle to reduce direct view of the lamp. |
| Sign | Advertising, directional or other outdoor promotional display of art, words and/or pictures. |
| Sky Glow | The brightening of the nighttime sky that results from scattering and reflection of artificial light by moisture and dust particles in the atmosphere. Skyglow is caused by light directed or reflected upwards or sideways and reduces one's ability to view the night sky |
| Temporary lighting | Lighting installed and operated for periods not to exceed 60 days, completely removed and not operated again for at least 30 days. |
| Third Party | A party contracted to provide lighting, such as a utility company. |
| Time Switch | An automatic lighting control device that switches lights according to time of day. |
| Translucent | Allowing light to pass through, diffusing it so that objects beyond cannot be seen clearly (not transparent or clear). |
| Unshielded Luminaire | A luminaire capable of emitting light in any direction including downwards. |
| Uplight | For an exterior luminaire, flux radiated in the hemisphere at or above the horizontal plane. |
| Vertical Luminance | Luminance measured or calculated in a plane perpendicular to the site boundary or property line. |