



# Parashant International Night Sky Province

## 2015 Annual Report



International Dark Sky Association

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Submitted by Eathan McIntyre



Figure 1. Wolfhole Valley area located in Grand Canyon-Parashant National Monument.

### **Status:**

Since the inauguration of the Parashant International Night Sky Province, an IDA recognized Dark Sky Park (DSP), designation in April 2014, Parashant has pursued further efforts to conserve and promote its dark sky resource and incorporate nearby landowners with light management strategies. One of the most visited ranches, located in the central part of Parashant, Bar-10 Ranch, has adopted light shielding for exterior lighting on its three structures and a 10pm light curfew. Also to our benefit, just north of Parashant is a small unincorporated community, Mt Trumbull, AZ, with 12 structures, and 22 permanent residents all of which remain off the power-grid. This Mt Trumbull community abstained from endorsing the Parashant 2014 DSP, however they do practice a light curfew (largely to save their solar power), thereby enhancing our adjacent dark skies. Directly east of Parashant is the Grand Canyon NP ranger station, which has recently modified 6 exterior lights to be dark sky friendly. Parashant DSP continues to partner with Grand Canyon NP by providing SQM data for its ongoing proposed DSP designation efforts, which will hopefully be submitted in 2016.

Annual visitation to the monument remains steady at 18,200 people; however there has been no increase in the use of artificial lights or any added structures as the monument light management plan (LMP) remains unchanged with a strict limit on minimal light levels. Most visitations consist of day visits only, with a marginal amount of overnight camping.

Given the remoteness of Parashant most dark sky interpretive events occur at local events in St George, UT and have been ongoing since the inauguration in April 2014. Interpretive opportunities were recently enhanced with the purchase of 4 large telescopes, providing a wide variety of presentations, youth programs, night-time outings, and solar demonstrations.

### **Signage:**

The newly minted Dark Sky Park designation has incorporated IDA signage at eleven of our portals. Four signs were posted onto our stone pedestal type portals, with the remaining on post mounted signs. Within three months, four of the post-mounted signs were stolen (even when they were installed with theft resistant screws). What is notable is that these signs were stolen rather than shot (shot-up signs are more typical in this area of Arizona). It appears these dark sky signs have become collector items. Replacement signs are currently underway.



Figure 2. Dark Sky Signs located at portals

### **Dark Sky Metrics:**

The remoteness of Parashant requires a new approach to acquiring SQM metrics as sending out volunteers and staff would become impractical to obtain measurements. Using designated SQM stations and solar power, remote backcountry monitoring is made possible along with periodic site visits to off-load the data. This set-up is being developed and consists of a Unihedron sky quality meter focused centrally on the sky apex, paired up with a microprocessor (Raspberry PI) which runs a script to capture light levels every minute. In addition, a separate time-keeping component provides a time stamp with an accuracy of only 50-60+/- seconds a year.





Figure 3. Tassi Springs Dark Sky Station located in the Southwest portion of the Grand Canyon-Parashant National Monument.

To date, four stations have been deployed with promising results in terms of reliability and data collection. The maintenance of these stations from the solar power source to the optics has been minimal. While the optics clarity was an initial concern given the precipitation and dust, the lenses have remained clear and unobscured. (It should be noted, the UV filter lenses have negligible offsets as this portion of the spectrum is not detected by the sensor)



Figure 4 & 5. Left: Microprocessors collecting data. Right: Grand wash Bench Dark Sky Station with the SQM sensor in the tripod towards the rear left

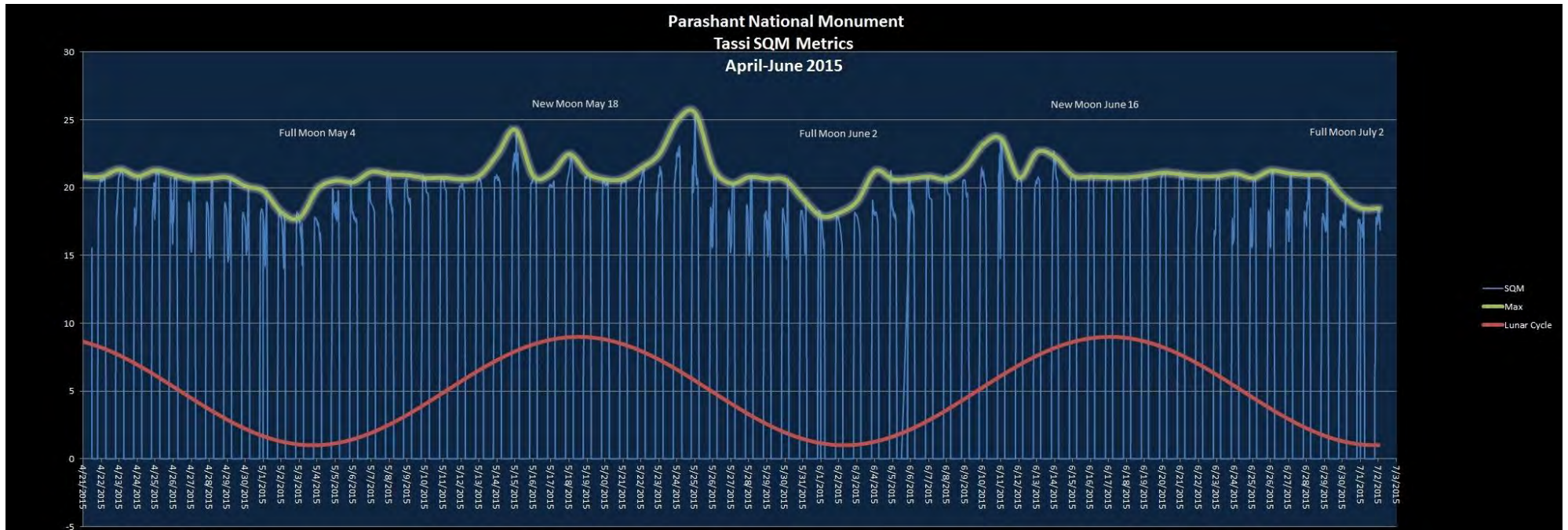


Figure 6. Dark Sky Metrics from Tassi Springs located in Grand Canyon-Parashant National Monument. Date ranges from April to July 2015

Data collected from the Dark Sky stations were imported into an Access database, and plotted in Excel (shown in blue) with a lunar cycle (red) and the max SQM value (green). The above figure illustrates SQM data from Tassi Springs, an area that is impacted by Las Vegas, NV, and Mead View AZ. Encouragingly the data set displays consistent values with the lunar cycle, with minimal data outliers. As expected this data indicates gold tier ( $>21.0$  SQM) light levels were mostly present during the non-lunar portion of the nights. A more detailed analysis revealed light levels increasing and decreasing with passing clouds most likely due to reflection and absorption of sky glow from nearby urban centers. Overall, this data allows for plotting long term trends such tracking artificial light over multiple locations, as well as track the extent of light domes emitted from adjacent sources to the Monument. Further possibilities include merging other relevant parameters with light levels such as wildlife acoustics (bat, rodent, and insect), as well as pairing multiple SQM sensors at different targets for exploratory analysis.

**Interpretation Events:** *(Date, # of participants, and short synopsis)*

- 6/26/2014 – 25 Night Sky program. Ecologist presented dark sky objects, discussed impact of light pollution on ability to view objects.
- 9/2/2014 – 35 Ecologist presented Moon-based program. Discussed exploration of the moon, moon lore, how urban area may not be able to view moon as the retreat participants (primarily over 55 years of age) did as children and how Parashant has worked to reduce our light pollution.
- 10/21/2014 Week long videography to showcase the new Parashant DSP for interpretive use in the visitor center. Video viewed 3-4 times a day.
- 1/16/2015 -88 Brown bag presentation on Dark sky designations, IDA, and conservation
- 4/02/2015 -56 George Wright Society presentation on Dark sky designations, IDA, and conservation efforts
- 5/28/2015 - 11 Partners in the Parks, youth program on light pollution
- 6/13/2015 – 200 Get Outdoors Day, youth program on light pollution
- 6/18/2015 - 15 Night Sky program with Outward Bound Adventures
- 4/22/2015 – 45 Solar Viewing Centennial kick off
- 5/16/2015 – 60 Star Party on Parashant
- 6/17/2015 – 25 Night Sky program with Outward Bound Adventures. Ecologist presented dark sky objects, discussed impact of light pollution on ability to view objects.
- 6/28/2015 – 25 Partners in Parks. Ecologist participated in “fear” activity about experiencing darkness. On second night, presented night sky facts and talked about physiological effects of not experiencing enough darkness.
- 9/11/2015 – 50 Star and solar viewing at BLM headquarters, St George UT
- 9/17/2015 – 25 Concrete to canyons, youth program on light pollution
- 9/26/2015 -15 Public Lands Day, presentation on Dark Sky metrics and sky glow issues
- 9/29/2015 – 25 Concrete to canyons, youth program on light pollution

(Overall: 800 attendees)



## **Conclusion:**

Parashant DSP continues to conserve our dark skies with our light management plan, monitoring, and interpretive events. 2014-2015 was a busy time as Parashant staff and volunteers helped extensively with our neighboring Indian reservation, Kaibab Southern Paiutes Tribe, with their successful DSC designation. We continue to see an increase interest in our Dark Sky programming. Future efforts will include additional astrophotography, expanding back-country SQM monitoring, interpretive events, and facilitating a dark sky designation with nearby Vermillion Cliffs NM.



Figure 7 & 8. Dark Skies along Mt. Dellenbaugh and night time outdoor recreation in Parashant.