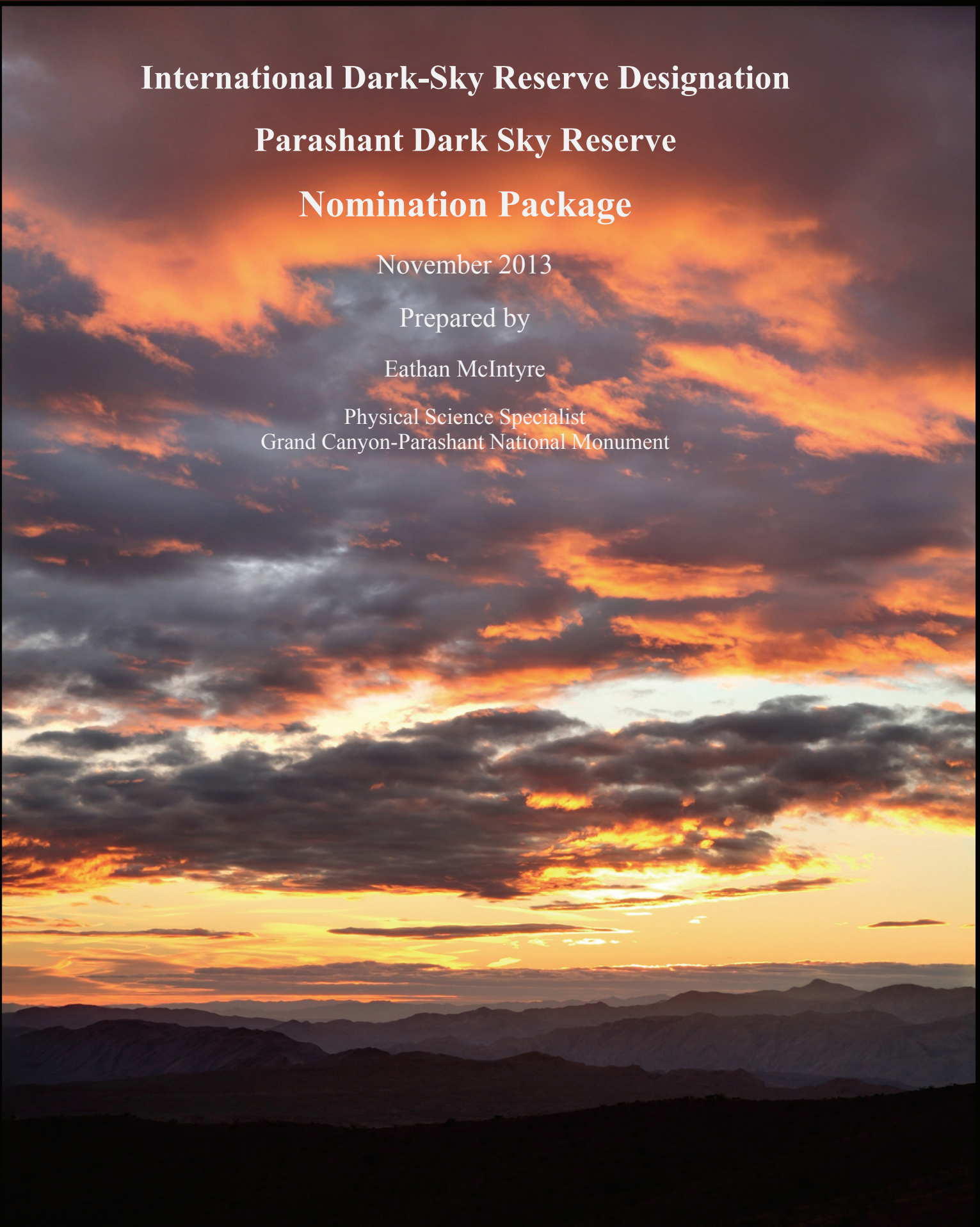
Bureau of Land Management
National Park Service
US. Department of the Interior



International Dark-Sky Reserve Designation

Parashant Dark Sky Reserve

Nomination Package

November 2013

Prepared by

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Grand Canyon-Parashant National Monument

Grand Canyon - Parashant National Monument

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Executive Summary

Grand Canyon–Parashant National Monument (Parashant) was created under Presidential Proclamation on January 11, 2000 by President Clinton to preserve the remoteness and essentially unspoiled landscape character of the area. This Monument, located in one of the most remote regions of the lower 48 states, is intended to protect the array of scientific, biological, geological, hydrological, cultural, and historical objects. Parashant represents an area of over a million acres with no paved roads, limited structures, four Wilderness areas, and pristine night skies, and exemplified the motto "*Where the West Stays Wild*". The commitment from the National Park Service (NPS) and Bureau of Land Management (BLM) Monument management to maintain this remoteness and solitude creates a unique sanctuary for Dark Sky resources in need of conservation and protection. The location of the Monument also provides a unique collaboration between the federal government and Arizona state lands and private landowners, and encourages support from neighbors and partners outside the Monument boundaries. In addition, the National Park Service and Bureau of Land Management are mandated to proactively manage and protect these Dark Sky resources with a wide variety of legislation.

This proposed Reserve is within an area formerly isolated from large urban centers and shares the concerns of other similar regions that now experience encroaching urban light as populations increase. It is important and becoming critical to recognize the Parashant Dark Sky resource while further involving partners and neighbors to be successful in preserving our pristine views of our night skies, meteor showers, and the Milky Way. Solitude and wilderness have always been associated with Parashant and these characteristics exemplify our night skies.

This proposal is to formally recognize the Parashant Dark Sky Reserve with the following objectives:

- Recognize the pristine Dark Sky resources in the Core Reserve as well as the function of the Periphery Reserve
- Recognize the partnerships with multiple Federal and State Agencies, organizations, local communities, Native American tribes, and private land owners
- Implement a lightscape management plan to enhance natural light throughout the Reserve
- Provide interpretation, education, and public access to allow visitors to experience these exceptional Dark Skies.

Given these objectives, one of the advantages of the Parashant Dark Sky Reserve are the limited structures within the proposed Reserve. There are only thirteen structures with light sources in the entire reserve with a total of 42 exterior light bulbs, making this Reserve one of the least developed regions in the United States. The Monument management has been proactive in recent years to modify the light fixtures at the government facility sites to be dark sky friendly.

This proposal seeks Gold Tier status for the proposed Parashant Dark Sky Reserve from the International Dark-Sky Association. This Reserve will be a true milestone to promote Dark Sky resources given the partnerships, interpretation opportunities, and ongoing initiatives to improve

our lightscapes. Having a recognized Dark Sky Reserve will further our efforts to promote and conserve this endangered resource within the Colorado Plateau community. Future initiatives include a fully implemented lightscape plan, promote additional Dark Sky communities and explore the possibility of expanding the size of the Parashant Dark Sky Reserve. It is our desire to keep these night skies pristine to provide a backdrop for the narrations of traditional cultural stories, to sustain our wildlife, to provide a sanctuary for star gazers to simply look up at the universe and ponder the vastness, and to allow future generations to come and share in all these experiences.

1. Parashant Dark Sky Reserve Status Eligibility

This section discusses the eligibility of the Parashant Dark Sky Reserve with the provided IDA Designation Guidelines, May 2013, Definition of IDA Dark Sky Reserve.

An IDA Dark Sky Reserve (DSR) is a public or private land of substantial size (of 700 km² about 173,000 acres) possessing an exceptional or distinguished quality of starry nights and a nocturnal environment that is specifically protected for its scientific, natural, educational, cultural heritage, and/or public enjoyment.

The proposed Parashant Dark Sky Reserve consists of a variety of land ownership types; Public lands (BLM and NPS managed lands), Arizona State Trust Lands, and privately owned lands, all within an area of over a million acres set aside by President Clinton (larger than the State of Rhode Island) for its natural, cultural, scenic, and recreational values. In addition, the undeveloped and primitive nature of Parashant lends to its exceptional starry nights as discussed further in the Sky Quality section.

The IDA DSR consists of a core area meeting the minimum criteria for sky quality and natural darkness, and a peripheral area that supports dark sky values in the core and while receiving similar benefits.

A core and a periphery area have been identified as illustrated on page 17, based on their sky quality and naturally occurring darkness from ongoing dark night surveys. The core area was selected, not only for having the most exceptional dark skies, but also to allow the periphery reserve to act as a buffer using topography and distance from urban centers to provide a lasting sanctuary for this endangered resource. Both portions of this DSR enjoy the benefits of the Light Management Plan and Interpretation Plan as well as public access.

The IDA DSR is formed through a partnership of multiple landowners and/or administrators that have recognized the value of the starry night through regulations, formal agreements, and long term planning.

This proposed DSR will benefit from the ongoing partnerships already in place since the mid-twentieth century with Federal, State, and County Land Administrators along with numerous private land owners. NPS and BLM administrators formally recognize the appeal of the Parashant dark night skies, to include the existing Monument Dark Night policies and various long term planning decisions described in the Monument Resource Management Plan.

In addition, one of the most compelling features of this proposed DSR is the unique geography of Parashant which is completely encapsulated by other large Public and Indian Reservation Land units: BLM Arizona Strip District, BLM Las Vegas District, Lake Mead National Recreation Area, Grand Canyon National Park, and Hualapai Indian Reservation, several of which are represented in the Letters of Support. This geography creates an “island” of dark skies with lasting longevity as any urban development would be minimal -- important as this proposal strives for reserve status and must be able to maintain sky quality for generations. More importantly this will provide opportunities to solidify further agreements with our neighbors and to perhaps merge IDA designations and combine efforts to promote awareness.

UNITED STATES DEPARTMENT OF THE INTERIOR
GRAND CANYON-PARASHANT NATIONAL MONUMENT
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Phone: (435) 688-3345 Fax: (435) 688-3388

October 30, 2013

In Reply Refer To:
BLM/NPS 1700 (AZA0300)

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:

The Grand Canyon-Parashant (Parashant) National Monument is a remote area of open, undeveloped spaces and engaging scenery, located on the edge of the Grand Canyon in north-west Arizona. Because of its remote and rugged location, it is a geologic, historic, and scientific treasure as well as a sanctuary for pristine dark night skies. This IDA Dark Sky Reserve nomination reflects our commitment and dedication to preserving these natural resources and understands that the wellbeing of our night skies enhance our wildlife, visitor experience, and the Monument as a whole. This Parashant Dark Sky Reserve will recognize some of the darkest skies in the United States but also represent the continuation of partnerships with federal agencies, state lands, tribes, private land owners, and local communities. As one of most remote regions in the lower 48 states, the Parashant Dark Sky Reserve will continue to offer some of darkest skies in the nation while maintaining a visitor experience rarely experienced elsewhere with solitude, wilderness, and isolation.

While the National Park Service is the only land management agency that has established policies to protect dark skies as a resource, Grand Canyon Parashant National Monument also enjoys the dual management between the National Park Service (NPS) and the Bureau of Land Management (BLM). Both agencies have focused their efforts via BLM National Lands Conservation System and the NPS Organic Act, to enact a Resource Management Plan/General Management Plan to identify and protect Monument objects. As a result, there are no paved roads, public facilities, nor formal campgrounds, allowing for the preservation of solitude, wilderness, and the primitive, undeveloped nature of Parashant National Monument.

Ongoing efforts to mitigate 24 outdoor lighting fixtures at our three existing administrative sites within the Monument will continue and working with our private partners to enhance natural light across this reserve. Interpretation will also be a key component as we reach out to our

visitors, partners, tribes, and neighbors to connect them with a dark night sky experience, including preservation of traditional cultural values and wildlife protection benefits.

We support this nomination for the IDA International Dark Sky Reserve "Gold Tier" designation. Dark night skies are symbolic of Parashant National Monument values which encapsulates the remoteness and solitude into one encompassing experience. Thank you for your consideration of this nomination as we strive to preserve these dark skies along with neighboring communities, to bring awareness and appreciation for the importance of night sky resources.

Sincerely,

Pamela D. McAlpin
BLM Monument Manager

Rosalie M. Pepito
NPS Superintendent

3. Description of Grand Canyon-Parashant National Monument Night Sky Resources

Figure 1. Grand Wash Cliffs Wilderness located in Grand Canyon-Parashant National Monument.

Location and Description of the Monument

On January 11, 2000, an area of 1,048,321 acres was set aside by presidential proclamation to protect scientific and historic objects, and the remote, scenic qualities of the region. The National Park Service (NPS) and the Bureau of Land Management (BLM) jointly manage this land designated the Grand Canyon-Parashant National Monument. NPS managed lands comprise of 36% and the BLM managed lands comprise 59% respectively. Included within the Monument boundary are approximately 23,000 acres of Arizona State Trust land (3%) and approximately 17,000 acres of private land (2%). Located in Mohave County in northwestern Arizona, the Monument borders Grand Canyon National Park to the south, Nevada to the west, and is bounded by the BLM Arizona Strip Field Office to the east and north (Fig 5). This region is known to be one of the most remote locations in the contiguous United States. Many opportunities are available for finding solitude and engaging in primitive recreation activities in this beautiful but sparse land surrounded by stunning vistas and scenery.

The Monument has a rich geologic history spanning almost 2 billion years. Paleozoic and Mesozoic sedimentary rock layers are exposed as relatively undeformed outcrops which offer a clear view to the geologic history of the Colorado Plateau. The Monument encompasses the lower portion of the Shivwits Plateau, which forms an important watershed for the Colorado River and the Grand Canyon. The Plateau is bounded on the west by the Grand Wash Cliffs and on the east by the Hurricane Cliffs. Fossils are abundant in the Monument and include large numbers of invertebrate fossils and brachiopods.

Figure 2. Pigeon Canyon at sunset during the monsoon season

Human influence on the Arizona Strip is recorded through archaeological and historical sites. The Monument has a human history beginning 13,000 years. Remnants of the once-extensive Puebloan (Anasazi) and Southern Paiute cultures are also found on the Monument. Mining activities, timber cutting, and settlement by farmers and ranchers began by the 1870s and continued through the 1900s. Today, ranching operations still rely on the land's natural resources. Across the entire Monument there are only 13 structures: 9 Federal Administrative cabins/lodges at 3 sites, and 4 private ranch houses at 3 other sites.

Figure 3. Springtime in Whitmore Canyon

The Monument supports diverse habitats due to its location at the junction of three physiographic provinces: the Colorado Plateau, Mojave Desert, and Great Basin. Wilderness areas mark transition zones between provinces and showcase rugged canyons (Fig 2), scenic escarpments (Fig 3), miles of towering cliffs, basalt capped plateaus, and sandstone buttes. There are four designated wilderness areas inside Parashant National Monument totaling to 147,460 acres: Grand Wash Cliffs (Fig 1), Mt. Logan, Paiute, and Mt. Trumbull. Together these comprise 18% of the Monument. A variety of wildlife lives in the Monument, including mule deer, bighorn sheep, wild turkey, and four species of rattlesnakes. The Monument protects important habitat for desert tortoise, Gila monster, and desert bighorn sheep.

Numerous threatened or endangered species seek refuge on the Monument, including the Mexican spotted owl, the California condor, the desert tortoise, and the southwestern willow flycatcher. Vegetation is a mix of Mohave Desert shrubs and annual grasses, and woodlands dominated by ponderosa pine, and pinyon-juniper.

Visitation

Visitation to the Monument currently stands at 42,000 per year with a wide range of destinations. Parashant offers many attractions from cultural and historical sites to recreational activities such as hunting, rock climbing, and numerous hiking trails. There is also numerous off-highway vehicle (OHV) and jeep clubs that make annual expeditions to the more remote locations to enjoy the isolation and wilderness (Fig 4). In addition, Parashant serves as a portal for visitors to experience the north rim of the Grand Canyon without any guard rails, crowds, or bus shuttles. Instead the visitor is surrounded with vistas, wildlife, and solitude. This visitor experience is what sets Parashant apart from many other parks or monuments.

Figure 4. Enjoying a OHV trip on the Monument.

Nearby urban centers include: Saint George, UT, Mesquite NV, Overton NV, Mead View, AZ and Fredonia, AZ. There are no paved roads in or within at least 20 miles of the proposed Reserve boundary. However, major routes are marked with directional signs and road numbers. Several good maps of the Monument and surrounding areas are available at the Interagency Information Center in Saint George, UT. The quickest public access consists of a 28 mile dirt road to the nearest Monument entrance. Average travel time to the monument boundary is 1 hour minimum. There are no formal campgrounds nor public facilities, only primitive camping, greatly enhancing solitude qualities.

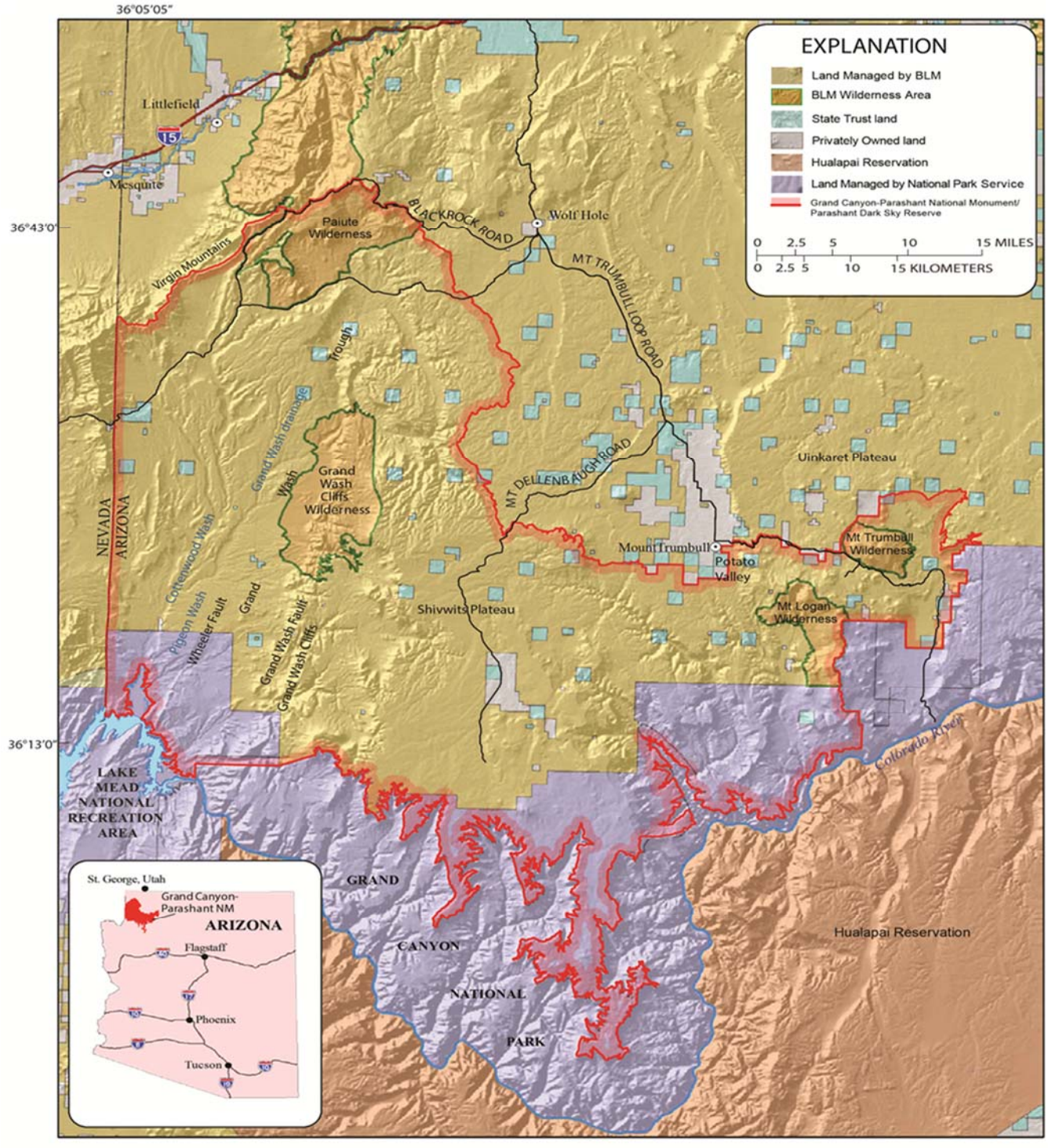


Figure 5. Map of Parashant National Monument and Proposed Parashant Dark Night Reserve

Map and Description of the Proposed Reserve

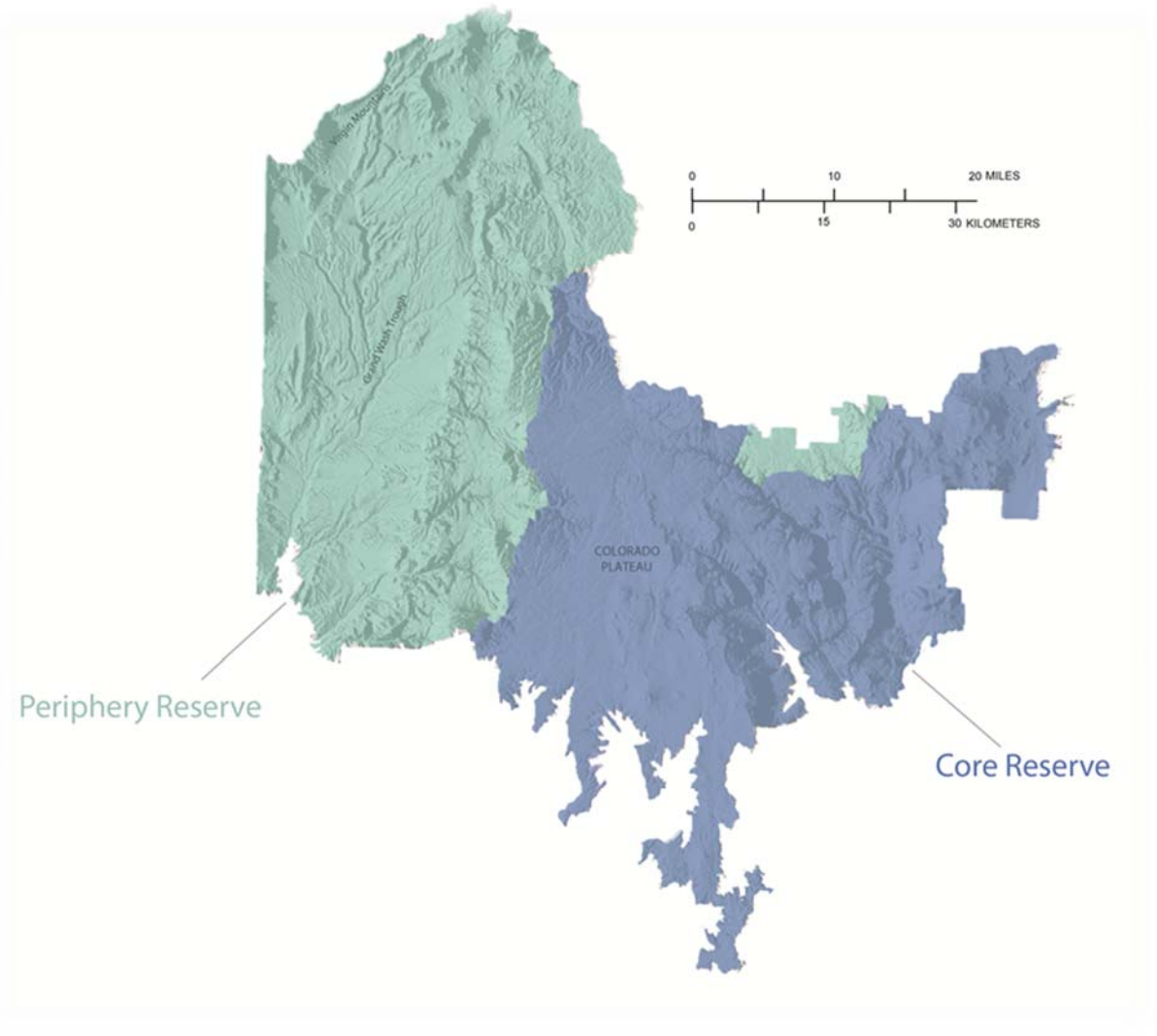


Figure 6. Proposed Parashant Dark Sky Reserve

Figure 6 represents the proposed Parashant Dark Sky Reserve with two separate components, the Periphery Reserve and the Core Reserve. The Periphery Reserve extends mostly in the western portion including the Mojave Desert and western Colorado Plateau and serves as an important buffer from encroaching urban light sources such as Las Vegas, NV, located 84 miles due west, and Saint George, UT, located 46 miles due northeast. Most of the sky quality measurements (SQM) in the Periphery Reserve are above 21.50 mag arcsec^2 with only a few portions below 21.25 mag arcsec^2. The Core Reserve, located mostly along the eastern portion, is on the Colorado Plateau bounded by the upper Grand Wash Cliffs vertically extending more than 2,000 ft in relief. This topographic relief serves to greatly suppress light domes and produces night skies of Gold Tier caliber (>21.75 mag arcsec^2) throughout the remainder of the Core Reserve.

As illustrated on the above map, there is an area located centrally within the proposed reserve which has also been delineated as Periphery Reserve. While this area shares Gold Tier characteristics, it is also adjacent to 8 permanent private owner structures (known as Mt Trumbull, AZ) just north of the Monument boundary. Designating this area as Periphery Reserve will act as a buffer between these 8 structures north of the boundary to ensure protection of the core sky qualities. Ongoing Sky Quality Measurements along this portion of the Periphery Reserve will be conducted to closely monitor for any increase of light emissions.

This DSR also benefits from having several large public land units adjacent to its boundaries such as the BLM Arizona Strip District which provides a 20-30 mile buffer from the Interstate 15 (I-15) corridor and nearby urban centers. Lake Mead National Recreation Area and BLM Las Vegas District offer a substantial 84 mile buffer from Las Vegas, NV to the western edge of the proposed Core Reserve. Lastly, south of the Core Reserve are Grand Canyon National Park (Also currently pursuing IDA designation and a likely candidate for future collaboration) and the Hualapai Indian Reservation, providing ample undeveloped area. It is of great interest to Parashant to continue efforts of Dark Sky Awareness and to form formal agreements with neighboring land administrators, Indian reservations, and additional private landowners to ensure the good lightscape practices and strategies.

Parashant is also part of the Colorado Plateau Dark Skies Cooperative a collaborative effort spearheaded by NPS for dark sky conservation in the US Southwest. One of the future goals of this proposed reserve is to remain an active participant within this network and promote awareness. One example is to spur additional interest with our neighboring land units such Vermillion Cliffs National Monument and the Hualapai Indian Reservation in pursuing IDA designation.

3. Ecology

Flora and Fauna

The 2,706 species, subspecies and varieties of flora and fauna of Parashant reflect the diverse and abrupt geologic and climatic variability across the 1 million acres within its boundaries. Parashant is at the junction of two physiographic bioregions (Basin and Range and Colorado Plateau) encompassing 5 major ecoregions (Fig 7) and the confluence of four major floristic regions: Colorado Plateau, Great Basin, Mojave Desert, and Sonoran Desert. Among vascular plants alone at least 19 taxa are recognized as local endemics and 136 more as being restricted to the southwest desert and plateau country. Nine different vegetational groupings dominate the Monument.

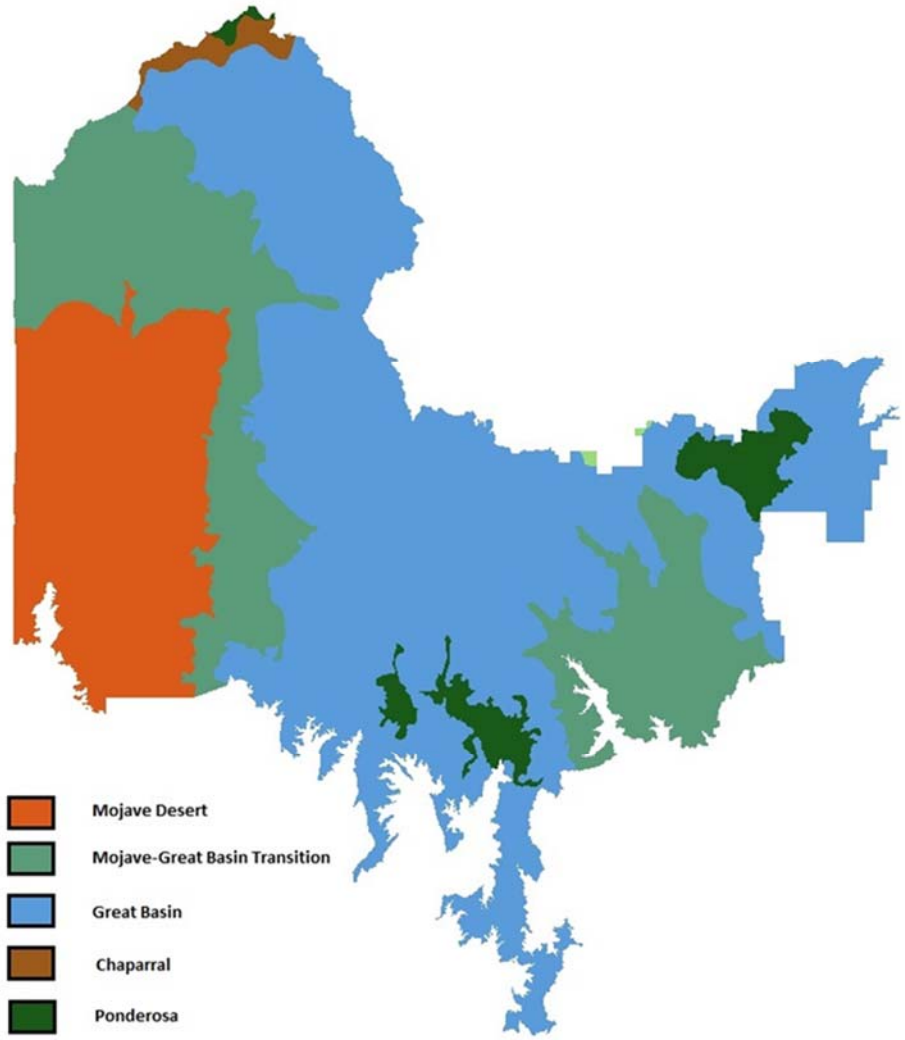


Figure 7. Parashant Ecoregions

These include:

- Mojave Desert Scrub (low elevation desert): Creosote bush (*Larrea tridentata*), Joshua tree (*Yucca brevifolia*), Blackbrush (*Coleogyne ramosissima*), Cholla (*Cylindropuntia* spp.), and Burrobush (*Hymenoclea salsola*).
- Salt Shrub: Shadscale (*Atriplex confertifolia*) and salt-tolerant shrubs, grasses, and forbs.
- Great Basin Sagebrush (Shivwits Plateau): Big sagebrush (*Artemisia tridentata*), rabbitbrush (*Ericameria* or *Chrysothamnus* spp.), Mormon-tea (*Ephedra* spp.) and various warm and cool season perennial grasses.
- Pinyon-Juniper Woodlands (Shivwits Plateau): Two-needle pinyon (*Pinus edulis*) or Singleleaf pinyon (*P. monophylla*), Utah juniper (*Juniperus osteosperma*), Gambel oak (*Quercus gambelii*), Turbinella oak (*Q. turbinella*), Banana yucca (*Yucca baccata*), Mormon-tea, sagebrush.
- Mountain Brush (Black Rock Mountain, Mt. Dellenbaugh, Mt. Trumbull, and Mt. Logan): Gambel oak, Bigtooth maple (*Acer grandidentatum*), Manzanita (*Arctostaphylos* spp.)
- Ponderosa Pine Forest (Black Rock Mountain, Mt. Dellenbaugh, Mt. Trumbull, and Mt. Logan): Ponderosa pine (*Pinus ponderosa*), New Mexico locust (*Robinia neomexicana*), Quaking aspen (*Populus tremuloides*), Gambel oak.
- Rock Outcrops: Ferns, bunchgrasses, brickellbush (*Brickellia* spp.), mountain-mahogany (*Cercocarpus ledifolius*), Squawbush (*Rhus trilobata* var. *simplicifolia*).
- Disturbed Areas (roads, parking areas, trails, old home-sites): non-native or weedy species, including Red brome (*Bromus rubens*), Cheatgrass (*B. tectorum*), Mediterranean grass (*Schismus barbatus*), Russian thistle (*Salsola kali*), Flixweed (*Descurainia sophia*), or Stork's-bill (*Erodium cicutarium*).
- Wetlands: Fremont cottonwood (*Populus fremontii*), Coyote willow (*Salix exigua*), Seep willows (*Baccharis* spp.), thistles (*Cirsium* spp.), Baltic rush (*Juncus arcticus*), bulrushes (*Schoenoplectus* spp.), Southern cattail (*Typha domingensis)*.

The verified faunal component of Parashant includes 3 fish, 62 mammal, 178 bird, 26 reptile, 8 amphibian and 257 invertebrate species. These include charismatic megafauna such as desert bighorn sheep (*Ovis canadensis*), endangered species such as the spotted bat (*Euderma maculatum*), and endemic species such as the Grand Wash springsnail (*Pyrgulopsis bacchus*). Many of the faunal species are restricted to small habitat patches within the mosaic of vegetational types, such as canyon treefrog (*Hyla arenicolor*) found only in springs on the rim of the Grand Canyon. Other species, such as Mojave Desert tortoise (*Gopherus agassizii*), are found throughout the various vegetation types in a geographic area (Mojave Desert including Mojave Desert scrub and salt scrub). Birds utilize the many springs, seeps and manmade tanks as stopover points during migration or as destinations for breeding or overwintering (such as Phainopepla).

Threats to the Ecosystem

Threats to the diverse ecosystems of Parashant, specifically from man-made light pollution include:

Mojave Desert rodent habits

Nineteen species of nocturnal rat and mouse exist on the Mojave Desert areas of Parashant. In this area, the major source of man-made light is the city lights of Las Vegas, Overton and Mesquite, NV. Studies have shown that bipedal kangaroo rats forage less under moonlight or other higher nighttime light levels, resulting in increased forage by smaller species. This could have long-term impacts on seed caching (the major source of seed dispersal for many Mojave Desert flora), nighttime predator behaviors of local owls, coyotes, fox and bobcat.

Migratory bird navigation

Of the 178 species of birds known on the Monument, 49 species are known or belong to families known to complete most of their migration nocturnally. Many of these birds navigate not by moonlight, but by starlight. Again, the Nevada-based lights directly provide potential impacts on fauna of Parashant. In addition, the lights to the north of Washington County, UT, most notably the Saint George urban complex, decrease navigation ability of birds as they traverse to the Monument.

Joshua tree pollination

Joshua trees (Yucca brevifolia), like all Mojave Desert yuccas, have an obligate pollinator species of moth. The pollinators belong to a family of yucca moths that are not only yucca specialists but nocturnal. High light levels prevent the moths from flying from yucca to yucca, effectively eliminating the ability of not only Joshua trees to successfully reproduce but also preventing their own reproduction.

Relict leopard frog recruitment (Fig 8)

Figure 8. Relict leopard frog reintroduction at Tassi Spring in August 2006.

Relict leopard frogs (Lithobates (Rana) onca) have been successfully reintroduced to Tassi Springs on the Monument. Tassi is located near the western boundary with Nevada and is in one of the places most susceptible to light from Las Vegas and Overton. While no direct studies of light levels have been done with L. onca, in general higher light levels at night have been linked to decreased calling and mating activities among ranids (eg. Buchanan 1993). Considering that L. onca was reintroduced to the site to attempt to bolster a small endemic population in Las Vegas itself, any decrease in viability of the population at Tassi also decreases the viability of the rare species.

These are examples spanning some of the taxa of the Monument. Impacts on behaviors of large predators, nocturnal species, flora with light level triggers for blooming, and species adapted to activity during the night under high temperature conditions are also expected. At this time these cannot be quantified or be labeled as a threat, only acknowledged that changes to ecosystem dynamics are expected to occur on a large scale.

Conservation

Many of the activities on Parashant include a conservation component. For example, acoustic monitoring to determine range and species composition of chiropterans, insects and birds has been in progress since 2009 (Fig 9). With the advent of Reserve status and the retrofitting of structures to decrease exterior lighting, acoustic monitoring will now include studies to determine the localized effects of the light level changes at Nixon and Dellenbaugh administrative sites.

Figure 9. Tassi Soundscape Station

For larger conservation projects, Reserve status will be used to help educate the public about the role they can play when protecting these sites from afar. In essence, Parashant has created or rehabilitated appropriate habitat for many species of flora and fauna, but the lights from near neighbors still pose a threat. Enjoying the sites, while providing a conservation message provides an opportunity to discuss the grassroots efforts people can take in their own communities or while enjoying vacation spots to be more ecofriendly and dark night sky aware.

Three conservation projects that involve landscape-level manipulation that may be used to illustrate the role of humans in active off-site light level modification are:

Internal boundary fencing

The National Park Service portions of Parashant are closed to grazing. To help keep cattle on their assigned allotments and prevent trespass onto closed areas, an internal boundary fence was recently repaired. The approximately 65 mile fence, coupled with vegetation restoration activities such as prescribed fire and seeding, promotes the reestablishment of native vegetation and, it is hoped, increasingly robust faunal populations.

Pakoon Springs rehabilitation (Fig 10)

Pakoon Springs, acquired from private landowners in 2004, is the largest spring complex on the Monument. Since 2004 rehabilitation efforts to reestablish a more natural Mojave Desert spring complex have removed over 30 tons of trash, restructured the spring heads, and increased the native wetland vegetation. Rehabilitating the system is expected to provide a valuable location for overwintering and migratory stopovers for birds.

Figure 10. Overview of Pakoon Springs restoration area from across valley.

Tassi Ranch restoration

Tassi Ranch is the second largest oasis on Parashant. It is a site of historic and natural significance. The ranch structures are primarily from the 1930s and are a draw for Monument visitors. In addition, the springs are home to relict leopard frog, Grand Wash springsnail and speckled dace (Rhinichthys osculus). Over the last 4 years alone, over a quarter million dollars have been spent to protect the ranch structures and the modified natural springs to promote understanding of the site and rare habitat.

4. Cultural History and Significance

Figure 11. Southern Paiute girls displaying water containers photographed by JK Hiller circa 1875.

Current evidence indicates the Monument was utilized by small numbers of hunter-gatherers during the Archaic Period (7000 B.C. to 300 B.C.). Population and utilization of the monument increased during the Ancestral Puebloan Period from the Basketmaker II Phase through the Pueblo II Phase (300 B.C. to 1150 A.D.), as evidenced by the presence of pit houses, habitation rooms, agricultural features, and pueblo structures. Population size decreased during the Pueblo III Phase (1150 A.D. to 1225 A.D.).

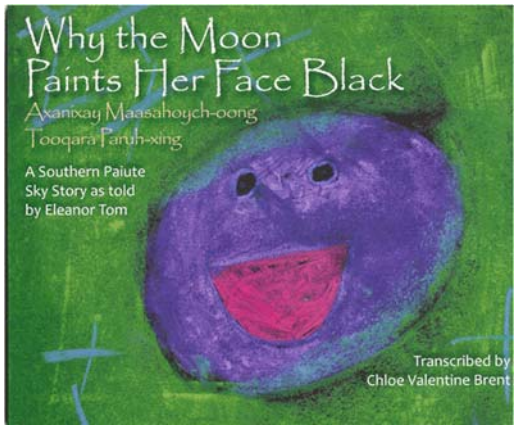
Figure 12. Southern Paiute family photographed by JK Hiller circa 1875.

Southern Paiute groups (Fig 11-12) replaced the Pueblo groups and were occupying the Monument at the time of Euro-American contact. Archeological sites in the Monument include large concentrations of ancestral Puebloan (Anasazi or Hitsatsinom) villages, a large, intact Pueblo II village, numerous archaic period archeological sites, ancestral Puebloan sites, and Southern Paiute sites. The Monument also contains areas of importance to other existing Indian tribes such as the Navajo, Hualapai, and Moapa.

Figure 13. Petty Sawmill crew, Mt. Trumbull, circa 1900. Courtesy of US Forest Service Dixie National Forest.

In 1776, the Escalante-Dominguez expedition of Spanish explorers passed near Mt. Trumbull. In the first half of the 19th century, Jedediah Smith, Antonio Armiijo, and John C. Fremont explored portions of this remote area. Jacob Hamblin, a noted Mormon pioneer, explored portions of the Shivwits Plateau in 1858 and, with John Wesley Powell, in the 1870s. Clarence Dutton completed some of the first geological explorations of this area and provided some of the most stirring written descriptions. Having traversed this area by wagon at the request of the territorial legislature, Sharlot Hall recommended it for inclusion within the State of Arizona when it gained Statehood in 1912. Early historic sawmills provided timber that was hauled 70 miles along the Temple Trail wagon road from Mt. Trumbull down the Hurricane Cliffs to Saint George, UT (Fig 13). Ranch structures and corrals, fences, water tanks, and the ruins of sawmills are scattered across the Monument and tell the stories of the remote family ranches and the lifestyles of early homesteaders. There are several historical mining sites dating from the 1870s, showing the history of mining during the late 19th and early 20th centuries. The remote and undeveloped nature of the Monument protects these historical sites in nearly their original context.

Southern Paiute Tribal Bands have an ongoing relationship with Parashant with annual youth archeology programs and interpretive events involving their traditional stories. Night skies is a common theme in a variety of traditional stories such as “Why the Moon Paints her Face Black”, which explains the phases of the moon. Continuing native culture elements will be a key component to future interpretation events. The following is an excerpt from this Southern Paiute traditional story:



Why the Moon Paints her Face Black, Told by : Eleanor Tom ; Artwork by: Chloe Valentine Brent, Secila Monreal, age 8, Ryan Moline, age 3, and Collen Kanosh; Permission Granted Capitol Reef Natural History Association, Copyright 2013

“In the evening, the Sun gets sleepy because it’s getting dark
He crawls into his big cave underground where he sleeps all night.

The Moon is very afraid of him.
So when he goes to bed, she usually gets up.
She comes out and then her children the Stars, come out.
They’re all up there in the skies.

The Moon loves her children and she smiles at every one of them as she goes by.
They’re all happy. Twinkling.”

5. Weather, Climate, and Air Quality

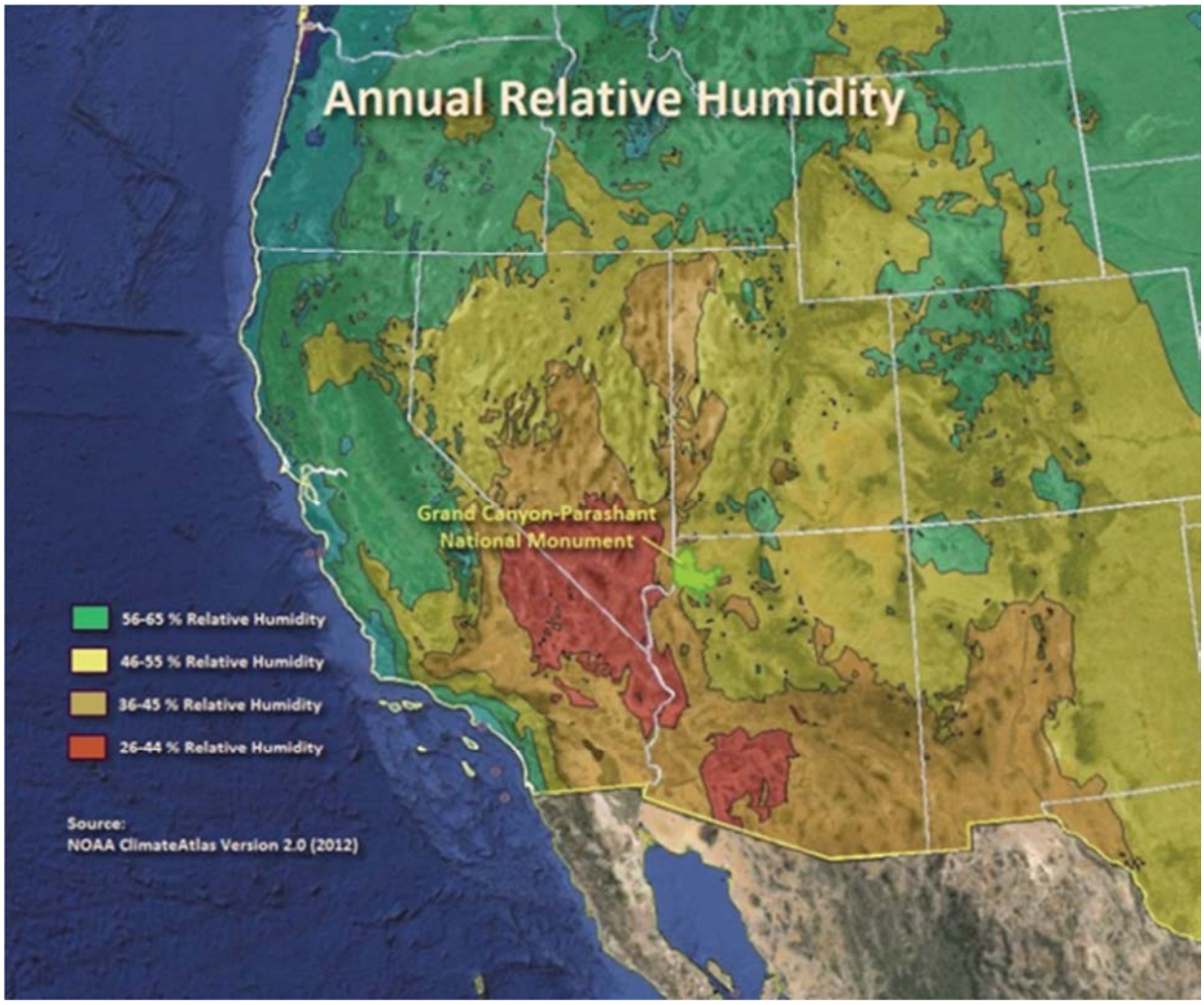


Figure 14. Western United States decadal relative humidity average

Weather and climate are integral to the quality of night skies due to various factors such as humidity, temperature patterns, and wind patterns, all of which can produce water vapor and dust scatter under certain circumstances. Low humidity with little cloud clover produces ideal night skies. Topography influences these factors as well. The proposed Parashant Dark Sky Reserve, located within a geologic province boundary, is also known for its wide ranging topography including the Virgin Mountains, Grand Wash Cliffs, Colorado Plateau, and the Unikaret Volcanics.

Figure 15. Western United States decadal clear day average.

This combination of versatile topography along with an intercontinental dry climate creates rain shadows ideal for optimal clear days per year. Rainfall and humidity amounts also vary widely with 2.5 inches in the Western Mojave Desert portion to 10-14 inches in the Eastern Colorado Plateau portion (Fig 14). Overall, this reserve is expected to enjoy 150-180 clear days each year, as defined by the National Weather Service, for optimal night skies (Fig 15). 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.

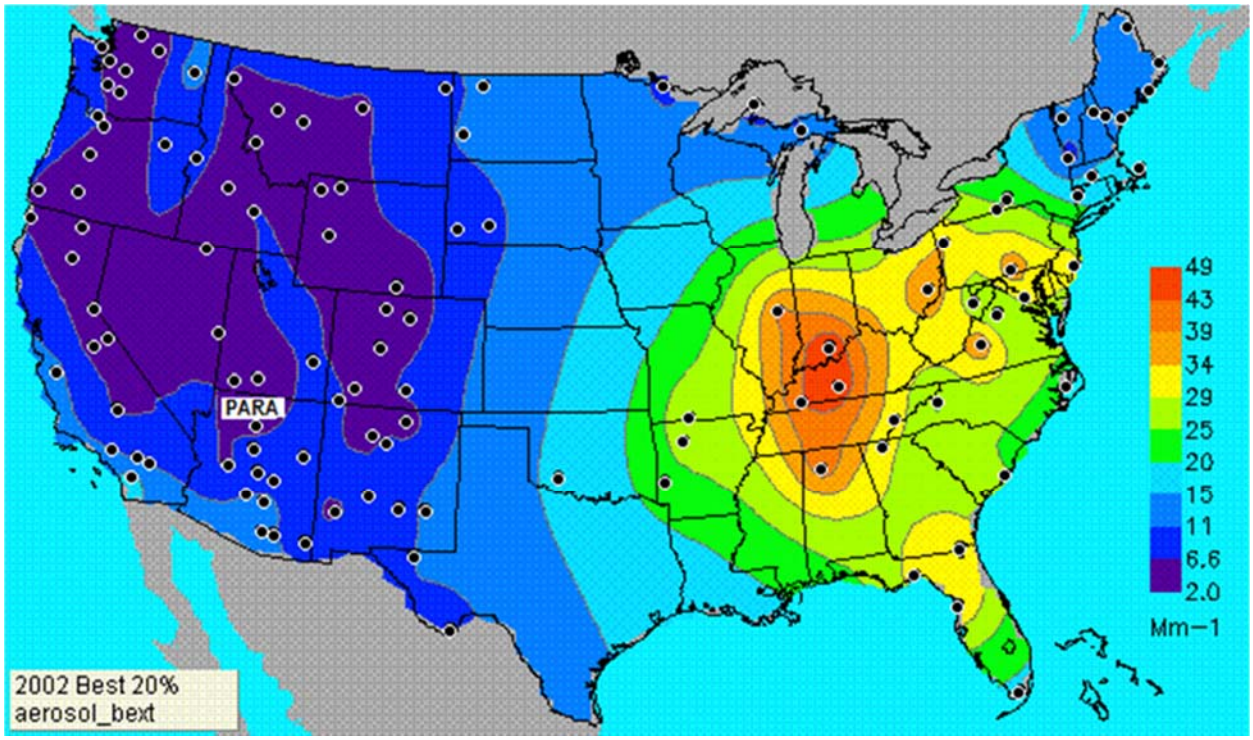


Figure 16. The best 20% values for the continental United States (averaged between 1997-2002).

Air quality for the proposed DSR is best compared utilizing the nearest NPS IMPROVE air quality station, GRCA2, located above the rim at Grand Canyon National Park at Hance Camp just southeast of the proposed Reserve. Figure 16 illustrates the various amount of light scattering due to aerosols and particulates. These values are for the continental United States (averaged between 1997-2002). The propose Parashant DSR is fortuitously located in the most exceptional clear air mass at 2.0 Mm-1. (Attenuation of light due to scattering and absorption as it passes through a medium is measured as inverse distance – therefore lower is better)

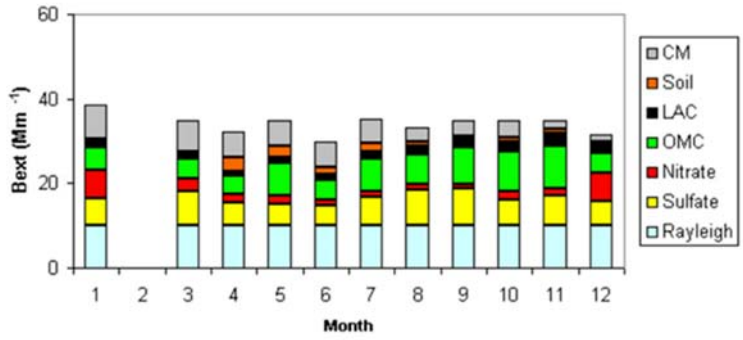


Figure 17. Average contributions of major aerosol chemical components to light extinction during 20% worst days in each month (based on data available 1997-2002). Soil=Fine Soil, CM=Coarse Mass, LAC= Light-absorbing carbon, OMC=Organic Mass by carbon, Nitrate=Ammonium nitrate, Sulfate=Ammonium sulfate, Rayleigh=Rayleigh scattering

The haze that is encountered at GRCA2 has the following components: Coarse Mass is the largest aerosol contributor at 19.6%. Sulfate and Organic Mass by Carbon (OMC) particles

contribute 16.5% and 15.8% respectively (Fig 17). Although in September, this figure indicates sulfate and organic mass particles (OMC) are responsible for 25.3% and 24.9% of the light scatter and absorption.

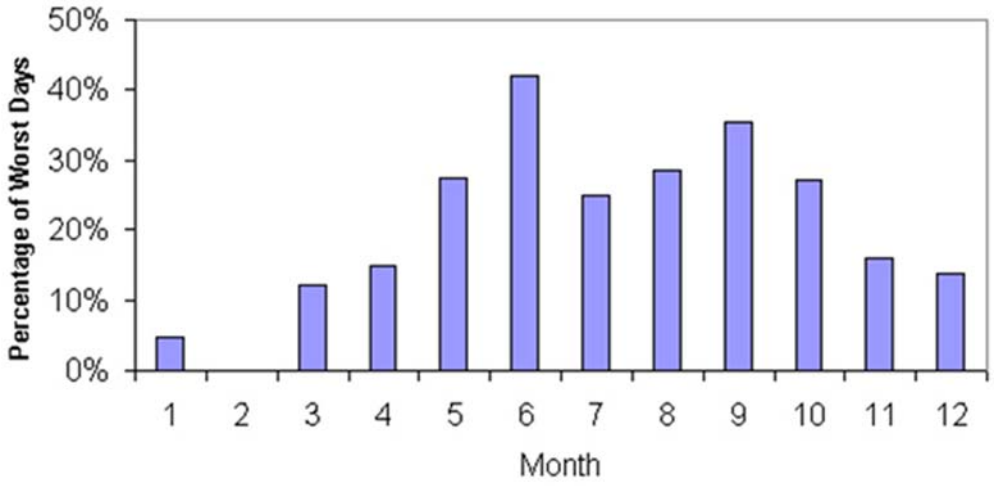


Figure 18. Percentage of sampling days which are 20% worst days. Based on data available in 1997-2002. Months are designated by number such that Month 1= January.

Results from GRCA2, also suggests that the highest occurrence of the haziest days (referred as the “20% Worst Days”) occur in June and September (Fig 18). This time period coincides with the monsoon weather patterns which contribute wind and particulates to the overall air quality. Overall, considering the limited timespan of this monsoon haze, the air quality data indicates 150-180 days of clear skies with pristine air quality and visibility for the proposed DSR.

Visibility and Isolation from Light Pollution

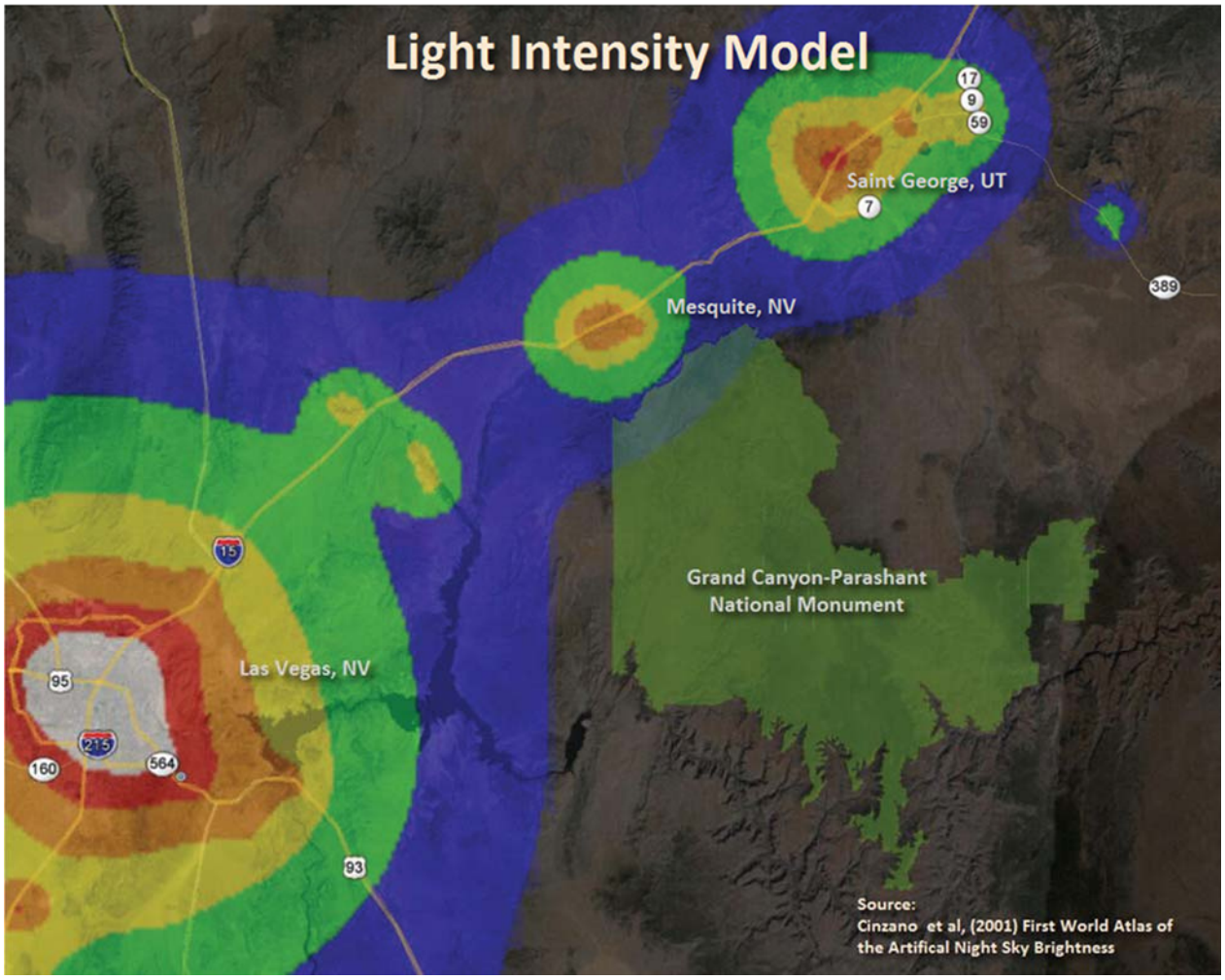


Figure 19. Light intensity model developed by Cinzano in 2001. Note the nearly continuous disruption in natural light levels along the I-15 corridor between Las Vegas, NV and Saint George, UT.

The 2001 Cinzano model (Fig 19) illustrates the effect local urban centers have on the proposed Parashant Dark Sky Reserve. It becomes evident that most of the light sources stem from the I-15 corridor. These urban centers are expected to grow. With increased local population and greater awareness of the Monument visitation to the Monument is also expected to increase. Fortunately the Monument has identified the values of solitude and isolation in the 2008 Grand Canyon-Parashant National Monument General Management Plan/Resource Management Plan (RMP). To maintain these core characteristics, paved roads, formal campgrounds, and large visitor facilities will not be implemented. The Monument management, with the mandates of the RMP, strive to keep isolation and solitude as Monument objects, to offer a unique experience to visitors that cannot be had at nearby crowded, bustling national parks such as Zion National Park or Grand Canyon National Park.

Visibility or viewshed resources are a priority for this proposed Reserve. Parashant is one of 5 federal land units, nationwide, currently enrolled with the NPS Air Quality division to conduct a

complete viewshed resource inventory as well as an in-depth air quality analysis to be completed in 2016. This air quality inventory will include aerosols and particulates. Overall the viewsheds are considered Monument objects, to be managed and protected under the RMP as well as mandates from the 1970 Federal Clean Air Act.

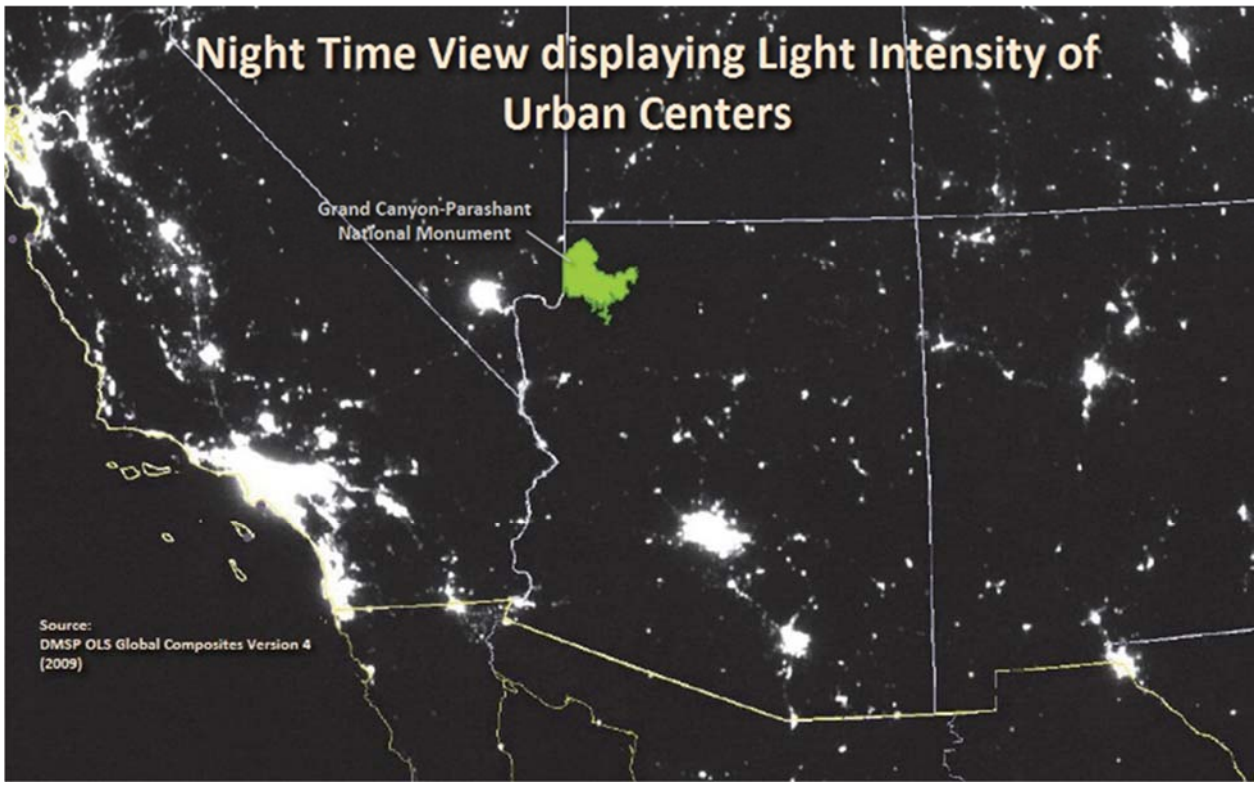


Figure 20. Night time view of the western United States. Note the proximity of Parashant to several urban centers as well as a large area with minimal to no effect on dark skies.

Isolation from urban centers is necessary to ensure the quality of night skies. The proposed Parashant Dark Sky Reserve is located in remote section in the United States Southwest. However, light sources from Las Vegas NV, and smaller townships along the I-15 Interstate corridor do affect the amount of light pollution visible (Fig 20). This Reserve is naturally shielded from most direct light sources due to the surrounding mountain ranges. The most significant light source emitter, Las Vegas NV, is 84 miles due west to the Core Reserve Boundary and is shielded by 3 mountain ranges: Southern Virgin Mountains, Muddy Mountains, and the Clark Mountains . The nearest urban centers, Mesquite, NV and Saint George, UT, are shielded directed by the Northern Virgin Mountains. In addition, this proposed DSR is surrounded by federal and state lands including the BLM Las Vegas and Arizona Strip Districts, and NPS Grand Canyon National Park. These provide a limited-development buffer around the Reserve as well as opportunities to partner and collaborate.

6. Sky Quality Data

Parashant National Monument is only one of two federal land units that are jointly managed between BLM and NPS as well as include private and state lands inholdings. This Service First agreement allows the NPS Night Sky Team to provide dark sky inventories across the Monument. The Night Sky Team has collected sky quality data from many locations throughout the Monument since 2002 using an automated CCD camera system calibrated to a close approximation of the Johnson V photometric system.

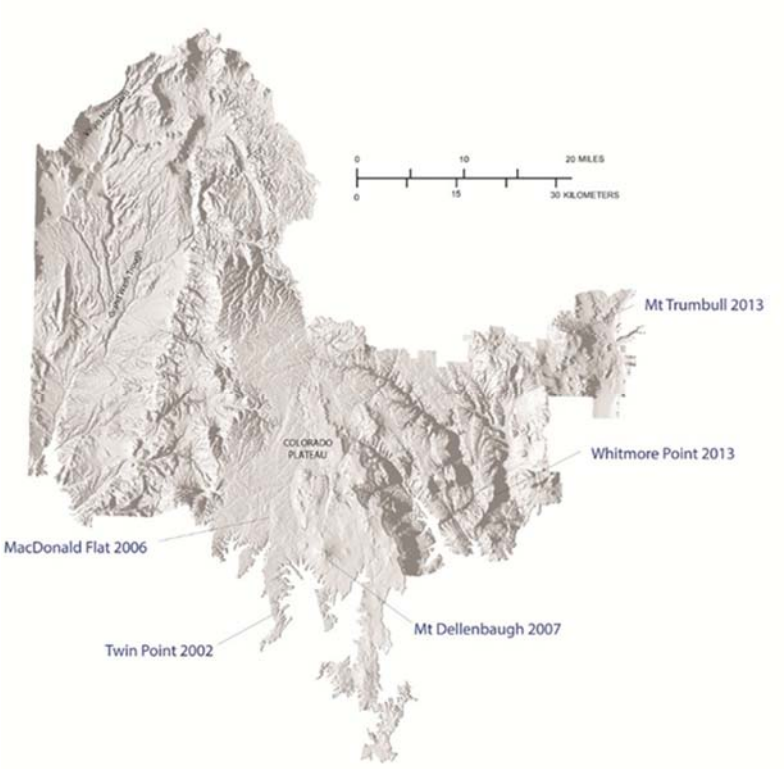


Figure 21. . Locations of Dark Sky surveys and years conducted on Parashant National Monument. Please note that surveys have been conducted stating 2 years after the Monument's designation and are continuing.

The following dark sky images (Fig 22-24), taken from various locations across Parashant (Fig 21), appear as circular graphs with various colorations, which represent the overall sky darkness as measured in astronomical magnitudes in the V-band, abbreviated as "mags". As was mentioned with the camera equipment used, the V-band measures mostly green light, omitting purple through ultra violet and orange through infrared. The resulting magnitude scale is a logarithmic scale. For example, a difference of 5 magnitudes corresponds to a 100x difference in brightness. Lower values (smaller or more negative) are brighter. The following data images are shown in false color, with yellow, red, and white corresponding to brighter sky and blue, purple and black corresponding to darker sky. For orientation purposes, the following images are viewed as North and south at the top and bottom of the image respectively. East is to the left of the image while west is to the right, as indicated on Fig 22.

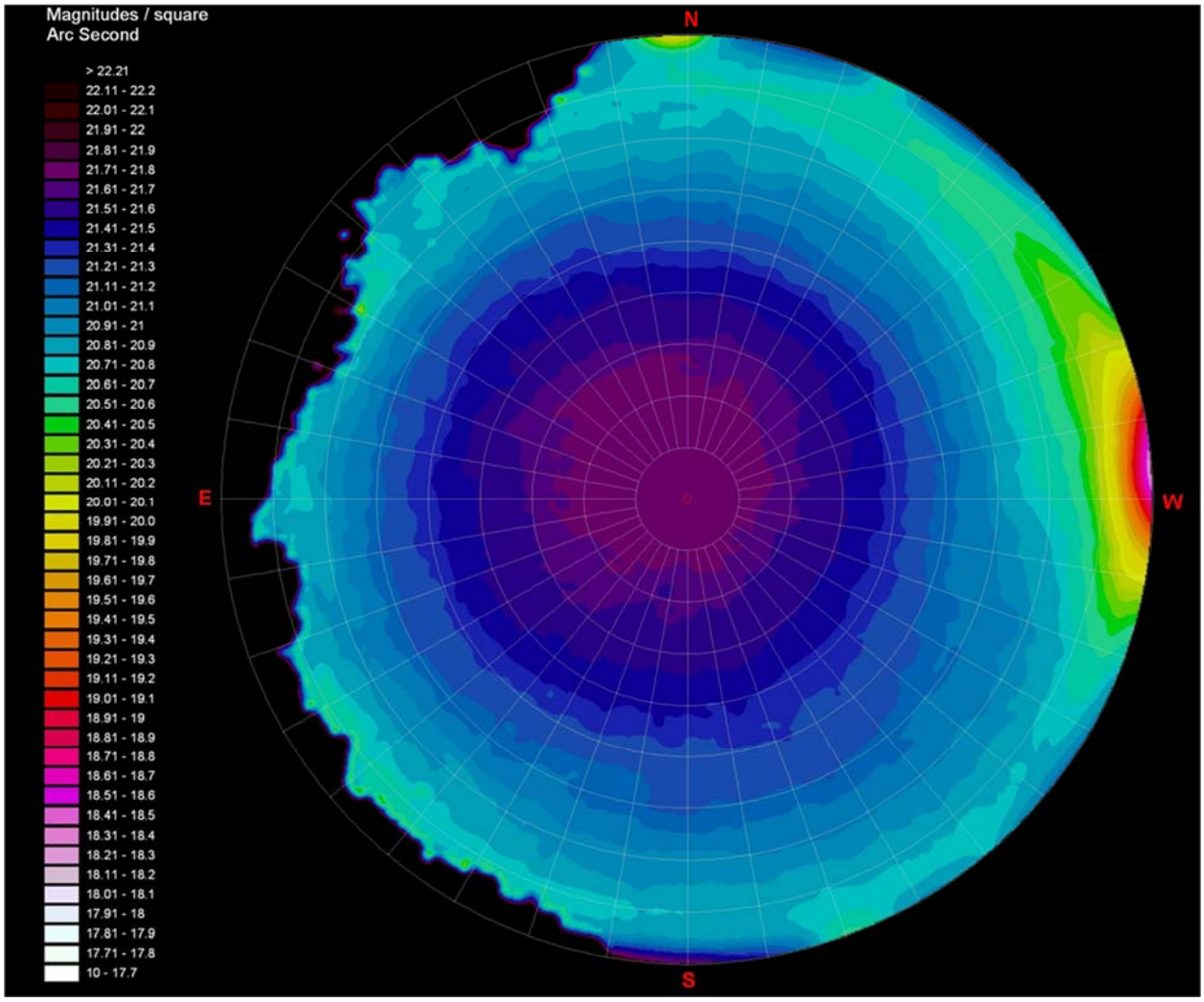


Figure 22. Spline-fit of surface-to-sky brightness data from over 5000 sample points. Location: Twin Point, May 5, 2002.

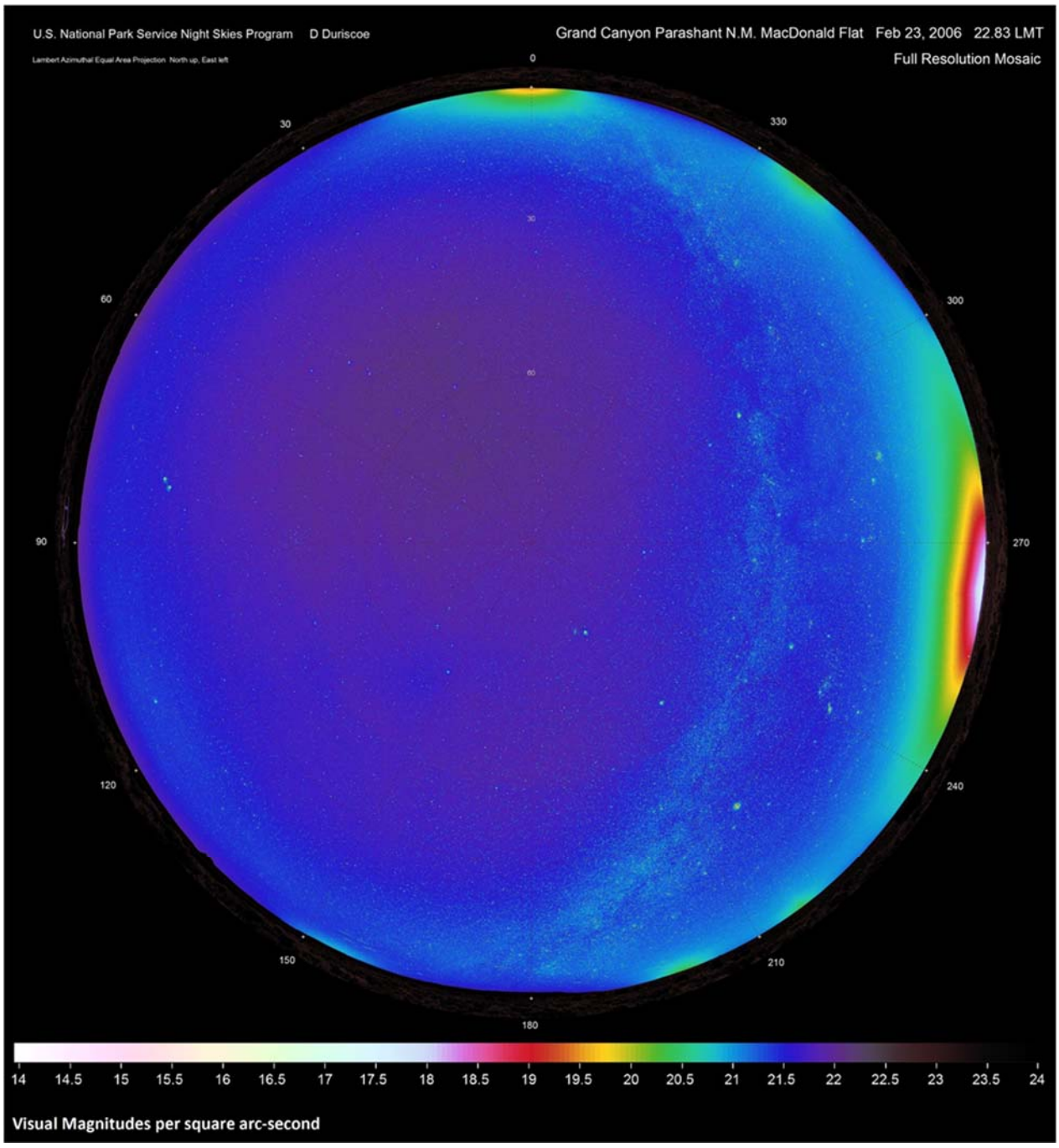


Figure 23. . Full Resolution Mosaic for McDonald Flat, February 23, 2006. Observation conditions consisted of low air glow with a temp of +9 degrees Fahrenheit, overall an exceptionally clear night.

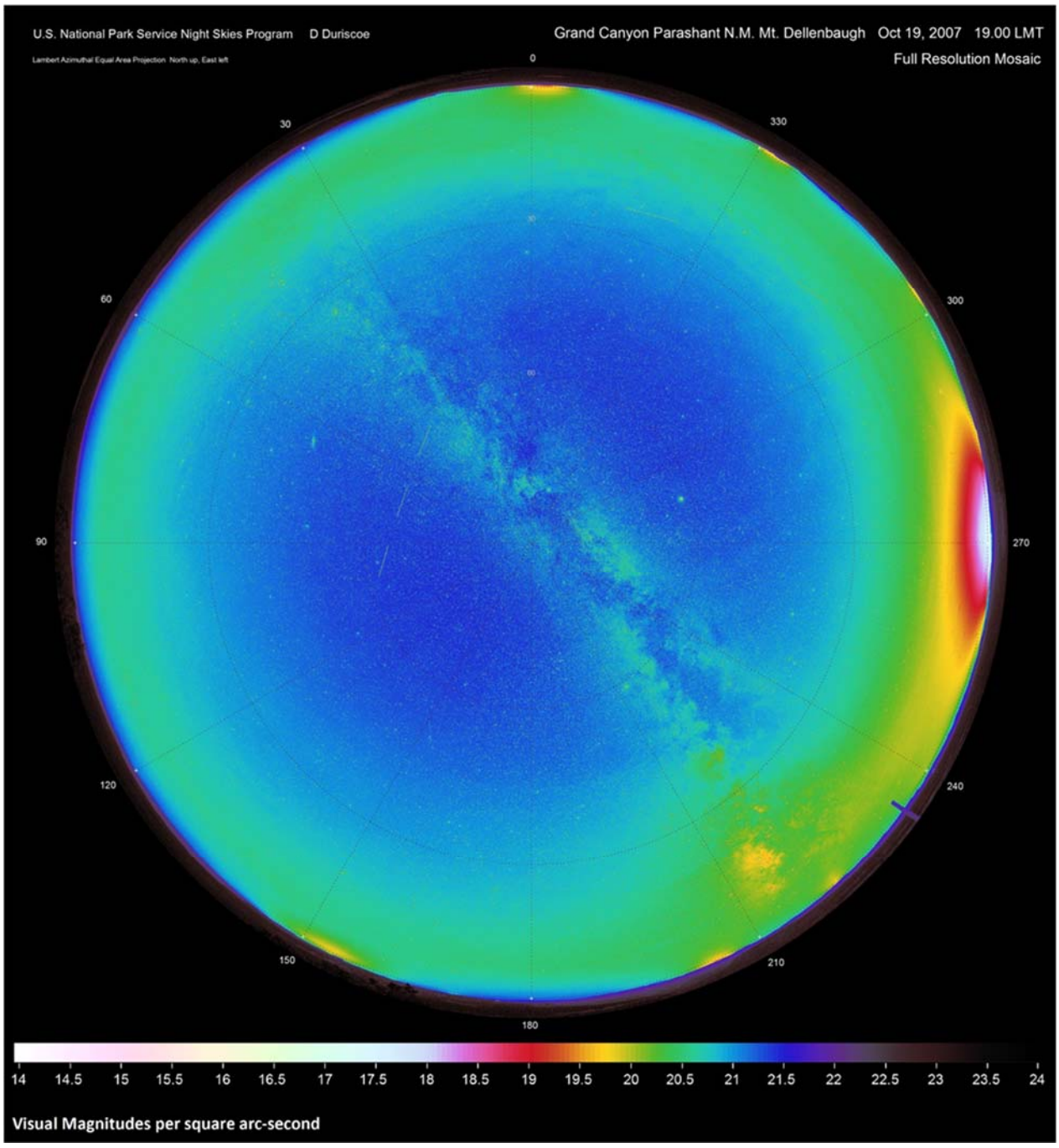


Figure 24. Full Resolution Mosaic for Mt Dellenbaugh, October 19, 2007. Observation conditions consisted of above-average air glow with excellent transparency.

Anthropogenic Light Sources

(Please refer to Figures 25-26 on the following page for this section)

With natural lights sources removed (Fig 25-26), anthropogenic light sources are clearly discerned. It is evident the Mt. Dellenbaugh site is more impacted by the Las Vegas area than the Macdonald Flat survey site as it is more towards the west. Saint George, UT is also a significant source (just about due north in the center) for either site. Transparency was excellent on both these nights resulting with distant light domes illuminating very well. Note Flagstaff, AZ, over 126 miles away, at azimuth 155. It is quite possible that Flagstaff, AZ will disappear under hazy conditions.

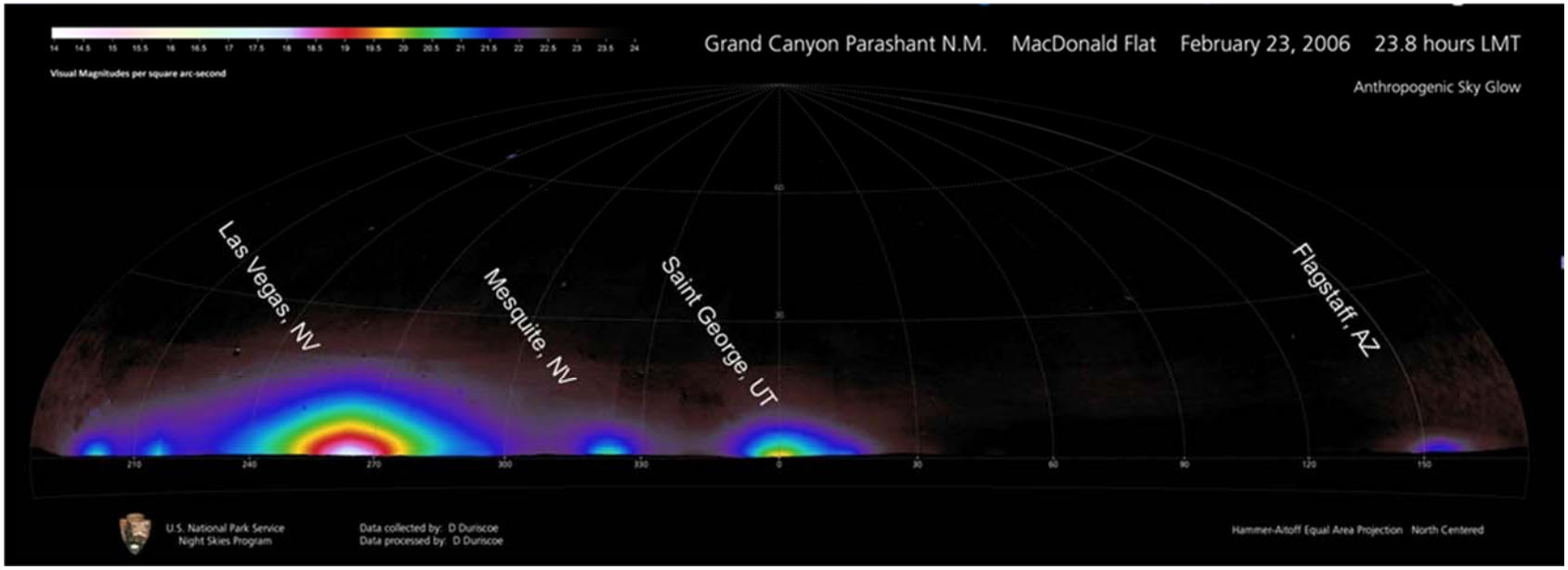


Figure 25. McDonald Flat Sky Glow image: Notice the major urban centers identified

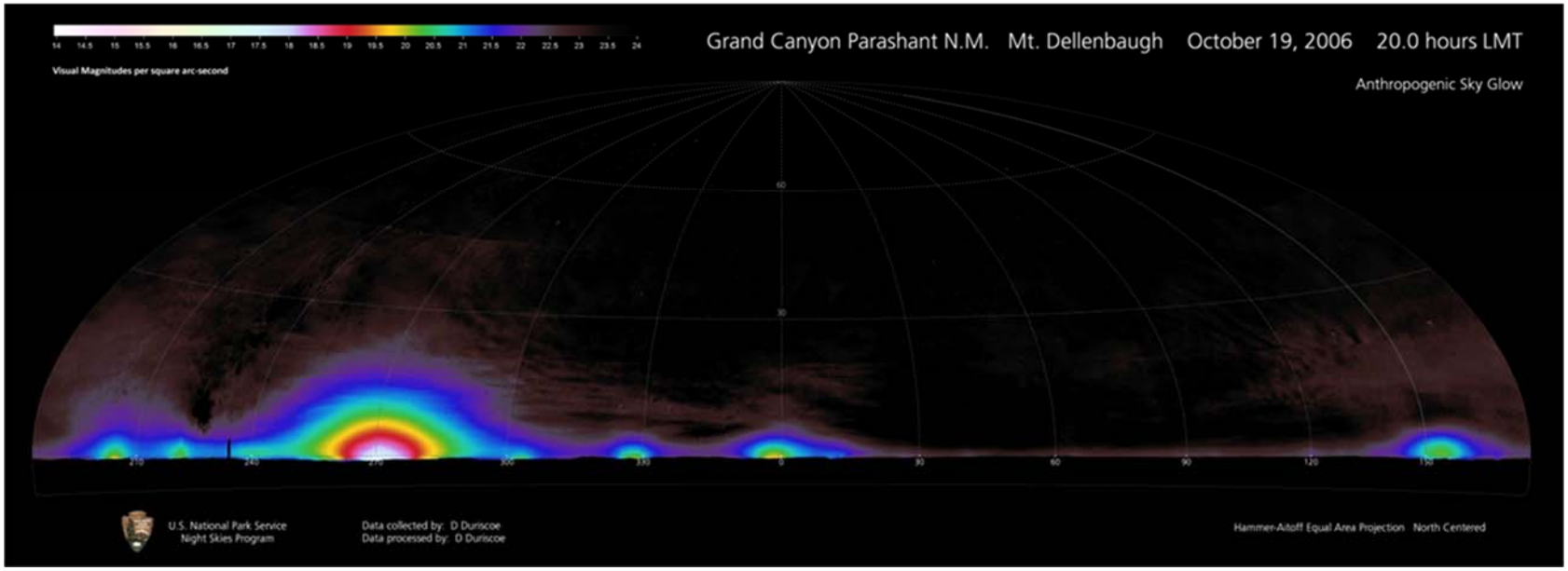


Figure 26. . Mt. Dellenbaugh Sky Glow image :There are some airglow artifacts apparent on the Mt. Dellenbaugh data as the airglow was very bright and asymmetrical that night.

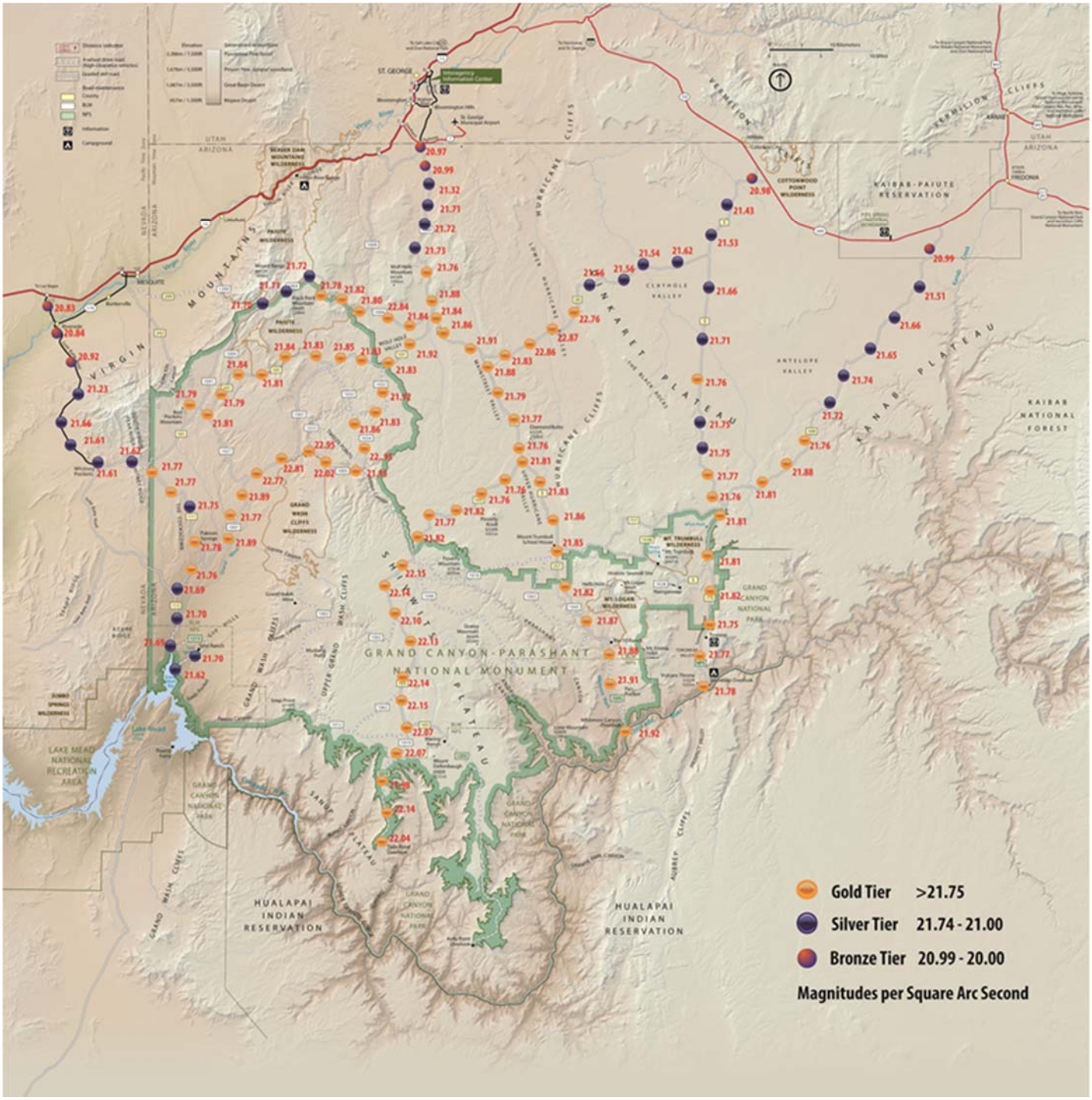


Figure 27. Unihedron sky quality measurements July-November 2013. SQM sampling protocol is included in Appendix A

This map (Fig 27) represents 130 data points taken with a standard field Unihedron Sky Quality Instrument from July to November 2013. The data points reflect the nearly continuous nature of similar light level across the survey site and identifies the anticipated light domes stemming from nearby urban centers of Las Vegas, Mesquite, and Saint George.

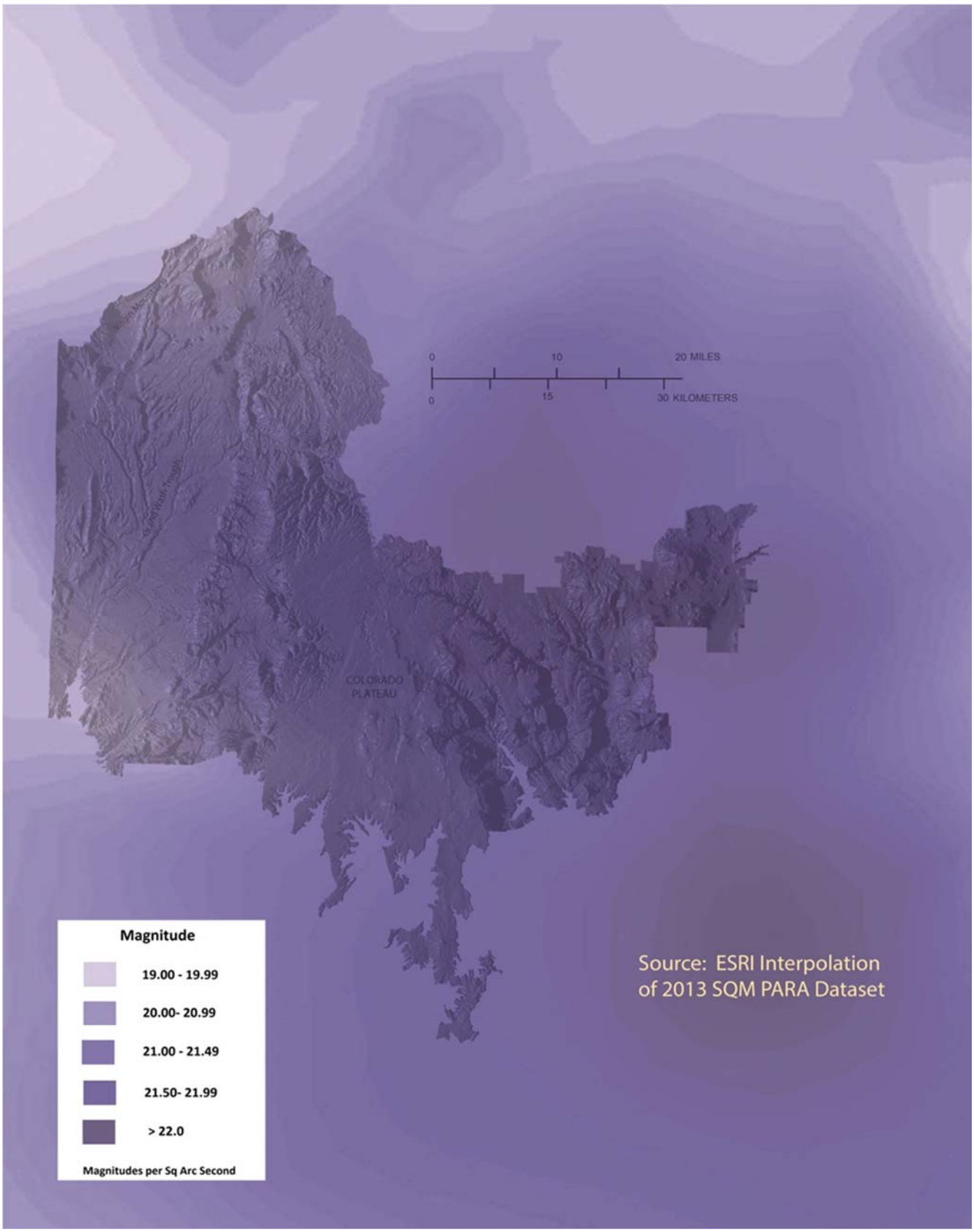


Figure 28. Interpolation of 2013 SQM data. Compilation of 130 data points. Full dataset is provided in Appendix B.

Using interpolation of the SQM dataset gives the ability to illustrate the contours of dark sky magnitude. This contoured graphic (Fig 28) highlights the western portion as being most affected by the Las Vegas light dome and other urban centers along the I-15 corridor. Also revealing was the interaction of topography versus the spread of light from urban centers. It is evident from this data set that the light domes have greater extent over plateaus versus mountain ranges and cliff fronts. An example of this phenomenon is to observe that the Las Vegas light dome is located 84 miles to the west of the Core Reserve boundary, behind three mountain ranges, yet is mitigated substantially within the periphery portion of the proposed dark sky reserve. The smaller and nearer urban center of Saint George produces light pollution that is discernable to a larger extent along the eastern portion of the Uinkaret Plateau, along the State Highway 89 corridor. (In this instance, distance protects the proposed Core Reserve) Overall this topography is fortuitous as Parashant's boundary (originally drafted to protect the Colorado River watershed) consists of surrounding mountains and cliffs which offer protection from encroaching light sources.

7. BLM/NPS Agency Policy and Legislative Protection

NPS Organic Act of 1916

The Organic Act of 1916 formally established the National Park Service. Congress directed the NPS to manage the parks and monuments

> "to conserve the scenery and the natural and historic objects and wildlife therein and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations" (The NPS Organic Act of 1916 - PL 64-235).

NPS Management Policies 2006

Section 4.10 Lightscape Management (excerpt):

> *The Service will preserve, to the greatest extent possible, the natural lightscape of parks, which are natural resources and values that exist in the absence of human caused light…The stars, planets, and earth's moon that are visible during clear nights influence humans and many other species of animals, such as birds that navigate by the stars or prey animals that reduce their activities during moonlit nights.*
>
> *Improper outdoor lighting can impede the view and visitor enjoyment of a natural dark night sky. Recognizing the roles that light and dark periods and darkness play in natural resource processes and the evolution of species, the Service will protect natural darkness and other components of the natural lightscape in parks. To prevent the loss of dark conditions and of natural night skies, the Service will minimize light that emanates from park facilities, and also seek the cooperation of park visitors, neighbors, and local government agencies to prevent or minimize the intrusion of artificial light into the night scene of the ecosystems of parks…*
>
> *The Service will*
>
> - *restrict the use of artificial lighting in parks to those areas where security, basic human safety, and specific cultural resource requirements must be met;*
> - *use minimal-impact lighting techniques;*
> - *shield the use of artificial lighting where necessary to prevent the disruption of the night sky, natural cave processes, physiological processes of living organisms, and similar natural processes.*
>
> *The decision about whether or not to install artificial lighting in particular circumstances is left to the discretion of the superintendent and is made through the planning process*

BLM National Landscape Conservation System (NLCS)

Parashant National Monument is a recognized NLCS unit and, as such, requires land management strategies with additional provisions focusing on science and conservation. The Monument will seek to conserve and promote science to facilitate its dark sky resource.

Excerpt from the NLCS 15–Year Strategy 2010–2025:

All NLCS units are designated in keeping with an overarching and explicit commitment: to conserve, protect, and restore natural and cultural resources as the prevailing activities within those areas, shaping all other aspects of management. To provide for uses that are compatible with landscape and resource values, NLCS managers will:

1. Focus on conservation as the primary consideration in planning for and management of NLCS lands, consistent with designating legislation.
2. Develop baseline information on NLCS lands through assessment, inventory, monitoring, evaluation, and scientific study.
3. Base planning and decision making on a scientific foundation using next-generation management tools.
4. Promote the NLCS as an outdoor laboratory and demonstration center for new and innovative management and business processes.
5. Provide for compatible uses consistent with the legislation designating each unit and in collaboration with surrounding communities and interest groups.
6. Plan and manage NLCS facilities with an eye to protecting resources, serving the public, and supporting local communities.

Grand Canyon-Parashant National Monument Resource Management Plan (RMP/GMP)

The following are excerpts from the Grand Canyon-Parashant National Monument Resource Management Plan that are relevant to dark sky issues such as preservation of natural processes, solitude and wilderness characteristics. (Table 1)

Table 1. Excerpts from Parashant RMP regarding management actions and desired future conditions relevant to the Parashant Dark Sky Reserve.

Chapter 1, Resource Management Plan Mission Statement
Grand Canyon-Parashant National Monument is a model of land management for the BLM and NPS that conserves the natural, scientific, and historic resources and includes ecological restoration and protection in a broad ecosystem context, while honoring the history and living traditions of the people who came before us: “The place where the West stays wild.” The goal of Monument management is to achieve the following:

- Natural and cultural resources and associated values of the Monument are protected, restored, and maintained in good condition and managed within their broader ecosystem and cultural context. The protection of cultural, biological, and physical resources and human values for which the Monument was created receives the highest priority in planning and management.
- Management decisions about resources and visitors are based on scientific information.
- The Monument is a model of scientifically based ecological restoration, research, and investigative studies that guide the restoration of healthy native ecosystems, natural fire regimes, and cultural landscapes.
- The variety of natural and social settings are managed to preserve the remote and essentially unspoiled landscape character while providing opportunities for people, communities, and the environment to benefit from visitors experiencing adventure, beautiful vistas, a retreat from the pressures of modern life, and a sense of discovery through a variety of appropriate and sustainable backcountry activities. The public receives the information they need to have a safe and enjoyable experience.
- New planning direction (developed through a collaborative process) and an accumulation of valid existing decisions provide clear direction for the management of the Monument.

Chapter 2, Table 2.1 Air Management
Desired Future Conditions (DFCs): • Federal and State air quality standards will be maintained within the Monument.
Management Actions (MAs): • Impacts to air quality will be prevented or reduced through the application of specific mitigation measures identified in activity level planning and NEPA level review.

Chapter 2, Table 2.8 Visual Resources – Night Sky
Desired Future Conditions • The region's scenic beauty, open space landscapes, and other high-quality visual resources, including Monument objects, will be maintained within the Monument.
Management Actions: • Permanent outdoor lighting in Visual Resource Management (VRM) Class I areas will not be allowed. • Impacts to dark night skies will be prevented or reduced through the application of specific mitigation measures identified in activity level planning and NEPA level review. These measures may include directing all light downward, using shielded lights, using only the minimum illumination necessary, using lamp types such as sodium lamps (less prone to atmospheric scattering), using circuit timers, and using motion sensors. • Any facilities authorized will use the best technology available to minimize light emissions.

Chapter 2, Table 2.10. Wilderness Characteristics
Desired Future Conditions: The following wilderness characteristics will be maintained on both BLM and NPS-administered lands: • High Degree of Naturalness: Lands and resources affected primarily by the forces of nature and where the imprint of human activity is substantially unnoticeable. • Outstanding Opportunities for Solitude: When the sights, sounds, and evidence of other people are rare or infrequent (and) where visitors can be isolated, alone or secluded from others. • Outstanding Opportunities for Primitive and Unconfined Recreation: Where the use of the area will be through non-motorized, non-mechanical means, and where no or minimal developed recreation facilities are encountered • Areas where wilderness characteristics will be maintained will be ecologically sustainable and resilient to natural and human-caused disturbances. (See Vegetation Management decisions.) • Wildlife populations and habitat are important aspects of the ecosystem and are an important component of naturalness.
Management Actions: • Restoration, vegetation treatments, wildlife management projects on BLM-administered lands, and other surface disturbing actions can be authorized in areas managed to maintain wilderness characteristics to achieve DFCs.

8. Parashant Dark Sky Reserve Light Management Plan (LMP)

Introduction:

Grand Canyon-Parashant National Monument encompasses over a million acres, including joint federal agencies, Arizona state lands, and private landowners. The Grand Canyon-Parashant National Monument Resource Management Plan (RMP) and the Monument founding Proclamation direct the BLM and NPS to maintain the Monument's rare wilderness characteristics, viewsheds, and natural resources. The night sky is one component of this wilderness experience enjoyed by Parashant's visitors and is endangered by encroaching light sources of nearby urban centers. This Light Management Plan takes the existing Monument RMP policies and expands these management efforts to maintain the current dark skies as well as to strategize for future conditions. This diminishing resource will be preserved by enacting this light management plan along with collaboration with neighboring public land units and communities to ensure the Parashant Dark Sky Reserve is an enduring sanctuary for generations to come. The following objectives will be implemented to enhance natural lighting in the proposed reserve, maintain visitor safety, and unite community and government dark sky efforts.

Objectives:

- Define Purpose and Need
- Define Lighting Zones
- Outdoor Lighting guidance for all government structures and facilities
- Outdoor Lighting guidance for private land owners within the Dark Sky Reserve
- Collaborate with adjacent land managers and communities to ensure the conservation of this Reserve including:
    - Grand Canyon National Park
    - BLM Las Vegas District
    - Hualapai Indian Reservation
    - BLM Arizona Strip District
- Educate the public on lighting options and the significance of night skies and this Reserve

Purpose and Need:

- The preservation of natural lightscapes will keep the nocturnal environment within the range of natural variability. Deviations outside this natural range may result in a modification to natural ecosystem function, especially to systems involving the behavior and survival of nocturnal animals. The natural night sky is therefore one of the physical resources under which natural ecosystems have evolved. A natural starry sky absent of anthropogenic light is a recognized natural resource.

- The history and culture of many civilizations are steeped in interpretations of night sky observations, whether for scientific, religious, or time-keeping purposes. As such, the natural night sky may be a very important cultural resource, especially in areas where evidence of aboriginal cultures is present.
- The recreational value of dark night skies is important to campers and backpackers, allowing the experience of having a campfire or sleeping under the stars.
- Economic value is also a consideration given the significant savings with reduced electrical cost and more efficient lighting uses.
- Night sky quality is an important wilderness value, contributing to the ability to experience a feeling of solitude in a landscape free from signs of human occupation and technology.

Lighting Zones Definition and Overview:

Lighting zones (LZ) reflect the base (or ambient) light levels that are desired. The use of lighting zones was originally developed by the International Commission on Illumination (CIE) and appeared first in the United States in IES Recommended Practice for Exterior Environmental Lighting, RP-33-99. Following the IES guidance, two LZs were chosen for the Parashant Dark Sky Reserve, LZ-0 and LZ-1 (See Table 2). The following two lighting zones will be applied to the Parashant Dark Sky Reserve:

LZ-0: No ambient lighting

Areas where the natural environment will be seriously and adversely affected by lighting. Impacts 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

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.

Table 2. IES Guidance for chosen LZs for Parashant National Monument.

Zone	Recommended Uses or Areas	Zoning Considerations	Parashant DSR Implementation
LZ-0	Lighting Zone 0 should be applied to areas in which permanent lighting is not expected and when used, is limited in the amount of lighting and the period of operation	Recommended default zone for wilderness areas, parks and preserves, and undeveloped rural areas. Includes protected wildlife areas and corridors.	Reserve Wide This zone will be the default lighting use in both Periphery and Core Reserve Areas to include BLM, NPS, and AZ State Trust Lands. Exceptions include: Administrative Sites and Private Property land units. Accounts for 97% of the entire DSR.
LZ-1	Lighting Zone 1 pertains to areas with low ambient lighting levels such as rural residential area with single or two family size structures or agricultural zone districts. Utilizing a 10pm light curfew to keep ambient lighting at a minimum along with retrofitting of exterior lighting to IDA dark sky guidelines.	Recommended default zone for rural and low density residential areas.	Identified Sites This zone applies to all Private Land sections and Administrative sites to use light curfews and retrofit 80% of their light fixtures. Accounts for 3% of the entire DSR.

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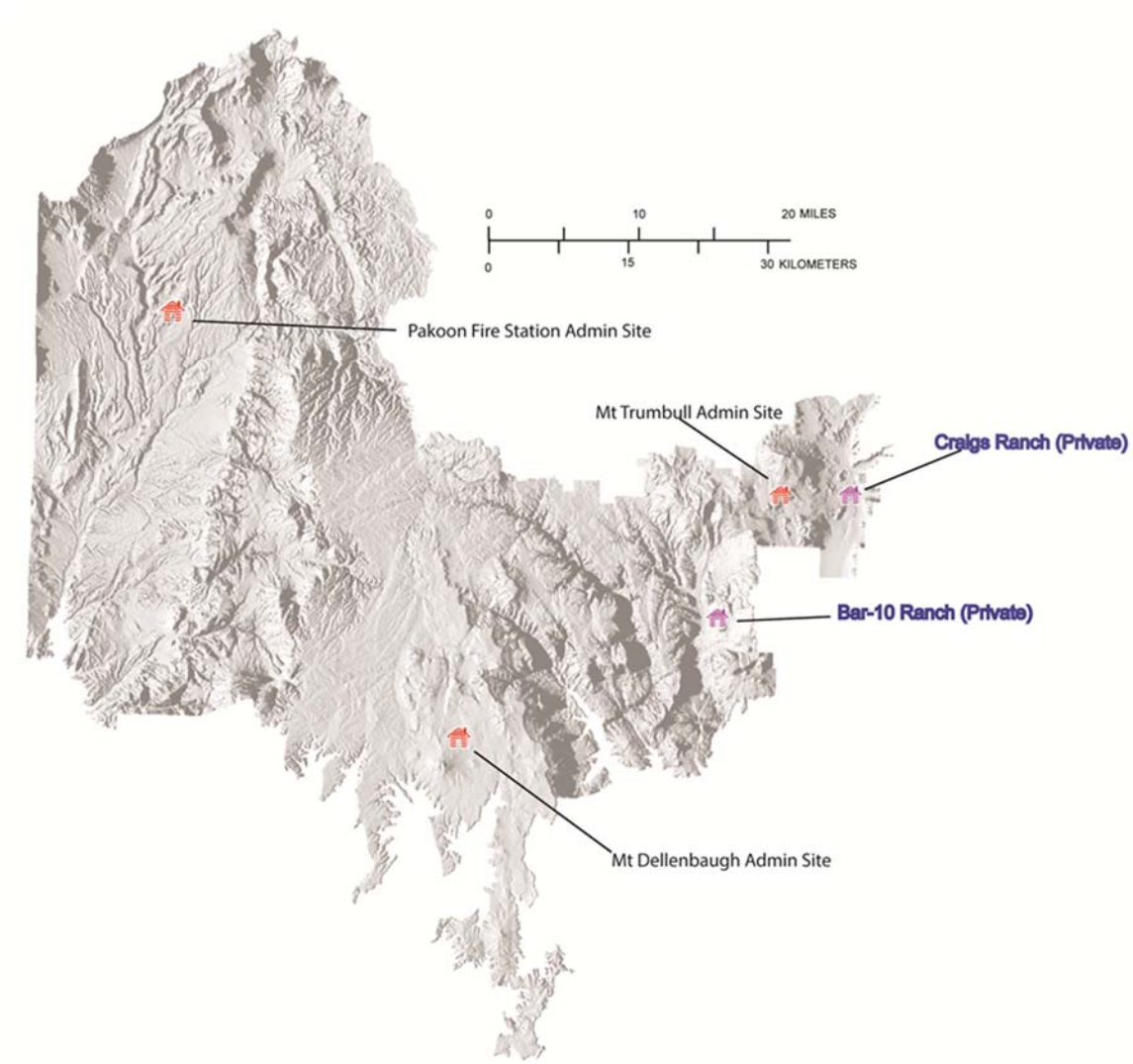

Figure 29. Locations of permanent light sources in the proposed Parashant Dark Sky Reserve. Note the private locations in purple and the federal locations in orange.

Given the undeveloped and solitary nature of Parashant (as well as the RMP Management Decision to maintain the quality of Class 1 viewsheds requiring no permanent outdoor lighting in the Monument) the Parashant Dark Sky Reserve will be primarily zoned as LZ-0.

The following sites will be the exception to the above lighting zone and will be managed as LZ-1 (Fig 29):

- Pakoon Fire Station -BLM Administrative Site (Site 1)
- Mt Dellenbaugh -NPS Administrative Site (Site 2)
- Mt Trumbull/Nixon - BLM Administrative Site (Site 3)
- Bar-10 Ranch –Private Property (Site 4)
- Craig Ranch –Private Property (Site 5)
- All other undeveloped Private Land Sections

These LZ-1 sites will also adhere to a 10 pm light curfew with all exterior lights extinguished and curtailed interior light use. The intent of this light curfew is to reduce or eliminate lighting after this specified time. Benefits include reduced environmental impact, longer hours of improved astronomy, energy savings, and improved sleeping conditions for residents and visitors.

Special Purpose <1000 Lumens Light Use

At the LZ-1 sites, unshielded lighting fixtures may be needed although they are highly visible even at lower wattages. These light fixtures will be designated as special purpose only. Special purpose light fixtures are to be only used momentarily, for a specific reason such as illumination of a front driveway while load/unloading vehicles or for periodic maintenance on a water tower. These light fixtures are not intended to be used for routine activity nor for extended durations.

Outdoor Lighting Guidance for all Government Structures within the Reserve

Monument management recognizes the importance of this Reserve and will set an example for visitors by proudly using dark sky friendly light fixtures. This commitment is reflected in the RMP under chapter 2, Table 2.8 which specifies that all authorized structures comply with NPS/BLM dark night standards. This lightscape management plan further directs all federal government structures, facilities, or any permanent lighting sources will adhere to International Dark Sky Association (IDA) standards for "Fixture Seal of Approval". These are lighting fixtures which will conform to the following criteria:

- The light source must be fully shielded and directed downwards.
- The fixture cannot emit any luminous output above 90 degrees in the vertical plane.
- Light fixtures will be specified to emit light at 4100K CCT and below.

All government sites will be retrofitted to be 100% IDA dark sky compliant by Fall 2014. These approved lighting fixtures will be inspected bi-annually by facility staff to ensure compliance.

Outdoor Lighting Guidance for private land owners within the Dark Sky Reserve

Within the proposed Parashant Dark Sky Reserve there are only 2 sites out of 5 private land owners that have permanent structures with light sources, Bar-10 Ranch and Craig Ranch (Only Bar-10 Ranch has exterior lighting as it serves as a quasi-bed-and-breakfast). Along with a 10 pm light curfew, these two sites will be further engaged as they will host astronomy groups, and will be on a five year plan to retrofit 80% of their existing exterior lighting to fixtures which will comply with IDA standards for "Fixture Seal of Approval".

Collaborate with adjacent land managers and communities to ensure the conservation of this Reserve

Beyond ensuring lighting guidance for existing light sources in the Reserve, it is important to be mindful of future development that can create unwanted light sources such as expanding urban centers. One important land administrator, the Arizona State Lands, located in the proposed DSR has designated their various sections for cattle grazing only, integral to maintaining current light levels. In addition, this nomination process has been able to produce letters of support from the significant adjacent Public land units – Lake Mead National Recreation Area, BLM Las Vegas District and BLM Arizona Strip District. In addition Grand Canyon National Park, one of our largest neighbors, is currently seeking IDA Dark Sky Park Designation. Future plans involve solidifying formal agreements and Memorandum of Understandings (MOU) with our neighboring municipalities, Indian Reservations, and public/ private land administrators.

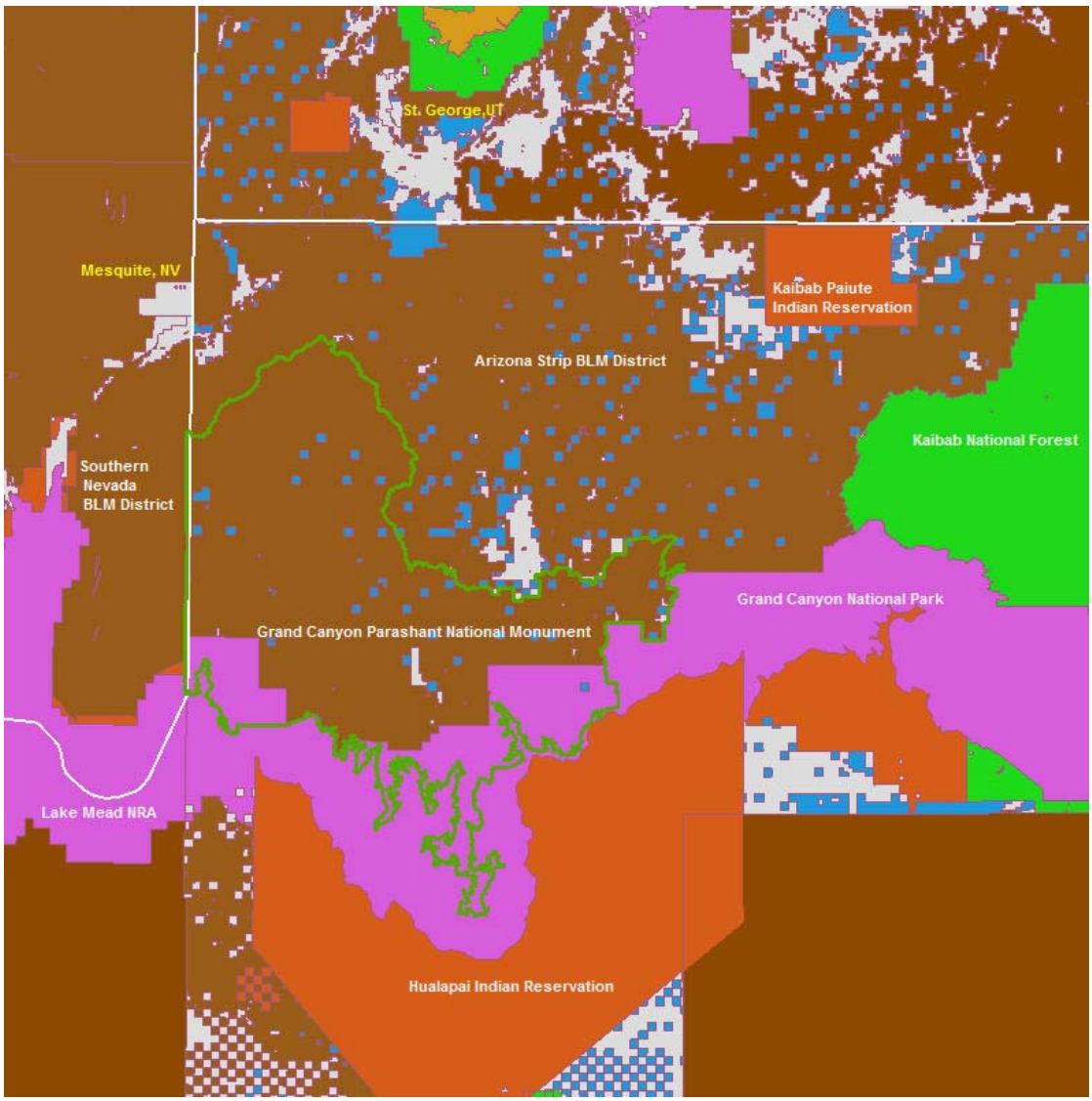

Figure 29. Locations of Adjacent Land Units

Light Management Plan Standard Compliance

The following compares the Proposed Parashant DSR LMP to the minimum IDA standards:

IDA Standard	Parashant DSR LMP	Meets or Exceeds Criteria?
A quality comprehensive LMP should be adopted by the communities to a proportion corresponding with at least 80% of population AND 80% of designated area of protection within the entire IDA DSR (core and periphery).	LMP has been currently adopted to 97% of the proposed DSR and covers 100% of the area including Periphery and Core Reserves, with 100% of the Parashant residents (Bar-10 Ranch) adopting LZ-1 Light management standards.	Exceeds
New, current, and required retrofit lighting must meet the reserve's LMP	2 out of 3 Administrative Sites are needed to comply and will be retrofitted by Fall 2014, with a 5 year plan to retrofit Bar-10 Ranch	Meets
Included policy for determining whether an area should or shouldn't be lighted, at what times an area should or shouldn't be lighted, and appropriate illumination levels.	LMP designates two lighting zones and locations of each indicating a "No Ambient Light zone" and a"Low Ambient Light Zone" along with a light curfew.	Meets
Fully-shielded fixtures are standard throughout the reserve. An exception to this may be when lighting fixtures contain lamps emitting less than 600 lumens.	LMP states retrofitted fixtures will adhere to IDA and RASC dark sky standards. Exceptions to larger lumen fixtures will be identified and used only sparingly for non-routine use.	Meets
A measurement program must be maintained either by the park or by another public or private organization to follow the evolution of light pollution in the IDA DSR core and assert that the night sky quality does not degrade.	Future Plans involve semi-annual Unihedron SQM measurements especially in areas of concern. Dixie University Physics Dept will conduct annual astronomy surveys along with any incidental assistance from the NPS Dark Sky Team.	Meets

Communities must have examples of conforming lighting installations relative to the population they serve.	All 3 Administrative sites (Also including the main Parashant Office and the Visitor Center located outside the DSR in St. George, UT) will have interpretive signage and feature a prominent example of a Dark Sky light fixture along with the other retrofitted fixtures.	Exceeds

9. Lighting Survey

The following tables (Table 3) illustrate the lighting currently in use in the proposed DSR.

Table 3. Lighting Survey of LZ-1 sites.

Site	Location	Light Ref. #	Photo	Fixture(s)	Use	Fully-Shielded	Special Purpose <1000 lumens	Conformity with Lighting Guidelines
Site 1: Pakoon Fire Station	Fire Cabin	1		4 Capital Lighting 9204 Poly Porch Outdoor Wall Fixture	Building egress	YES-Under Porch Ceiling	NO	YES [To be retrofitted]
	Storage Garage	2		2 Two Lamp, 54 Watt T5HO Lamps, No Reflector	Building egress	YES-Under Porch Ceiling	NO	YES [To be retrofitted]
Site 2: Mt. Dellenbaugh Admin Site	Law Enforce-ment Cabin	3		4 Sea Gull Lighting 8338-10 Outdoor Bullet Small Dark Sky Sconce	Building egress	YES-Under Porch Ceiling	NO	YES

Table 3. cont.

Site	Location	Light Ref. #	Photo	Fixture(s)	Use	Fully-Shielded	Special Purpose <1000 lumens	Conformity with Lighting Guidelines
Site 2: Mt. Dellenbaugh Admin Site cont.	Research Cabin	4		4 Sea Gull Lighting 8338-10 Outdoor Bullet Small Dark Sky Sconce	Building egress	YES-Under Porch Ceiling	NO	YES
	Storage Unit	5		2 Warehouse style lights over doorways, 60watt	Double Door lighting for loading zone only	NO	YES	YES [To be retrofitted]
	Driveway/Water tower	6		2 120 W, Flood Luminaire, ZY1-100E	Parking lot, limited use and loading zone only	NO	YES	YES

Table 3. cont.

Site	Location	Light Ref. #	Photo	Fixture(s)	Use	Fully-Shielded	Special Purpose <1000 lumens	Conformity with Lighting Guidelines
Site 3: Mt. Trumbull-Nixon Admin Site .	Fire Cabin	7		4 Sea Gull Lighting 88660-814 Outdoor Bullet Sconce	Building egress	YES-Under Porch Ceiling	NO	YES [To be retrofitted]
	Research Cabin	8		4 Sea Gull Lighting 8870-44 Outdoor Lantern w/ Weathered Finish and Clear Glass.	Building egress	YES-Under Porch Ceiling	NO	YES [To be retrofitted]
	Guest Cabin	9		1 Pair of 100 watt Flood Lights	Parking area lighting for loading zone purposes	YES-Under Porch Ceiling	YES	YES [To be retrofitted]

Site	Location	Light Ref. #	Photo	Fixture(s)	Use	Fully-Shielded	Special Purpose <1000 lumens	Conformity with Lighting Guidelines
Site 3: Mt. Trumbull-Nixon Admin Site cont.	Storage Unit	10		2 Pair warehouse style lights over doorways, 60watt	Building egress	NO	YES	YES [To be retrofitted]
	Walkway	11		12 Solar Lights Auto On - for 3 hours after sunset	Walk Way limited use only	NO	YES	YES
Site 4: Bar-10 Ranch (Private)	Main Lodge	12		4 Lighting 100watt, Flood Light 2-Light Outdoor	Building egress	YES-Under Porch Ceiling	NO	YES [To be retrofitted]
Site 5: Craig Ranch (Private)	Main Cabin	13		No exterior light fixtures	Only interior lighting use	YES	NO	YES

10. Lighting Retrofits:

Efforts to retrofit the existing administrative structures to ensure they meet IDA's Dark Night Standards has already been underway. While there are five administrative structures, 3 have permanent exterior light fixtures, the remaining 2 structures only have a single interior light fixture at each location. In 2012, NPS has completely retrofitted their Mt Dellenbaugh administrative site with multiple Sea Gull Lighting 8338-10 Outdoor Bullet Small Dark Sky Sconce which directs light vertically downward with no outward flaring.

The bulk of the lighting at the remaining two administrative structures is under covered porches, Pakoon Fire Station and Mt Trumbull/Nixon, will still require further retrofitting to meet the IDA Dark Sky lightening Standards. The lighting inventory revealed 14 light fixtures were in need of retrofitting at the Mt Trumbull/Nixon Site, primarily at building egress locations. In addition, Pakoon Fire Station is in need of 6 light retrofits to be in compliance. NPS has agreed to conduct these retrofits within a 1yr time frame to be completed by Fall 2014 with federal funds set aside for light fixtures and installation labor. These retrofits will install IDA approved fixtures along with small signage at each retrofitted building informing visitors the presence of Dark Sky Friendly fixtures.

The only private landowner location with exterior light sources, Bar-10 Ranch, maintains a light management strategy of a 10pm light curfew. Future plans, over a 5yr timeline, will involve third party non-profit organizations accepting NPS funds to complete the remaining retrofits needs as identified by Bar-10 Ranch. Until such retrofits pursued, Bar-10 ranch will continue its light curfew to preserve dark sky Core Reserve levels.

11. Interpretive Programs on Night Skies

Figure 30. Parashant Astronomy Interpretation while hosting the May 2012 Solar eclipse, in Saint George, UT.

Grand Canyon-Parashant National Monument is one of the most remote areas within the 48 contiguous states. With the Grand Canyon plunging thousands of feet deep along the south perimeter and only unpaved roads providing entry from the North, west and northeast, no towns or communities lie within its boundaries and portions of the Monument fall on the Colorado Plateau, one of the darkest night sky areas in the United States. Dark night skies are considered a monument object and lends to the significance of the Monument as a remote and unspoiled

landscape with limited travel corridors. The vastness and isolated location of the Monument provides for solitude, natural quiet, dark night skies and wilderness characteristics.

Access to the Monument is somewhat limited due to unimproved (read: dirt) roads and a minimum 1 hour travel time to the Monument borders. Travel into the more interior regions of the Monument, beyond the Arizona-Mojave County maintained road surfaces, requires slow driving over rough terrain, often in a high-clearance, four-wheel drive or off-highway vehicle. In addition, the Monument does not have any public facilities including restrooms or campgrounds. These convenience and safety issues can impede public activities from being conducted on the Monument and it is for these reasons a portion of interpretation, education and outreach is conducted at various venues within gateway communities surrounding the Monument. However, even with these extra considerations, public access is still available to the more seasoned visitor as most events are planned with additional travel prerequisites for our attendees (spare tire, water, communication plan, etc…).

The recently completed Long Range Interpretive Plan identifies the challenge of conducting onsite programs and recognizes that the majority of interpretive activities will be conducted offsite. We request that the IDA give special consideration to our circumstances in accessibility to the Monument and our outreach efforts to conduct programs specifically on the Monument. This will also allow us to reach a greater audience with our local municipalities and gateway communities and to increase awareness of this DSR.

Currently, consistent night sky programming in gateway communities surrounding Parashant is somewhat sparse and inconsistent, predominately driven by grassroots organizations. However, one gateway community, Apple Valley, UT is currently seeking IDA Designation Dark Sky Community along with an observatory which would provide an excellent venue to extend combined interpretive efforts. Another example is Sunrise Ridge Intermediate School, located in Saint George, UT which builds on Utah core curriculum for 6th and 7th grade students and holds an annual star party event. Lesson plans for the students include topics such as the solar system, scale, size, distance, movement between objects, the sun, the moon, etc. This event invites guest speakers and conducts activities for the students. Telescopes and operators for the telescopes are provided from Dixie State University (DSU) and the DSU Astronomy Club.

Evening Programs

Parashant currently offers night sky programs to several youth groups who camp on the Monument. Partners in the Parks, a program that introduces collegiate honors students throughout the country to the National Park Service, and Outward Bound Adventures, a non-profit organization that brings inner city youth into the outdoors, work closely with staff from the Monument to learn about natural resources management. The night sky programs that have been conducted with these groups have typically involved a staff member presenting naked-eye astronomy and constellation tours.

Daytime Astronomy

Partnering with the Washington County Water Conservancy, Virgin River Project and Dixie State College, Parashant hosted an event to view the Annular Solar Eclipse in May of 2012 (Fig 30). Advertising for the event included a news release, website postings, flyers and posters distributed throughout the community. Free protective solar viewing eyewear was provided to the public to promote safety while observing the eclipse. Astronomy video clips streamed from the Jet Propulsion Laboratory were shown on indoor monitors and planetary exhibits were prepared and displayed. Dixie State College provided telescopes and operators for viewing the eclipse. The event drew nearly 1,200 participants as well as many more community members to a nearby park, demonstrating a strong interest in astronomy programs.

The night sky programs that have been conduct with these groups have typically involved a staff member presenting naked-eye astronomy and constellation tours.

Interpretive Night Sky Publications

Reserve Signage

Areas near select Monument portals and Administrative sites will display the Dark Night Sky Reserve status. Signs or informational kiosks in these areas may carry the IDA logo or in some cases a more interpretive message that informs the visitor of dark night sky status. Monument facilities will be retrofitted with night sky friendly fixtures and will also provide opportunities to post information.

Website

Parashant will add pages to their website that are specifically devoted to the Dark Night Sky. Material included in the pages will cover the preservation of dark night skies on the Monument, including the IDA Dark Night Reserve designation, astronomical lesson plans, and astronomical photos taken on the Monument. Webpages may give the potential visitor basic information regarding viewing areas, the best time of year for viewing and any astronomical events that may be viewed from the Monument.

Site Bulletin

A site bulletin may be produced that gives information about the Dark Night Sky Reserve, what it is and why it is important. Other topics may include, the best viewing areas and times of year within the Monument or retrofitting your home with night sky friendly lighting.

12. Future Work

Astronomy Viewing on Parashant

Parashant staff is currently evaluating sites for conducting onsite astronomy viewing (one of which is only 1 hour distance from St. George, UT in the Periphery Reserve). However, the goal is to provide a site within the Core Reserve for conducting more substantial onsite astronomy viewing. As more sites are explored for the best access and the ability to transport in sizeable telescopes, Parashant will pursue conducting a regular remote amateur astronomy viewing night on the Monument.

Additional opportunities with visitors may be pursued through sidewalk astronomy events conducted within gateway communities. Night and daytime astronomy opportunities may be sought in public locations such as community events, festivals, activities and amateur viewing sites close to city limits that are easily accessible for the general public. During this time, 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.

Lectures

Many of the surrounding communities offer lecture series throughout the year. Utilizing these venues Parashant staff will provide interpretation and lectures on topics such as night sky friendly light fixtures, disruption of nocturnal wildlife activities, the formation of stars, disappearing dark night skies, and traditional culture star stories such as the Southern Paiute "Why the Moon Paints Her Face Black", etc.

Exhibits

A traveling night sky exhibit may be made available to gateway communities, city offices, airport facilities, tourism offices, local museums and universities, etc. Parashant staff will explore topics for the exhibit that may include night sky friendly light fixtures, the importance of dark night skies, IDA Dark Night Sky Reserve designation, disappearing dark night skies etc.

Administrative sites and research facilities located in the Monument may be used to demonstrate proper lighting and outfitting. The small libraries in these facilities may also be equipped with telescopes and literature that promotes the dark night sky.

Community Influence

Parashant will strive for a strong community influence for Dark Night Skies through K-12 education, and involvement with Scout, church and civic groups by first developing programs that are age appropriate and then making staff available to conduct the programs.

Partnerships

Along with the many friends groups, tribes, and neighboring land administrators who provided Letters of Support, Parashant will continue to pursue formal arrangements and promote IDA

designations to further awareness of this DSR. Additional efforts are underway to form a partnership with the developing, SouthWest Science Center in Apple Valley, UT, which will contain an Astronomical Observatory Complex and Performing Arts Center as well as additional partnerships with local Astronomical Societies, University Astronomical Clubs and the Washington County School District for youth education.

Additional partnerships with gateway communities, Native American tribes, National Park Service units such as Pipe Springs National Monument, Zion National Park, Bryce Canyon National Park, State Parks, local business owners and city offices will also be pursued.

Interpretive Planning

The following table illustrates the stages of the various interpretive components promoting dark night skies.

Table 4. Yearly interpretive goals associated with the Parashant Dark Sky Reserve.

	Year 1	Year 2	Year 3	Year 4	Year 5
Develop Relationships with local Astronomy Societies and Clubs/pursue new partnerships	x	x	X	x	x
Host a Star Party Program on the monument		x	x	x	x
Create and update NPS website pages	x	x	x	x	x
Site Bulletin(s)	x	x			
Night Sky Exhibit		x			
Educational Programming		x	x	x	x
Evening Night Programs	x	x	x	x	x
Reserve Signage		x	x	x	x
Off-Site Programs	x	x	x	x	x

Sky Quality Monitoring

Sky quality monitoring is necessary to monitor for changes in lightscapes from neighboring urban centers or any infractions of light use within the proposed DSR. Staff and volunteers will conduct sky quality monitoring on a regular basis at identified locations. Below (Fig 31) illustrates Areas of Concern in the vicinity of the DSR.

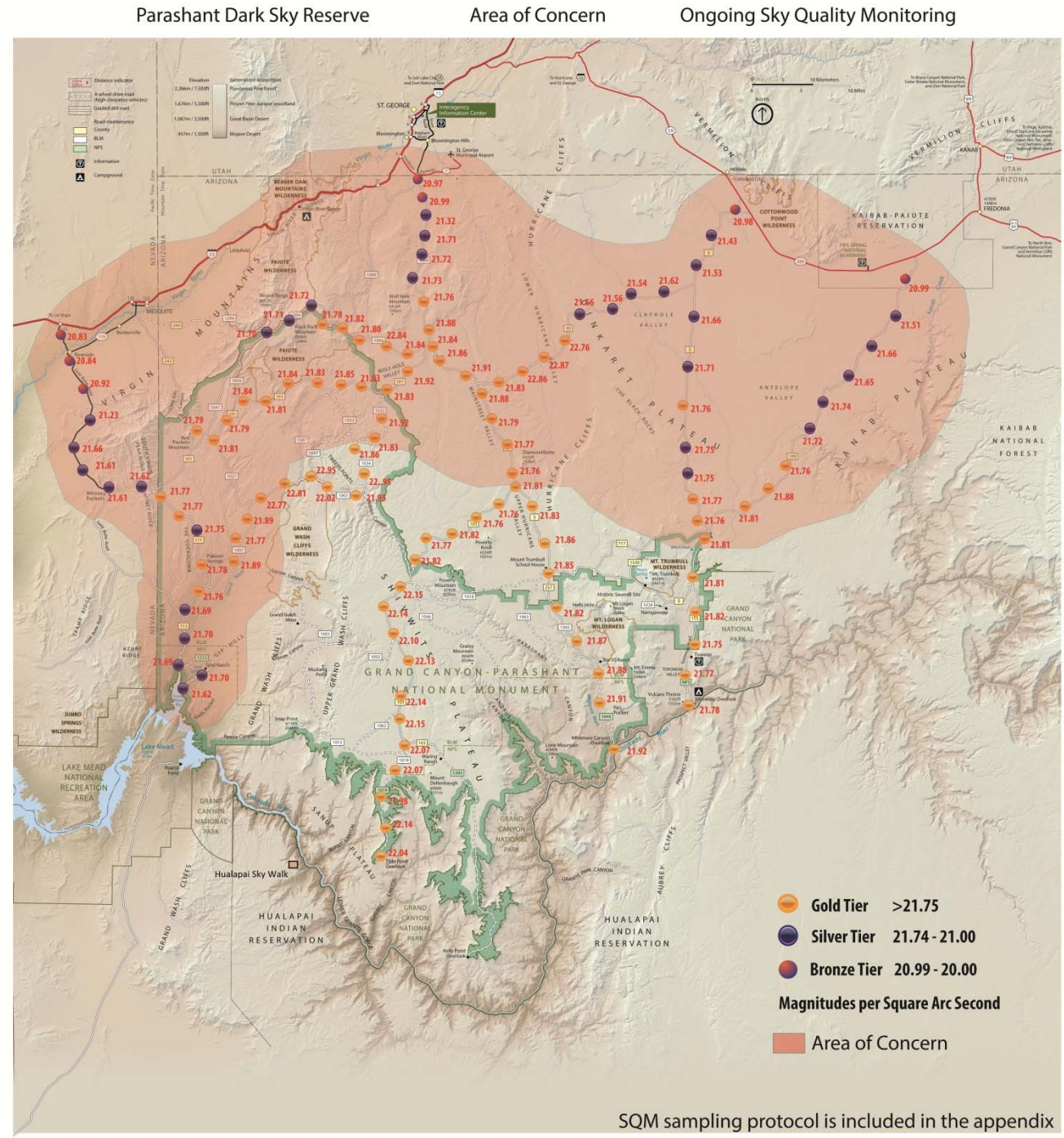

Figure 31 Map of Areas of Concern and at Risk of Light Encroachment

An Area of Concern is defined as the transition zone where encroaching light scatter begins to impede the pristine Gold Tier dark skies. Sky quality survey crews will conduct 60-80 SQM measurements each year to identify any seasonal shifts or trends in light levels within Areas of Concern. This same crew will also complete repeat SQM measurements in the Core Reserve to ensure retention of these higher caliber (Gold Tier) skies. Also of concern is the Hualapai Sky Walk Attraction, located west across the Grand Canyon from Twin Point (see Fig 31) which currently uses a 10 pm light curfew. Efforts will be made to partner with the Hualapai Sky Walk and to continue to monitor as this attraction develops.

Areas in the vicinity of the administrative sites will also be evaluated during the 2014 retrofit process. SQM measurements with expanding radii will be taken before and after retrofitting from the three administrative sites to showcase the impact of exterior-lighted structures. This will also produce helpful interpretive materials.

An Annual Report will be submitted as required by IDA, each year by October 1, and will detail the results of SQM datasets as well as any additional sky quality data that surfaced from efforts by Dixie State University, the NPS Dark Sky Team, or incidental data from visiting astronomy groups. In addition, the report will detail interpretive events, communication outlets, volunteer hours, and visitation as this proposed DSR blossoms.

Acoustical Monitoring

Parashant currently has a soundscape program with 4 stations deployed along the northern rim of the Grand Canyon (Fig 32, 33). These stations record and monitor the ambient soundscapes by digitizing audible sound pressure levels. This data can then be processed to produce spectrograms, i.e. visual depictions of the sound data which enables easy identification of biological and anthropogenic sound sources (Fig 34). This data is very helpful when quantifying biological responses to changes in the environment to include shifting lightscapes.

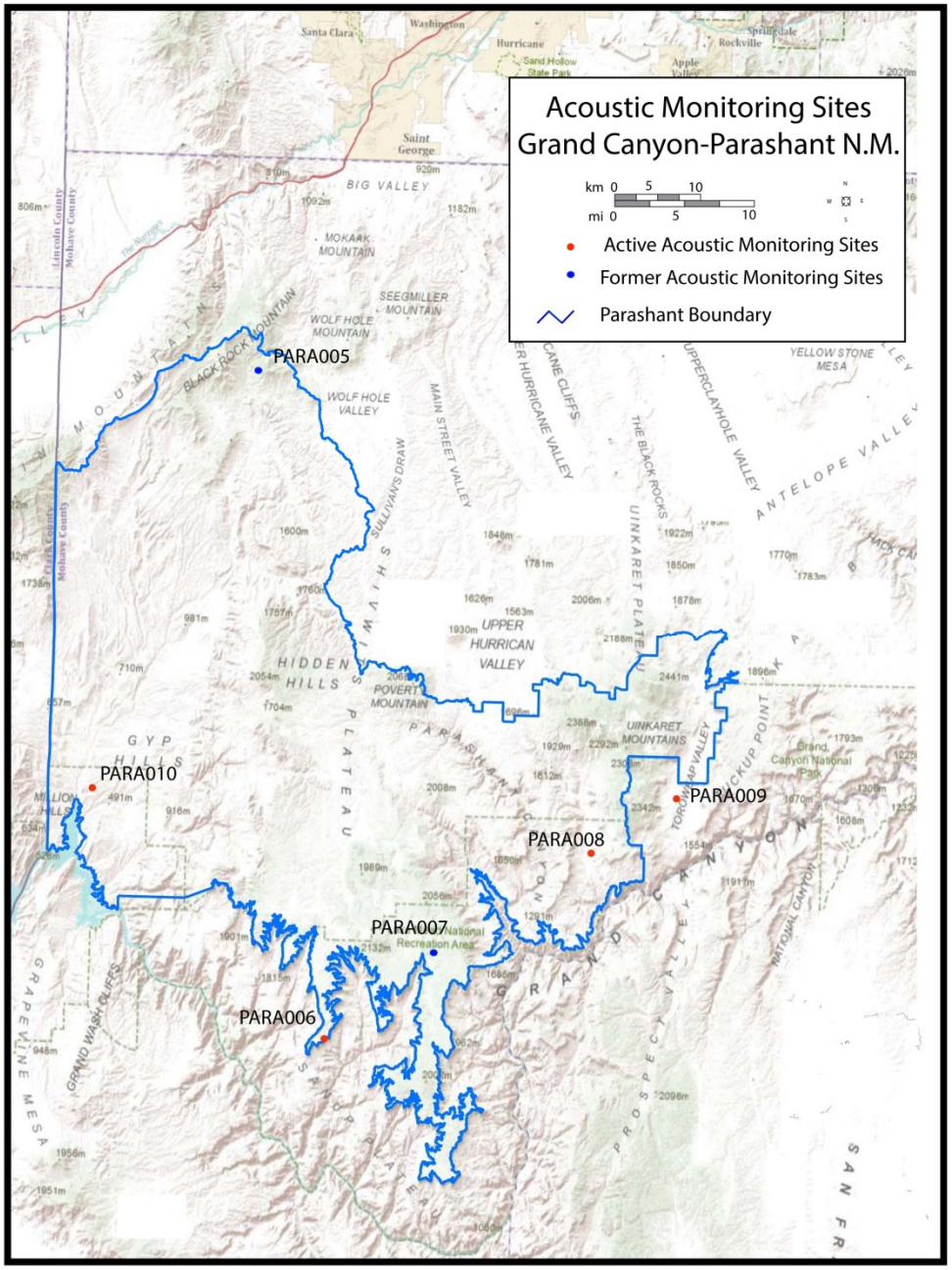

Figure 32 Map of Acoustic Monitoring Stations

Figure 33 Retrieving Sound Data from Tuweep Valley Acoustic Monitoring Station PARA009

Using these instruments, Parashant staff will monitor bat acoustics before-and-after administrative site lighting retrofits to determine any change in acoustics and behavior. In addition, the currently deployed sound monitoring equipment will capture ambient sound sources and levels for both Periphery and Core Reserves. This will help to better describe wildlife use of the night skies. Results will be detailed in the Annual IDA Report.

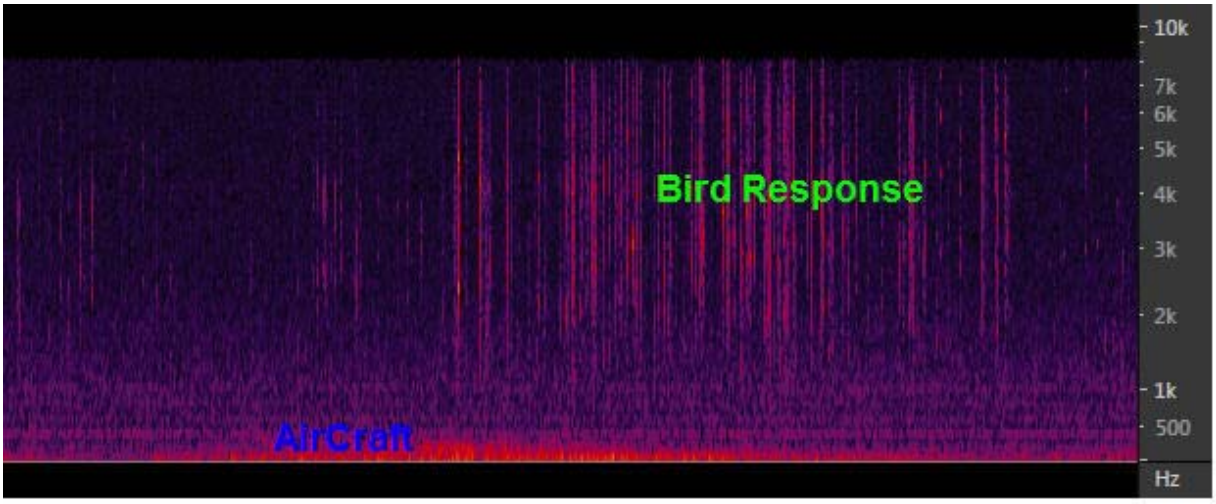

Figure 34 Spectrogram illustrating aircraft sound and wildlife response

Credits and Acknowledgements

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Appendix A: Unihedron Sky Quality Instrument Sampling 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 Dark Night projected viewing times. Viewing times are determined as the darkest time of the night: after and before astronomical twilight periods and the moon must be at least 30 degrees below the horizon (approximately 2hrs). Cloud clover should be minimum. Refer to Dark Sky Calendar spreadsheet for these calculated viewing times.

2. Be cognizant of cloudy conditions and only continue on the clearest nights. Select a travel itinerary and be sure to communicate your travel objectives and confirm your outing at least two weeks prior to trip.

3. 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

4. Ensure the vehicle, headlights, and tires are in working order.

5. Check out on the white board, Call up LAKE Dispatch 702- 293-8998 and inform them of your travel plans. Depart the Parashant office to the starting point of your survey.

6. 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.

7. Begin your data sheet entry by creating a new sample number using the date: yymmdd, road #, and sample #. (For example: 130722-1069-3)

8. From your GPS clock, record the time (which should be local Mountain Time)

9. Set up the Tripod with the Sky Quality Meter (SQM) and the Temp/Rh sensor on the road surface approximately 35-40 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.

10. Record from your GPS: Altitude, Easting, and Northing onto your datasheet. (Make sure your GPS is using UTM and is in NAD83 datum)

11. Record with the handheld laser thermometer the ground surface temperature measurements from an area below the tripod.

12. 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.

13. TURN OFF ALL LIGHT SOURCES --Begin taking SQM measurements. - A total of 5 and be sure to discard the initial measurement. Depress the red button while the device is orientated towards the sky Zenith. Record the resulting measurements.

14. 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.

15. Repeat Steps 4-12 at your next stop.

16. After completion of outing, confirm with dispatch and electronically record your data on the given excel spreadsheet

Parashant Dark Sky Reserve Unihedron Sky Quality Measurements July - November 2013

Sample Number			GPS (UTM - NAD 83)				Time (MT)	Surface Temp	Air Temp	Humidity						
Date YYmmdd	Road #	Sample #	Elevation (ft)	Zone	Easting	Northing	24hr	Celcius	Celcius	Rh %	SQM_1	SQM_2	SQM_3	SQM_4	SQM_5	SQM_{ave}
20130712	1045	1	2495	12 S	301696	4003112	0101	23.4	25.5	68.1	21.99	21.88	21.89	21.88	21.95	21.92
20130712	1045	2	3568	12 S	300764	4007015	0159	22.6	23.4	76.8	21.87	21.86	21.96	21.89	21.99	21.91
20130712	1045	3	3836	12 S	299196	4011030	0240	20.0	24.3	73.7	21.94	21.84	21.86	21.86	21.88	21.88
20130712	1045	4	4035	12 S	299637	4015644	0302	19.7	20.3	74.3	21.97	21.85	21.84	21.84	21.84	21.87
20130712	1045	5	4283	12 S	296589	4018064	0321	18.7	21.9	71.0	21.82	21.83	21.81	21.81	21.82	21.82
20130712	5	6	5295	12 S	294387	4021842	0340	16.1	22.5	60.8	21.94	21.83	21.82	21.81	21.83	21.85
20130712	5	7	5248	12 S	292391	4026170	0355	15.1	21.2	57.5	22.01	21.84	21.82	21.81	21.83	21.86
20130712	5	8	5328	12 S	291459	4030662	0407	16.3	21.7	62.0	21.87	21.80	21.83	21.81	21.86	21.83
20130712	5	9	5272	12 S	291587	4035857	0420	14.9	22.3	61.0	21.86	21.80	21.79	21.79	21.80	21.81
20130714	5	10	5081	12 S	289287	4040115	0147	16.0	20.5	65.7	21.71	21.85	21.79	21.85	21.62	21.76
20130714	5	11	5024	12 S	287966	4044605	0201	16.0	18.9	59.7	21.79	21.79	21.76	21.77	21.76	21.77
20130714	5	12	5140	12 S	285774	4048664	0220	15.5	20.9	54.7	21.38	21.90	21.90	21.89	21.89	21.79
20130714	5	13	5046	12 S	284508	4053436	0231	14.9	21.6	55.3	21.93	21.87	21.87	21.87	21.86	21.88
20130714	5	14	5030	12 S	282267	4058001	0243	16.8	19.9	57.2	21.99	21.90	21.91	21.88	21.88	21.91
20130714	5	15	5003	12 S	280415	4062981	0255	16.8	20.3	59.4	21.91	21.86	21.85	21.85	21.85	21.86
20130714	5	16	5097	12 S	276668	4065695	0308	17.1	21.1	57.4	21.89	21.83	21.85	21.81	21.80	21.84
20130714	5	17	5077	12 S	273356	4068659	0322	16.0	21.6	56.2	21.99	21.87	21.84	21.86	21.85	21.88
20130714	1069	18	5102	12 S	271861	4073104	0335	17.3	20.3	57.7	21.74	21.79	21.76	21.74	21.76	21.76
20130714	1069	19	5018	12 S	271751	4077816	0347	17.2	19.7	60.8	21.72	21.71	21.73	21.74	21.75	21.73
20130714	1069	19	5018	12 S	271751	4077816	0347	17.2	19.7	60.8	21.73	21.72	21.73	21.72	21.71	21.72
20130714	1069	20	4409	12 S	270362	4081704	0400	19.6	23.9	46.8	21.87	21.67	21.67	21.68	21.67	21.71
20130714	1069	21	3770	12 S	271758	4086313	0411	22.2	24.2	50.0	21.32	21.32	21.32	21.32	21.31	21.32

Parashant Dark Sky Reserve Unihedron Sky Quality Measurements July - November 2013

Sample Number			GPS (UTM - NAD 83)				Time (MT)	Surface Temp	Air Temp	Humidity						
Date YYmmdd	Road #	Sample #	Elevation (ft)	Zone	Easting	Northing	24hr	Celcius	Celcius	Rh %	SQM_1	SQM_2	SQM_3	SQM_4	SQM_5	SQM_{ave}
20130714	1069	22	3210	12 S	272360	4091225	0423	22.9	25.4	50.0	20.99	20.97	20.99	20.94	20.94	20.97
20130714	1069	23	2867	12 S	271473	4096041	0434	23.4	24.9	51.5	21.03	20.89	20.88	20.88	20.88	20.91
20130804	1213	1	1188	11 S	768972	4013250	2218	38.3	36.7	11.2	21.56	21.68	21.62	21.63	21.63	21.62
20130804	1213	2	1485	12 S	233265	4015962	2229	33.9	35.2	10.4	21.71	21.70	21.69	21.69	21.70	21.70
20130804	1213	3	1913	12 S	235007	4018795	2242	32.3	34.1	10.8	21.71	21.69	21.68	21.68	21.68	21.69
20130804	1213	4	1306	11 S	769481	4017664	2259	35.9	33.6	12.0	21.75	21.75	21.76	21.77	21.76	21.76
20130804	1213	5	1705	12 S	236497	4016195	2307	33.1	33.9	10.7	21.73	21.70	21.74	21.72	21.71	21.72
20130804	113	6	1555	12 S	231113	4022367	2315	32.2	34.0	12.4	21.79	21.78	21.77	21.77	21.77	21.78
20130804	113	7	1764	11 S	768371	4026749	2330	28.9	30.6	16.4	21.76	21.75	21.75	21.75	21.76	21.75
20130804	113	8	2082	11 S	765184	4030247	23.42	26.9	29.0	14.4	21.81	21.77	21.77	21.76	21.76	21.77
20130804	113	9	2318	11 S	761233	4032427	2358	29.6	31.1	13.2	21.80	21.79	21.77	21.75	21.76	21.77
20130804	111	10	2314	11 S	757107	4034740	0012	31.5	29.5	14.3	21.63	21.62	21.62	21.62	21.61	21.62
20130804	111	11	2339	11 S	755082	4039085	0027	29.2	30.5	13.5	21.62	21.61	21.60	21.60	21.60	21.61
20130804	111	12	2712	11 S	755051	4043290	0043	28.9	31.2	12.9	21.65	21.61	21.60	21.60	21.60	21.61
20130804	111	13	2755	11 S	754174	4046446	0058	32.5	29.6	14.6	21.70	21.64	21.65	21.65	21.65	21.66
20130804	111	14	2591	11 S	750823	4050338	0111	32.4	32.0	13.5	21.65	21.63	21.63	21.62	21.62	21.63
20130804	111	15	2771	11 S	749218	4055008	0121	30.1	29.7	14.4	21.68	21.64	21.63	21.63	21.69	21.65
20130804	111	16	2144	11 S	745958	4058597	0132	31.8	31.1	14.9	21.65	21.62	21.62	21.68	21.62	21.64
20130804	GBR	17	1499	11 S	742156	4061561	0142	34.7	33.0	13.8	21.25	21.26	21.23	21.21	21.21	21.23
20130804	GBR	18	1471	11 S	745347	4064675	0153	35.2	34.6	12.0	20.94	20.92	20.92	20.91	20.92	20.92
20130804	GBR	19	1464	11 S	747941	4068442	0205	35.2	34.1	13.0	20.85	20.84	20.83	20.84	20.83	20.84
20130804	GBR	20	1494	11 S	748410	4068721	0208	35.1	35.2	11.7	20.84	20.83	20.83	20.82	20.82	20.83

Parashant Dark Sky Reserve Unihedron Sky Quality Measurements July - November 2013

Sample Number			GPS (UTM - NAD 83)				Time (MT)	Surface Temp	Air Temp	Humidity						
Date YYmmdd	Road #	Sample #	Elevation (ft)	Zone	Easting	Northing	24hr	Celcius	Celcius	Rh %	SQM_1	SQM_2	SQM_3	SQM_4	SQM_5	SQM_{ave}
20130807	115	1	4537	12 S	315113	4009774	2250	23.3	26.2	21.4	21.84	21.78	21.75	21.74	21.80	21.78
20130807	115	2	4646	12 S	313870	4013078	2330	20.0	24.4	21.4	21.76	21.78	21.76	21.77	21.77	21.77
20130807	115	3	4745	12 S	314587	4017728	2345	20.1	24.1	22.5	21.72	21.75	21.75	21.80	21.75	21.75
20130807	115	4	4806	12 S	315456	4022673	2400	17.3	20.5	32.5	21.87	21.82	21.80	21.80	21.81	21.82
20130807	115	5	4995	12 S	316135	4027377	0010	16.2	20.9	36.2	21.88	21.81	21.85	21.77	21.76	21.81
20130807	5	6	5181	12 S	315412	4031797	0020	14.2	20.7	41.2	21.89	21.79	21.77	21.83	21.78	21.81
20130807	5	7	5496	12 S	317137	4036258	0030	11.6	17.5	51.8	21.77	21.75	21.76	21.76	21.73	21.75
20130807	5	8	5653	12 S	316697	4040140	0046	12.3	26.0	43.7	21.87	21.75	21.74	21.73	21.74	21.77
20130807	5	9	5542	12 S	315444	4044396	0100	11.9	19.9	43.8	21.75	21.75	21.75	21.76	21.73	21.75
20130807	5	10	5298	12 S	315463	4048429	0111	11.9	19.0	29.5	21.71	21.77	21.73	21.77	21.77	21.75
20130807	5	11	4995	12 S	316135	4027377	0010	16.2	20.9	36.2	21.88	21.81	21.85	21.77	21.76	21.81
20130807	5	12	5181	12 S	315412	4031797	0020	14.2	20.7	41.2	21.89	21.79	21.77	21.83	21.78	21.81
20130807	5	13	5496	12 S	317137	4036258	0030	11.6	17.5	51.8	21.77	21.78	21.76	21.76	21.73	21.76
20130807	5	15	5653	12 S	316697	4040140	0046	12.3	26.0	43.7	21.87	21.75	21.74	21.73	21.74	21.77
20130807	5	16	5542	12 S	315444	4044396	0100	11.9	19.9	43.8	21.75	21.77	21.79	21.76	21.73	21.76
20130807	5	17	5298	12 S	315463	4048429	0111	11.9	19.0	29.5	21.78	21.77	21.73	21.77	21.77	21.76
20130907	1032	1	5178	12 S	262871	4054647	2306	9.8	20.7	35.2	21.83	22.02	22.01	21.88	21.84	21.92
20130907	1032	2	5023	12 S	262999	3991043	2333	9.5	24.6	30.4	21.81	21.82	21.84	21.85	21.83	21.83
20130907	1034	3	4095	12 S	260785	4052218	2351	9.1	21.4	38.7	21.91	21.84	21.85	21.87	21.84	21.86
20130907	1034	4	4763	12 S	261473	4048608	2411	8.4	24.5	35.4	22.02	21.92	21.96	21.92	21.95	21.95
20130907	1034	5	4123	12 S	267512	4004038	2445	8.5	25.7	.37.6	22.02	21.94	21.95	21.92	21.91	21.95
20130907	1003	6	3545	12 S	257233	4045361	0115	8.0	25.6	38.5	22.01	21.98	22.00	22.06	22.04	22.02

Parashant Dark Sky Reserve Unihedron Sky Quality Measurements July - November 2013

Sample Number			GPS (UTM - NAD 83)				Time (MT)	Surface Temp	Air Temp	Humidity						
Date YYmmdd	Road #	Sample #	Elevation (ft)	Zone	Easting	Northing	24hr	Celcius	Celcius	Rh %	SQM_1	SQM_2	SQM_3	SQM_4	SQM_5	SQM_{ave}
20130907	1003	7	3297	12 S	260768	4044743	0135	7.6	23.4	33.4	21.94	22.01	21.96	21.94	21.90	21.95
20130907	1007	8	2946	12 S	252409	4047623	0159	7.9	28.6	38.9	21.81	21.81	21.83	21.80	21.81	21.81
20130907	1007	9	2744	12 S	250067	4047350	0222	7.4	22.7	40.5	21.83	21.76	21.76	21.74	21.76	21.77
20130907	1007	10	2683	12 S	245379	4045772	0240	6.0	22.9	40.7	21.89	21.95	21.84	21.89	21.86	21.89
20130907	1007	11	2430	12 S	242118	4042439	0258	6.3	21.4	45.3	21.82	21.79	21.78	21.77	21.68	21.77
20130907	1007	12	2371	12 S	241649	4039306	0309	6.1	22.0	40.8	21.89	21.94	21.94	21.89	21.80	21.89
20131029	1019	1	6039	12 S	262769	3986419	2005	1.8	9.8	25.1	21.95	22.14	22.13	22.00	21.96	22.04
20131029	1019	2	5974	12 S	262999	3991043	2025	2.4	14.6	20.4	22.13	22.17	22.13	22.14	22.12	22.14
20131029	1019	3	5975	12 S	263102	3996023	2040	1.6	11.1	28.7	22.03	21.96	21.97	21.99	21.96	21.98
20131029	1019	4	5972	12 S	266009	3999467	2058	1.8	14.1	24.8	22.14	22.04	22.08	22.04	22.07	22.07
20131029	1019	5	5921	12 S	267512	4004038	2115	3.4	15.5	27.3	22.14	22.06	22.07	22.04	22.03	22.07
20131029	103	6	5841	12 S	266370	4008780	2126	2.8	15.1	28.3	22.15	22.12	22.14	22.15	22.18	22.15
20131029	103	7	5744	12 S	268032	4013529	2132	3.2	13.9	33.0	22.14	22.15	22.11	22.17	22.12	22.14
20131029	103	8	5732	12 S	267562	4018296	2143	1.7	18.8	31.7	22.05	22.14	22.17	22.14	22.14	22.13
20131029	103	9	5779	12 S	265162	4022692	2153	1.8	12.7	30.3	22.11	22.09	22.08	22.09	22.12	22.10
20131029	103	10	5929	12 S	264093	4027607	2204	2.7	12.4	30.4	22.52	22.07	22.03	22.09	22.01	22.14
20131029	103	11	5802	12 S	267480	4030393	2216	3.4	11.4	35.3	22.26	22.15	22.13	22.11	22.12	22.15
20131029	103	12	5937	12 S	269753	4033877	2229	1.3	10.5	35.8	21.89	21.83	21.81	21.79	21.80	21.82
20131029	103	13	5652	12 S	271939	4037802	2242	0.6	9.0	38.5	21.74	21.78	21.76	21.80	21.79	21.77
20131029	103	14	5442	12 S	276840	4038372	2253	1.5	9.1	42.3	21.81	21.83	21.80	21.84	21.82	21.82
20131029	103	15	5278	12 S	280412	4041728	2304	1.0	7.6	46.1	21.79	21.77	21.73	21.76	21.75	21.76
20131029	103	16	5210	12 S	284754	4044126	2316	2.3	8.3	47.5	21.77	21.77	21.79	21.72	21.74	21.76

Parashant Dark Sky Reserve Unihedron Sky Quality Measurements July - November 2013

Sample Number			GPS (UTM - NAD 83)				Time (MT)	Surface Temp	Air Temp	Humidity						
Date YYmmdd	Road #	Sample #	Elevation (ft)	Zone	Easting	Northing	24hr	Celcius	Celcius	Rh %	SQM_1	SQM_2	SQM_3	SQM_4	SQM_5	SQM_{ave}
20131029	5	17	5050	12 S	286224	4047058	2328	2.8	7.2	53.7	21.79	21.79	21.77	21.81	21.82	21.80
20131104	30	1	4938	12 S	316510	4079096	2047	1.9	4.1	45.6	21.78	21.83	21.81	21.85	21.90	21.83
20131104	30	2	4890	12 S	311918	4077241	2100	1.8	6.5	43.4	21.81	21.89	21.87	21.87	21.88	21.86
20131104	30	3	4698	12 S	307060	4077118	2110	2.9	3	43.3	21.92	21.87	21.86	21.86	21.86	21.87
20131104	30	4	4886	12 S	303248	4075282	2121	3	8.1	27.2	21.77	21.76	21.75	21.77	21.76	21.76
20131104	30	5	5097	12 S	298910	4075344	2131	3.4	3.7	41.8	21.67	21.63	21.64	21.68	21.67	21.66
20131104	30	6	5183	12 S	295469	4073220	2140	2.7	4.3	40.2	21.63	21.55	21.54	21.53	21.55	21.56
20131104	30	9	4544	12 S	286426	4064587	2214	3.4	3.4	41.6	21.51	21.57	21.53	21.55	21.56	21.54
20131104	30	10	4944	12 S	282550	4063254	2226	1.8	5.5	32	21.65	21.62	21.61	21.61	21.62	21.62
20131104	5	11	4974	12 S	280305	4063330	2239	2.2	6	34.4	21.59	21.59	21.61	21.60	21.59	21.60
20131104	389	1	4866	12 S	325329	4090779	1905	1	6.3	43.6	21.14	20.91	20.96	20.94	20.95	20.98
20131104	5	2	4880	12 S	320973	4088611	1920	1	9.3	37.1	21.46	21.45	21.41	21.41	21.41	21.43
20131104	5	3	4957	12 S	318891	4084112	1935	2	6.4	53.6	21.62	21.50	21.53	21.50	21.50	21.53
20131104	5	4	4922	12 S	316574	4080051	1948	1.8	8.7	47.3	21.72	21.62	21.63	21.69	21.62	21.66
20131104	5	5	4891	12 S	316376	4075172	2001	1.8	7.4	26.4	21.72	21.70	21.69	21.68	21.74	21.71
20131104	5	6	4898	12 S	315774	4070183	2015	1.5	8.1	43.3	21.74	21.75	21.75	21.78	21.78	21.76
20131103	109	1	4881	12 S	318066	4038008	2029	1.3	5.1	48.5	21.76	21.81	21.82	21.83	21.84	21.81
20131103	109	2	5012	12 S	319934	4041317	2214	2.7	2.4	42.6	21.86	21.87	21.87	21.90	21.90	21.88
20131103	109	3	5064	12 S	325380	4042701	2226	2.7	4.6	39.5	21.77	21.78	21.78	21.75	21.74	21.76
20131103	109	4	5023	12 S	280305	4063330	2239	2.5	6.2	34.7	21.71	21.71	21.73	21.72	21.71	21.72
20131103	109	5	5107	12 S	325329	4090779	1905	1.7	5.8	43.9	21.70	21.78	21.73	21.75	21.74	21.74
20131103	109	6	5046	12 S	330925	4046918	1920	1.9	7.6	39.5	21.68	21.67	21.63	21.63	21.63	21.65

Parashant Dark Sky Reserve Unihedron Sky Quality Measurements July - November 2013

Sample Number			GPS (UTM - NAD 83)				Time (MT)	Surface Temp	Air Temp	Humidity						
Date YYmmdd	Road #	Sample #	Elevation (ft)	Zone	Easting	Northing	24hr	Celcius	Celcius	Rh %	SQM_1	SQM_2	SQM_3	SQM_4	SQM_5	SQM_{ave}
20131103	109	7	4876	12 S	332691	4053066	1935	2.6	5.4	46.5	21.70	21.67	21.55	21.69	21.68	21.66
20131103	109	8	4791	12 S	338010	4061017	1948	1.9	6.9	46.8	21.54	21.49	21.51	21.50	21.51	21.51
20131103	109	9	4960	12 S	342675	4064988	2001	2.4	7.5	45.7	21.04	21.03	20.94	20.98	20.98	20.99
20131101	1004	1	6662	12 S	248863	4074169	2005	1.5	7.7	19	21.70	21.72	21.69	21.70	21.70	21.70
20131101	1004	2	6799	12 S	252543	4076509	2020	2.0	7.5	14.0	21.75	21.72	21.70	21.68	21.71	21.71
20131101	1004	3	6664	12 S	255149	4074427	2035	2.4	7.3	14.0	21.69	21.71	21.74	21.71	21.74	21.72
20131101	1004	4	5409	12 S	257286	4073510	2049	2.7	8.4	14.8	21.82	21.83	21.76	21.76	21.75	21.78
20131101	1004	5	5089	12 S	260512	4070680	2105	3.4	8.6	23.8	21.84	21.88	21.80	21.79	21.80	21.82
20131101	1004	6	5191	12 S	264564	4070818	2120	1.4	8.3	23.7	21.79	21.79	21.79	21.82	21.79	21.80
20131101	1004	7	5006	12 S	268691	4068135	2134	1.6	8.3	24.1	21.92	21.84	21.82	21.80	21.81	21.84
20131101	1004	8	4982	12 S	272140	4069664	2148	1.3	7.2	20.4	21.87	21.83	21.84	21.82	21.83	21.84
20131101	101	9	5021	12 S	269504	4065974	2202	1.5	7.3	26.2	21.78	21.84	21.84	21.84	21.84	21.83
20131101	101	10	5088	12 S	266135	4062615	2216	1.3	7.1	24.1	21.79	21.88	21.85	21.86	21.86	21.85
20131101	101	11	5178	12 S	261490	4062987	2231	1.6	6.9	29.2	21.79	21.81	21.83	21.85	21.87	21.83
20131101	101	12	4484	12 S	257651	4062715	2245	1.6	6.6	24.2	21.73	21.83	21.88	21.88	21.90	21.84
20131101	101	13	4137	12 S	253942	4063477	2300	1.1	6.1	23.5	21.72	21.84	21.83	21.83	21.85	21.81
20131101	101	14	4490	12 S	249644	4063622	2316	2.0	6.0	24.4	21.82	21.82	21.84	21.86	21.86	21.84
20131101	101	15	4215	12 S	245757	4060779	2332	1.0	5.9	18.9	21.73	21.79	21.81	21.81	21.83	21.79
20131101	101	16	4181	12 S	240912	4061261	2349	1.9	5.7	30.4	21.79	21.85	21.81	21.79	21.83	21.81
20131101	101	17	4130	12 S	234173	4056760	2412	1.2	6.0	22.5	21.73	21.79	21.81	21.81	21.83	21.79

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/

November 20, 201 3

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:

The Bureau of Land Management Arizona Strip District cooperates with the National Park Service under a Service First agreement to manage the Grand Canyon Parashant National Monument (GCPNM); a unique and special place consisting of more than one million acres of remote and unspoiled public land. The Monument is home to countless biological, historical and archeological resources. It contains deep canyons, beautiful mountains and sweeping buttes which speak volumes of geologic forces which have been at play since age immemorial.

Visitors to the Monument come seeking scenic four-wheel-drive travel, to hike, for equestrian rides, wildlife and plant studies, bird watching, hunting, to view archeological and historic sites and to study fascinating geologic formations. To this end, establishing a Night Sky Preserve within the Monument would blend well with such recreational users and visitors and further educate an even broader base of visitors, exposing even more of the public to the benefits of Night Sky Preserves and the existence of other Preserves across the country. The Monument would also attract visitors who more commonly seek out Night Sky Preserves such as astronomy groups and eco-tourists who would enjoy and appreciate the pristine, remoteness that is so unique to the GCPNM.

In support of nominating the GCPNM for Dark Night Sky Preserve status, it should be noted that such an action would significantly aid in preserving the Colorado Plateau night skies and prevent encroaching light sources from urban centers.

A Dark Night Sky Preserve's presence within the Monument would also further help conservation efforts for wildlife that inhabit the Monument including 20 species of bats, 49 bird species within the GCPNM which use starlight to navigate, as well as assist the yucca moth which pollinates Joshua trees at night.

Dark Night Sky Preserves also supports BLM's National Conservation Lands missions within Monuments which are designed to "protect objects of scientific and historic interest by public proclamation under the President, under the Antiquities Act of 1906, or by Congress for objects of historic or scientific interest on public lands, and to provide for the management of those features."

The Bureau of Land Management Arizona Strip District offers its' full support for the nomination of the Grand Canyon Parashant National Monument for Dark Night Skies Preserve status. Thank you for considering these crucial conservation concerns during the nomination process.

Sincerely,

Scott R. Florence

Scott R. Florence
District Manager

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Arizona Strip Field Office
345 East Riverside Drive
St. George, Utah 84790
www.az.blm.gov

November 18, 2013

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

To the IDA Board of Directors:

As the Lead Wildlife Biologist for the Arizona Strip District of the Bureau of Land Management I support the Parashant Dark Sky Reserve nomination. The Grand Canyon-Parashant National Monument is known for its remoteness and pristine dark skies. Recognizing the monument as a Dark Sky Reserve would add more protection for this important resource to the protection already in place from its status as a National Monument. Numerous nocturnal species of wildlife call the Parashant home. These species are negatively impacted by light pollution. I feel Dark Sky Reserve recognition would benefit the wildlife resources of the monument from many nocturnal rodents to predators such as bobcats, coyotes, and owls.

I encourage you to give careful consideration to the nomination of the Parashant Dark Sky Reserve. The dark night sky resources of the Grand Canyon-Parashant National Monument are becoming increasingly more rare and worth protecting.

Sincerely,

Jeffrey Young
Lead Wildlife Biologist

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Southern Nevada District
4701 N. Torrey Pines Drive
Las Vegas, NV 89130
http://www.blm.gov/nv/st/en/fo/lvfo.1.html

In Reply Refer To:
Red Rock/Sloan Field Office

November 8, 2013

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:

In 2000 the President of the United States designated Grand Canyon-Parashant National Monument (NM) due to its vast, biologically diverse, impressive landscape encompassing an array of natural and cultural resources. This remote area of open, undeveloped spaces and spectacular scenery is located on the edge of one of the most beautiful places on earth, the Grand Canyon. Full of spender and solitude, Grand Canyon-Parashant remains remote and unspoiled, qualities that are essential to it becoming officially recognized as a Dark Sky Reserve.

As a former staff member who was on detail at the Arizona Strip District Office, I support the nomination of Grand Canyon-Parashant for the IDA International Dark Sky Reserve "Gold Tier" designation. The nomination reflects the Bureau of Land Management's (BLM) commitment to managing this National Monument as one of the jewels of the National Landscape Conservation System.

Thank you for your consideration of this nomination. If you have any questions, please do not hesitate to call me at (702) 515-5351.

Sincerely,

Mark R. Spencer
Field Manager
Red Rock/Sloan Field Office

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

N14

November 11, 2013

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

To the IDA Board of Directors:

I am writing today, as the Superintendent of Bryce Canyon National Park, to support the Parashant Dark Night Sky Reserve Nomination, an effort to formally recognize the pristine dark skies of this portion of Northern Arizona. Grand Canyon-Parashant National Monument is located in one of the most remote regions of the lower 48 United States and offers an exemplary wilderness experience mostly unmatched on other public lands and National Parks across the country. Most of this area remains undeveloped with provisions in the Monument Proclamation and Monument Resource Management Plan emphasizing restrained development, to include no paved roads and limited structures. Parashant National Monument is meant to be conserved for its' natural and cultural resources and undeveloped qualities. We acknowledge the immense value that dark skies bring to cultural traditions, conservation of wildlife, and scientific study.

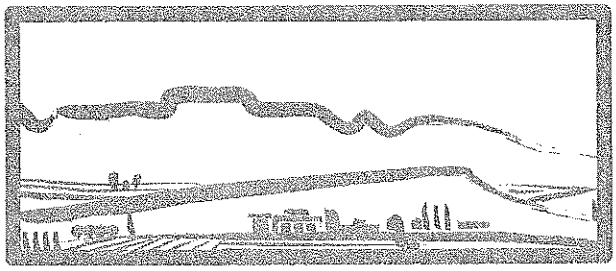
In conclusion, we fully support the efforts of the Grand Canyon-Parashant National Monument as they seek designation of the Parashant Dark Sky Reserve. Such efforts to conserve dark night skies will benefit current Monument visitors, future generations and the nearby communities.

Sincerely,

Jeffrey S. Bradybaugh

Jeff Bradybaugh
Superintendent

TAKE PRIDE® IN AMERICA



CITIZENS FOR DIXIE'S FUTURE

Board of Directors
International Dark-Sky Association
3223 North First Avenue
Tucson, Arizona 85719-2103
October 22, 2013

As the Executive Director of Citizens for Dixie's Future, I am writing this letter to support the Parashant Dark Night Sky Reserve Nomination in order to formally recognize the pristine dark skies of this region. The Parashant National Monument is located in one of the most remote locations of the lower 48 states and offers a wilderness experience that cannot be matched at other regional National Parks, such as Zion NP or Lake Mead NRA.

As a participant in the Resource Management Planning process for the Arizona Strip District Office, I can attest that the intent was to keep this area undeveloped, with provisions in the Parashant National Monument Resource Management Plan emphasizing limited human influence and use, to include no paved roads, limited facilities, and limited structures. Parashant's purpose and mission require that management must preserve its natural resources and untouched qualities. We acknowledge the importance and immense value that dark skies bring to our traditions, conservation of wildlife, and to future generations, qualities which echo the mission of Citizens for Dixie's Future.

In conclusion, we fully support the efforts of the Grand Canyon-Parashant National Monument as they seek nomination of the Parashant Dark Sky Reserve. Any effort that can help conserve our dark night skies will benefit our younger generations, tourism, the regional tribal communities, the broader region and our members.

Sincerely,

LeAnn Skrzynski
Executive Director

August 29, 2013

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

Dear Board Members:

The Dixie/Arizona Strip Interpretive Association (D/ASIA) Board of Trustees met in regular session on Wednesday, August 21, 2013 and authorized this letter of support for the Parashant Dark Night Sky Reserve nomination. As the partnering cooperative association for Grand Canyon Parashant National Monument and the Arizona Strip Field Office of BLM, D/ASIA recognizes the value of the dark night skies in our region. Popular interpretive materials on our shelves deal with astounding views of the heavens in the vast stretches of one of the most remote areas of the lower 48 states.

Our board was particularly pleased to be informed that the International Dark-Sky Association is a private organization with a mission to "Promote one simple idea: light what you need, when you need it. We know some light at night is necessary for safety and recreation. We work with manufacturers, planners, legislators, and citizens to provide energy efficient options that direct the light where you want it to go, not uselessly up into the sky." Our board supports private, locally-based efforts to enhance public lands, rather than top-down mandates generated with little or no understanding of our region.

A Parashant Dark Sky Reserve, established by a private entity, with no force of law or regulation and not incorporated into the plethora of restrictive federal land management schemes, will be another tool to assist in interpreting a key value of the remote lands of northwestern Arizona and southwestern Utah. It will aid in preserving local traditions, conserving wildlife, and providing a place where dark skies can reveal the wonders of a full array of visible sky phenomena.

D/ASIA supports the efforts of Grand Canyon-Parashant National Monument to achieve designation as a Dark-Sky Reserve.

Sincerely,

Lee Fife

Lee Fife, President
Board of Trustees
Dixie/Arizona Strip Interpretive Association

345 East Riverside Drive * St. George, UT 84790 * 435-688-3275 * fax 435-688-3258 * www.azstrip.org

DSU DIXIE STATE UNIVERSITY
ST. GEORGE, UTAH

School of Science and Technology
Physical Science Department

November 21, 2013

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 the representative of Dixie State University (DSU) to support the Parashant Dark Night Sky Reserve Nomination in order to formally recognize the pristine dark skies of this region. I teach astronomy at DSU throughout the year. Due to distance and interest from the students we do our night sky labs either on campus or near campus. Both of which have significant light pollution from the city of St. George, UT. All of my students would love to observe the stars with less light pollution. Although this is not always possible for the course, I would love for them to share their knowledge of the night sky at a location without light pollution. Parashant is an ideal location for this purpose.

Parashant is located in one of the most remote locations of the lower 48 states. Most of this area remains undeveloped with provisions in the Parshant National Monument Resource Management Plan emphasizing limited human influence. This limited human influence provides little to no light pollution. Parashant is meant to be preserved for its natural resources and untouched qualities. They acknowledge the immense value dark skies bring to our traditions, conservation of wildlife, and to future generations.

In conclusion, we fully support the efforts of the Grand Canyon-Parashant National Monument as they seek nomination of the Parashant Dark Sky Reserve. Any effort that can help conserve our dark night skies will benefit our younger generations, our visitors, and the tribal community at large.

Sincerely,

Samuel Tobler, PhD
Assistant Professor, Physics and Astronomy
Dixie State University
(435) 652-7759

Friends of The Cliffs

November 20, 2013

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

To the IDA Board of Directors:

As president of Friends of The Cliffs I am writing in support of the Parashant Dark Night Sky Reserve Nomination. This designation will formally recognize the pristine dark skies of this remote and primarily undeveloped area. The vast majority of the Parashant landscape has no development and what current development is within the proposed Reserve area is minimal. The undeveloped characteristic of the area is recognized as a valuable resource for the Monument .The Parashant National Monument Resource Management Plan limits but does not exclude structure, facility and road development within the Monument. Designation as a Dark Sky Reserve will prescribe Dark Sky requisites to any future development that may be proposed within the proposed Reserve.

Dark Sky Reserves provide unique opportunities for campers, astronomers and eco tourists which are available in extremely limited areas throughout the country. The Dark Sky Reserve designation dove tails well with the desired Wilderness characteristics of the Parashant.

Native wildlife benefits from Dark Sky Reserve Designation. The native creatures have the opportunity to natural habitat that is as close to pre-settlement as possible.

For all of these reasons, Friends of The Cliffs is proud to support Parashant National Monument in your efforts to achieve this coveted designation. As a neighboring Monument, located within the same geographic landscape, we look forward to continuing our partnership of support as both Monuments move forward with planning efforts.

Sincerely,

/s/ Maggie Sacher, President
Friends of The Cliffs

HC67 BOX 2 Marble Canyon, AZ 86036
928-355-2244
www.friendsofthecliffs.org
VCmaggie@Mac.com

Friends of Gold Butte

PO Box 3664 Mesquite, Nevada 89024

November 23, 2013

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

To the Board of Directors:

As the Executive Director of Friends of Gold Butte, representing over 350 members, I would like to formally inform you we fully support the Parashant Dark Sky Reserve initiative. Gold Butte is located immediately west of the Grand Canyon-Parashant National Monument in Nevada covering 348,000 acres of public land identified as a "Crown Jewel" by the Department of Interior.

The Parashant is managed to preserve its remoteness, natural resources and its intact qualities. This area offers a wilderness experience like no other, including the landscape, the soundscape, and the star gazing qualities. We acknowledge the immense value dark skies bring to quality of life, conservation of wildlife and for future generations.

In conclusion, we fully support the efforts of the Grand Canyon-Parashant National Monument as they seek nomination of the Parashant Dark Sky Reserve. Any efforts that facilitate the conservation of our dark night skies will benefit our younger generations, our visitors and our landscape as a whole.

Sincerely,

/S/ Nancy Hall
Executive Director
Friends of Gold Butte

November 12, 2013

FRIENDS *of* NEVADA WILDERNESS

Eathan McIntyre
Physical Science Specialist
Grand Canyon-Parashant National Monument
345 E. Riverside Dr.
St. George, UT 84790

Dear Eathan:

Friends of Nevada Wilderness endorses your efforts to designate Grand Canyon Parashant National Monument as a Dark Sky Reserve by the International Dark Sky Association.

The proposed Reserve sits in a beautiful and remote location between Grand Canyon National Park and Gold Butte. These areas are home to a wealth of spectacular natural and cultural wonders. The spectacular views of the heavens are enjoyed by residents and visitors alike. It is important to both Arizona and Nevada that this increasingly rare resource be protected and recognized.

Please keep us posted and let us know how we can help!

Sincerely,

Shaaron Netherton

Shaaron Netherton
Executive Director
Friends of Nevada Wilderness

Friends of Nevada Wilderness, 1360 Greg Street Suite 111, Sparks, Nevada 89431
PO Box 9754, Reno, Nevada 89507 Phone (775) 324-7667; Fax (775) 324-2677
Visit our Website at www.NevadaWilderness.org

November 22, 2013

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

Dear Sirs.

I am writing this letter as the representative of Friends of Snow Canyon State Park to support the Parashant Dark Night Sky Reserve Nomination in order to formally recognize the pristine dark skies of this region. Friends of Snow Canyon represents a significant cross-section of recreation users (both in-State and out-of-State) - users who recreate not only in the park but within the greater region.

Parashant is located in one of the most remote locations of the lower 48 states and offers an wilderness experience that cannot matched at other National Parks such as Zion NP nor Lake Mead NRA. Most of this area remains undeveloped with provisions in the Parshant National Monument Resource Management Plan emphasizing limited human influence and use, in these isolated areas to include no paved roads, limited facilities, and limited structures. Parshant is meant to be preserved for it's 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, Friends of Snow Canyon fully supports the efforts of the Grand Canyon-Parashant National Monument as they seek nomination of the Parashant Dark Sky Reserve. Any effort that can help conserve our dark night skies will benefit our younger generations, our visitors, and the tribal community at large.

Sincerely,

Kai Reed

Kai Reed, President
Friends of Snow Canyon State Park

GRAND CANYON
WILDLANDS
COUNCIL

November 20, 2013

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

To the IDA Board of Directors:

As the Executive Director of Grand Canyon Wildlands Council, I am writing this letter to support the Parashant Dark Night Sky Reserve Nomination, in order to formally recognize the pristine dark skies of this region. The mission of Grand Canyon Wildlands Council is to protect and restore all native species and natural processes in the Grand Canyon Ecoregion, integrating the best available science. Dark skies play an important role in the life cycles of various invertebrates and other animals. The Parashant Dark Night Sky Reserve will provide for protection of these exceptional dark skies, vital to wildlife.

Grand Canyon Wildlands Council has been an active partner with the Grand Canyon-Parashant National Monument since its designation through presidential proclamation by President Clinton in 2000, when these lands were set aside to retain their primitive character and protect important scientific and historic objects. We recognize the immense value of dark skies as a key characteristic to sustain the full complement of native ecosystems. Given the Monument's remoteness and the quality of its dark skies, we recommend that this nomination go forward.

Grand Canyon Wildlands Council fully supports the efforts of the Grand Canyon-Parashant National Monument in nominating the Parashant Dark Sky Reserve.

Sincerely,

Kelly Burke

Kelly Burke
Executive Director

P.O. Box 1594, Flagstaff AZ 86002 928-556-9306 grandcanyonwildlands.org

Kaibab Band of Paiute Indians

October 15, 2013

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

VIA: IDA Board of Directors

I, Manuel M. Savala, Chairperson of the Kaibab Band of Paiute Indians submit this letter to support the Parashant Dark Night Sky Reserve Nomination in order to formally recognize the pristine dark skies of this region. Parashont 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 Parashant National Monument Resource Management Plan emphasizing limited human influence and use, in these isolated areas to include no paved roads, limited facilities, and limited structures. Parashant is meant to be preserved for its 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, we fully support the efforts of the Grand Canyon-Parashant National Monument as they seek nomination of the Parashant Dark Sky Reserve. Any effort that can help conserve our dark night skies will benefit our younger generations, our visitors, and the tribal community at large. And to have an area where one can look into/onto the dark skies and see stars, planets and wonder.

Regards,

Manuel M. Savala
Chairperson
Kaibab Paiute Tribe

Tribal Affairs

HC 65 Box 2
Fredonia, 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:

A3815 (LAKE-SUPT)

November 12, 2013

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 in support of the Parashant Dark Night Sky Reserve Nomination.

The Grand Canyon Parashant National Monument is located in one of the most remote regions within the lower 48 states. It offers a diversity of natural, cultural, and recreational resources, including pristine dark skies, unmatched in most other locations. While the Grand Canyon Parashant National Monument is located within a one-half days drive of Las Vegas, visitors are able to experience the full intensity and awe inspiring beauty of starry, starry nights. The Grand Canyon Parashant National Monument was established in recognition of the outstanding quality and undeveloped nature of its resources. It is managed to protect these nationally significant monument objects. The region's unimpaired dark night skies being amongst the most spectacular.

As Superintendent of Lake Mead NRA, and as the Director's Call to Action Champion for the Starry, Starry Night initiative, I strongly support this application and well deserved recognition for the Grand Canyon Parashant National Monument as a Dark Night Sky Reserve.

Sincerely,

William K. Dickinson
Superintendent
Lake Mead National Recreation Area

United States Department of the Interior

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

November 26, 2013

VIA ELECTRONIC MAIL: NO HARD COPY TO FOLLOW

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

Dear IDA Board of Directors:

The National Park Service (NPS) Intermountain Region's Natural Resources Program is pleased to support the Parashant International Dark Sky Reserve nomination. Grand Canyon-Parashant National Monument is located in one of the most remote regions in the continental U.S. and offers exemplary wilderness experience mostly unmatched on other public lands and National Parks across the country. The dark skies of Parashant have immense value to cultural traditions, wildlife conservation, and scientific research in the region. In addition, a Parashant International Dark Sky Reserve designation would assist in the conservation of dark night skies in neighboring Lake Mead National Recreation Area and Grand Canyon National Park. This effort represents a very unique and successful partnership between multiple land management agencies and private landowners, and could serve as model for future cooperative projects.

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

In July 2011, the Intermountain Region's Natural Resources Program became a new member of the International Dark Sky Association. We are pleased to join in the worldwide network of committed individuals who care deeply about preserving the beauty and heritage of our night skies. We fully support the efforts of Grand Canyon-Parashant National Monument as it seeks designation of an International Dark Sky Reserve. Such efforts to conserve dark skies will benefit visitors, nearby communities, and future generations. Should you have any questions, please contact Theresa Ely at theresa_ely@nps.gov or 303-969-2653, or Nate Ament at nathan_ament@nps.gov or 435-719-2349.

Sincerely,

for

Patrick Malone
Assistant Regional Director, Natural Resources

Cc:
Eathan McIntyre, Physical Science Specialist, Grand Canyon-Parashant National Monument
Nathan Ament, Park Ranger, Intermountain Region Natural Resources
Theresa Ely, Soundscape and Night Skies Coordinator, Intermountain Region Natural Resources
William Dickinson, Superintendent, Lake Mead National Recreation Area
Judy Rocchio, Air Quality, Natural Sounds, and Night Skies Coordinator, Pacific West Region

THE PAIUTE INDIAN TRIBE OF UTAH

440 North Paiute Drive • Cedar City, Utah 84721 • (435) 586-1112

November 13, 201 3

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 the representative of my tribe to support the Parashant Dark Night Sky Reserve Nomination in order to formally recognize the pristine dark skies of this region. Parashant 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 Parshant National Monument Resource Management Plan emphasizing limited human influence and use, in these isolated areas to include no paved roads, limited facilities, and limited structures. Parshant is meant to be preserved for it's 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, we fully support the efforts of the Grand Canyon-Parashant National Monument as they seek nomination of the Parashant Dark Sky Reserve. Any effort that can help conserve our dark night skies will benefit our younger generations, our visitors, and the tribal community at large.

Sincerely,

Gari Lafferty, Chairwoman
Paiute Indian Tribe of Utah

THE WILDERNESS SOCIETY

November 22, 2013

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

To the IDA Board of Directors:

I am writing to fully support the nomination of the Parashant Dark Night Sky Reserve for the Grand Canyon-Parashant National Monument in northern Arizona on behalf of the Wilderness Society and it's more than 500,000 members and supporters nationwide. The Wilderness Society's mission is to protect Wilderness and inspire Americans to care for our wild places. Since 1935, The Wilderness Society has worked to protect wilderness-quality lands across the United States including the awe-inspiring Grand Canyon-Parashant National Monument.

The Monument is a vast, remote and largely undeveloped landscape that sits on the northern edge of one of America's most iconic natural landmarks, the Grand Canyon. Due to the lack of development and infrastructure, the Monument has some of the more spectacular dark skies in the continental United States. This leads to outstanding opportunities for camping, star-gazing, astronomy and other nighttime outdoor activities that attract visitors to our public lands. It is also an important for candidate or sensitive nocturnal wildlife including the spotted bat, the western mastiff bat, and the Townsend's big eared bat.

Places like the Parashant are at a premium in the United States. Wilderness opportunities and the chance to see dark night skies uninhibited by light pollution will become extinct without the action necessary to preserve these qualities. Creating America's first Dark Night Sky Reserve for the Grand Canyon-Parashant National Monument will help ensure that future generations have the opportunity to experience this area as it was by our ancestors as well as for the future study of science. We appreciate your consideration of this important nomination.

Sincerely,

Phil Hanceford, Assistant Director
The Wilderness Society—BLM Action Center
1660 Wynkoop Street, Suite 850
Denver, CO 80212
303.650.5818, ext. 122
phil_hanceford@tws.org