Certification of the Cosmic Campground within the **Gila National Forest** as an International Dark Sky Sanctuary

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Imagery Date: 2/22/2013 33°28'45.15" N 108°55'19.45" W elev 5354 ft eye alt 9580 ft

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A Proposal to Certify The Cosmic Campground within the Gila National Forest as an International Dark-Sky Association International Dark Sky Sanctuary

[September 23, 2015]

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Introduction

The Cosmic Campground, located within the Gila National Forest, is endowed with a natural night sky. This will be documented by visual observations, night sky photographs, satellite images, SQM and SQM-L measurements, and a detailed comparison with other astronomical viewing sites.

After astronomical twilight, at the Cosmic Campground on a clear night, the only evidence of the external human society are the passing of an artificial satellite, the occasional headlights on a distant highway, and a barely precipitable glow extending a few degrees above the southwestern horizon from the mines at Morenci some 38 miles away. This extremely faint "light dome" is completely surpassed by the Milky Way when it sets there.

During the course of the preparation of this document the authors were forced to confront the real nature of the natural night sky.

The natural night sky is not a dark sphere punctuated with bright stars but rather the aggregation of a variety of natural light sources. These include Earth's airglow, planets, the Milky Way, Zodical light, stars, clusters of stars, and galaxies. Under an average range of the solar cycle and the seasons natural night sky measurements span the range typically from 21.2 to 21.9 magnitudes per arc-second. This fact is documented by data from the Cosmic Campground, Kitt Peak National Observatory, La Palma Observatory, and Cerro Tololo Inter-American Observatory. A minor Solar burp can and does brighten the natural night sky significantly beyond this average range.

The authors were also presented with the question of "What is being measured when an SQM or SQM-L is pointed straight up in a naturally illuminated night sky compared to what these instruments measure from inside a light pollution dome?". Data are presented which will, hopefully, begin to shed some light on this important question.

The Cosmic Campground is located, far from city lights, along the Arizona – New Mexico state line in a huge tract of Gila and Apache-Sitgreaves National Forest Land. It is more than 25 miles to the nearest National Forest Boundary in any direction from the observing area. It has the Gila Wilderness to the east, a roadless area to the north and the Blue Range Primitive Area in Arizona to the west. To the south the Gila National Forest land extends for 26 miles. These



are natural barriers which prevent the introduction of artificial lighting which could compromise the pristine natural night sky currently present at the Cosmic Campground. The map above presents light pollution data and the geographical setting of the Cosmic Campground.

The Cosmic Campground on the map to the right is immediately surrounded by the green areas of the Gila National Forest. This is a preliminary map indicating the location of the Cosmic Campground and its relative location to nearby communities. The villages of Alma and Glenwood, New Mexico are indicated. There are some ranch houses and barns in the privately owned white areas of the Map, however, no human made structure can be seen from the observing area except for the CTX toilet on site.



The Cosmic Campground located on an all weather road is connected to US Hwy 180. [Image Credit: Google Earth].

Currently, the Cosmic Campground is open 24/7/365. One is not required to stay there to use it. Eventually, the Cosmic Campground will be operated as a group campground using the USFS scheduling system. It will be open to the public on this basis.



The boundaries of the Gila National Forest enclose the Cosmic Campground planning area. The Cosmic Campground planning area consists of the Cosmic Campground and the Dark Sky Campground. The Cosmic Campground consisting of 3.5 acres will comprise the land base for the Sanctuary. The long term intent will be for the Dark Sky Campground to become a public

campground that is managed as a first come first serve "pull off" campground.

The lightscape management plan is simple. The nearest commercial power is is more than one mile away from the Sanctuary. The USFS does not provide power and lighting in a campground of this type and has no intention of doing so in the future. In his letter of 2015 September 3 to the IDA , Gila National Forest Supervisor Adam Mendonca states "No Lighting will be installed at the Cosmic Campground". [page 40 this proposal]

In the future, if any night lighting is installed by the USFS in the Sanctuary for safety or any other reason it will be installed and operated strictly in accordance with IDA guidelines and forest service regulations.



Section 1: Location of the Cosmic Campground

The Cosmic Campground has a 360 degree, unobstructed, view of the sky with no man-made structures visible except for the CTX toilet on site and the Verizon unlighted tower on Glenwood Brushy Mountain some 15 miles away. The southern horizon is unique and impressive since it offers a deep window into the southern skies.



North



West Cosmic East Campground







The night sky at a truly dark natural site is simply not a dark semi-sphere filled with stars having a constant unchanging brightness of 22 magnitudes per square arc second. The natural night sky is animated with a changing panorama of beautiful, wondrous, cosmic light sources.

After sunset, at the Cosmic Campground, on a moonless night, planets, then stars, then the Milky Way, and faint clusters of stars make their appearance. Even in twilight the Milky Way can be seen prominently stretching across the sky.

After astronomical twilight, the horizon, which extends many miles in every direction, is uniformly illuminated. It is one of the remaining places on planet Earth one can see the natural airglow. The horizon is the same to the east where there are no cities for hundreds of miles as it is in the directions of Phoenix, Tucson, El Paso, Albuquerque, and Santa Fe. Faint stars can be seen as they rise and are less than a fraction of degree above the horizon.



The Milky Way rising in June of 2015 over the Gila Wilderness Area as photographed by David Thornburg. The dim outline of the Mogollon Mountains can be seen at the bottom of this image. No human made structure is visible from the Cosmic Campground except for the unlit two station outdoor toilet at the site and an Verizon unlit tower more than 15 miles away.



On clear nights, the only visual evidence of humanity is a very faint glow from the mines at Morenci, Arizona, some 38 miles away, extending a few degrees above the horizon to the southwest. This barely precipitable glow is <u>visually</u> overwhelmed by the Milky Way when it sets there. David Thornburg captured this image of the Milky Way setting over Morenci in October of 2013. It is a very long time exposure so <u>both</u> the Milky Way and the Morenci "glow" are much brighter than would be seen with the naked eye. The point is, the very faint "light dome" is significantly dimmer than the setting Milky Way. Note the presence of faint stars right to the horizon.

In the spring and fall the zodiacal light is noticeably bright, extends to the zenith, and remains prominently bright for hours after sunset.

As ones eyes become completely dark adapted many, many faint clusters are visible and beg for perusal with binoculars. Previously unobserved wonders, including seeing ones shadow on a white car caused by Milky Way light and Orion reflected in the windshield, grab your attention.

The planets Venus and Jupiter are so bright that they seem to test a person's night vision. When a cloud drifts by it is a black hole in the dome of the sky.

On the <u>Bortle scale</u> the Cosmic Campground rates a 1 or a 2 as being in the range of excellent to typical truly dark sky sites. This gives a limiting magnitude in the range of 7.1 to 8 and a night sky brightness of 21.89 to 21.99 magnitudes/arc-second squared.

The Cosmic Campground is in the darkest category on the <u>Clear Sky Chart light</u> <u>pollution map</u>. This is in complete agreement with visual observations made at the site. It shows the Cosmic Campground to be in the 21.93 to 21.99 magnitudes/square arcseconds range.



The location of the Cosmic Campground is marked with a plus sign. It is an island of night sky darkness surrounded by the large cities of Phoenix, Tucson, El Paso, Albuquerque, and Santa Fe.

[Map above from Light Pollution Atlas 2006 used by permission of the author Dr. David Lorenz]



Rich Richins of the Astronomical Society of Las Cruces obtained this image of the Blue Horse Head Nebula at the Cosmic Campground in June of 2015. This faint reflection nebula in Scorpius is a challenging target for accomplished astrophotographers.



In November of 2014, Dan Crowson obtained this image of the Andromeda Area at the Cosmic Campground [12X300s-Cannon T2i-Rokinin 18mm @ F/5.6]



In November of 2014, Dan Crowson obtained this image of the Sagittarius Area at the Cosmic Campground [12X300s-Cannon T2i-Rokinin 18mm @ F/5.6]



In November of 2014, Dan Crowson obtained this image of the Orion Area at the Cosmic Campground [36X300s-Cannon T2i-Rokinin 18mm @ F/5.6]

In a letter to District Ranger Debbie Cress dated November 28, 2014, Dan Crowson stated "After spending the night imaging at the Cosmic Campground, I ended up also setting up my equipment at the <u>All-Arizona Sky</u> <u>Party</u> (near Salome, Arizona) and the <u>Chiricahua Astronomy Complex</u> (near Pearce, Arizona). Of the four places I imaged from, the Cosmic Campground was definitely the darkest. "

In an effort to further characterize the night sky at the Cosmic Campground measurements were conducted with two hand held Sky Quality Meters manufactured by Unihedron in Canada. One was an older model # SQM with a field of view of 80 degrees fwhm and the other, a newer one, model # SQM-L with a field of view of 20 degrees fwhm.

First, the SQM and the SQM-L were placed in a completely dark room. They both gave an error signal which appeared on the displays as the bottom half of zeros. Next, they were exposed to a faint light by pointing them at the top of a shelf illuminated by light coming under a door. The results were SQM [23.81 stdev 0.04] and SQM-L]23.56 stdev 0.05]. The difference is likely due to a slight difference in the illumination they received.



Measurements were taken at positions CC1 through CC17. These locations are shown in a closeup of the Cosmic Campground on the right and on a wider area map to the left. Given the remoteness of the site it is not surprising there is no significant difference between measurements taken over this several square mile area. The measurements were made by Dr. Al Grauer, his wife Patricia Grauer, and an Aldo Leopold high school student Joesph Gruska. [Image Credit for image on right: Google Earth]



The figure above is a summary of the nightly average measurements made at the Cosmic Campground. The complete record can be found in **Section 10**.

Our first SQM observations revealed the effect of solar activity on the night sky. After the fact we learned that there were radio blackouts due to solar activity on the first two nights presented in the figure above.



Even though the Sun's activity is below historic standards it was still very active during our measurement period.

Cosmic	Campground	Dark	Sky	Measurements			
Summary	Table						
		Average C	AVERA	GE STDEV	AVERAGE	STDEV	Solar
Date	Location	Temperature	SC	M SQM	SQM-L	SQM-L	Conditions
2014October27-28	Average	16.78			21.34	0.04	[1]
2014October28-29	Average	13.11			21.31	0.04	[2]
2014November19-20	Average	11.14	21.	54 0.03	21.45	0.05	[3]
2014November20-21	Average	8.13	21.	57 0.02	21.55	0.02	[4]
2014December19-20	Average	0.78	21.	57 0.03	21.45	0.03	[5]
2015January24-25	Average	4.00	21.	68 0.04	21.68	0.04	[6]
2015February17-18	Average	3.90	21.	59 0.02	21.44	0.10	[7]
2015 March 10-11	Average	12.20	21.	42 0.03	21.38	0.07	[8]
2015 March 15-16	Average	7.25	21.	47 0.02	21.37	0.07	[9]
2015 April 21-22	Average	7.44	21.	63 0.06	21.63	0.06	[10]
2015 June 13-14	Average	21.86	21.	73 0.03	21.74	0.03	[11]
	=	=		= =	=	=	=
Grand Averages	14Oct-15June	e	21.	58 0.01	21.52	0.13	

The measurements, taken, above were during a rather active period on the Sun as can be seen in the NASA figure on the previous page. Even so, they meet the IDA guidelines for an International Dark Sky Sanctuary.

The solar activity's effect on the upper atmosphere is complicated since x-rays arrive 8.3 min after the outburst while particles from the Sun may take several days to travel to Earth.

X-ray Solar Flares 6-hr max: C4 2217 UT Oct28 24-hr: M6 0332 UT Oct28 (1)

X-ray Solar Flares 6-hr max: M2 2122 UT Oct29 24-hr: M2 2122 UT Oct29 (2)

Four solar flares occurred within 5 days from sunspot AR 12192, which is both the largest sunspot of solar cycle 24 and the largest since 1990. On October 19 there was a major X1.1-class solar flare. October 22 an M8.7-class flare was followed the same day by an X1.6 event. The October 24 X3.1class solar storm was strong enough to trigger a radio blackout. Larger than the planet Jupiter, the AR 12192 sunspot was visible during a partial solar eclipse seen in North America

- X-ray Solar Flares 6-hr max: C2 1956 UT Nov20 24-hr: C7 0641 UT Nov20 (3)
- X-ray Solar Flares 6-hr max: C1 1818 UT Nov21 24-hr: C1 0445 UT Nov21 (4)
- (5) X-ray Solar Flares 6-hr max: X2 0027 UT Dec20 24-hr: X2 0027 UT Dec 20
- (6)
- X-ray Solar Flares
 6-hr max: B9 1818 UT Jan25
 24-hr: C1 1213 UT Jan25

 X-ray Solar Flares
 6-hr max: C3 2208 UT Feb18
 24-hr: C3 2208 UT Feb18
 (7)
- X-ray Solar Flares 6-hr max: M1 1851 UT Mar11 24-hr: X2 1622 UT Mar11 (8)
- X-ray Solar Flares 6-hr max: C8 2049 UT Mar16 24-hr: M1 1058 UT Mar16 (9)

The magnetic eruption occurred yesterday (Wednesday) at 12:22 p.m. ET (16:22 UT), lighting up a huge area in the lower solar corona (the sun's magnetically dominated atmosphere). Shortly after the huge eruption, that measured X2 on the scale of flare energy, Spaceweather.com reports a radio blackout was detected over large swathes of the globe, including much of the Americas.

(10) Already energized by the action of a high-speed solar wind stream, Earth's magnetic field could receive an additional jolt on April 22nd from an incoming CME.

(11) During the past month of low solar activity, ionizing radiation in the stratosphere has increased by 10%.

The SQM and SQM-L results from the Cosmic Campground in October of 2014, were, initially, rather, surprising since they are about 0.4 to 0.5 magnitudes per square arc second brighter than are indicated by visual observations and light pollution maps.

Section 3: Validity of SQM and SQM-L Measurements

Questions arise; "How dark is a truly natural site?" and "What is being measured by an SQM in a completely naturally illuminated night sky?"

When one points a SQM or an SQM-L straight up it receives radiation from a number of sources. One of these is emitted by the Earth's atmosphere predominantly in the form of the green line of oxygen at 5577 Angstroms.

The International Space Station provides a unique view of the airglow and aura.



NASA's Image "Fire in the Sky and on the Ground" from the International Space Station.

When the Sun is active there is action.

September 7, 2015, Space Station astronaut Scott Kelly tweeted "Must be a big solar storm going on there's some crazy green stuff going on outside " and sent this picture.

This solar activity did not make the news.

The structure in the airglow in this image may be the reason that SQM readings of a natural night sky are observed to have rapid small variations.



Section 3: Validity of SQM and SQM-L Measurements

The hand held Sky Quality Meters, SQM-L and SQM, by the Unihedron Corporation can be valuable tools for determining the degree of light pollution at a particular location. The SQM and SQM-L can, also, be useful in measuring variations at a particular site which occur due to seasonal changes relating to the position of the Milky Way and the zodiacal plane, and changes in solar activity.

The hand held Sky Quality Meters, SQM-L and SQM, by the Unihedron Corporation are extremely misleading when it comes to comparing a light polluted sky to a pristine natural one.

This situation arises from several physical phenomena:



<u>A. Atmospheric scattering of light is not the same for all colors.</u>

From space, with suitable eye protection, the Sun would appear white because it contains all of the colors. The Solar spectrum above is from the National Solar Observatory. The Sun lights up our sky in the daytime and yet the sky appears blue. Blue light is scattered more than red light.

Therefore, the artificial light dome above a city at night will appear bluer than the sum total of the sources that illuminate it from the ground.

Section 3: Validity of SQM and SQM-L Measurements

<u>B. There are many light pollution lines with wavelengths less than 5577A.</u>

Neugent and Massey [PASP, 122, 896, pp 1246-1253] obtained new absolute spectrophotometry of the Kitt Peak night sky at the zenith, in the direction of several cities, and in a direction away from all man made lighting. They compared the new data taken in 2009 and 2010 with that taken in 1988, and 1999. The 2009–2010 data were taken on the Kitt Peak 2.1 m telescope using the GoldCam CCD spectrometer during prime dark time. All observations were taken at least 15° away from the ecliptic and the Galactic plane, in order to avoid contributions from zodiacal light and the Milky Way. Measurements were made either at zenith, or zenith distances of 60° in the direction of Tucson (azimuth = 64 °), Phoenix (azimuth = 340 °),

Nogales ($azimuth = 142^{\circ}$), or "Nowhere" ($azimuth = 180^{\circ}$)

The figure to the right is Figure 3 from the Neugent and Massey paper and is the spectra 30 degrees above the horizon in the direction of Tucson and in the direction straight up. At a distance of 56 miles from the center of Tucson these observations sample a beam through the light dome passing more than 30 miles above the city center. There is significant light with wavelengths shorter than the strongest atmospheric line at 5577 Angstroms. This can be verified by comparing the "Tucson spectrum" with the zenith spectrum.

The spectra were used to calculate the sky brightness measurements in terms of broad and narrow band photometric filters. These show, qualitatively, the light above Tucson is bluer than the direction of nowhere. They cannot be used qualitatively since to correctly measure the light pollution one would need to do so at the center of Tucson and at the center of Nowhere.



C. Spectral Response of the SQM and SQM-L

The spectral response of the SQM falls dramatically for light bluer than the strongest natural atmospheric night sky line at 5577 Angstroms.



Fig. 9.— Measured SQM responsivity (squares) and calculated SQM responsivity (line).

Thus, the SQM, substantially, under-represents the blue light in areas effected by artificial light domes relative to the natural night sky lines in a pristine location.

Fortunately, other studies can be brought to bear to understand the variations in the night sky being measured at the Cosmic Campground.

Chile AURA Observatory Site

On August 9, 2015 the Chile AURA Observatory became the world's first International Dark Sky Sanctuary. This is a fitting distinction for one of the premier astronomical sites on Earth.

For comparison with SQM and SQM-L readings taken at the Cosmic Campground Figure 14 and Table 1 have been extracted from AURA application.



"Figure 14: Comparison of Sky Quality Meters in January 2010 as the galactic anticenter passes through their beams . SQM (red) has a field of view (FOV) of ~80 degrees, so the effect of the Milky Way passing through its beam is diluted (see text). The SQM-L (blue) has proved more sensitive, with its FOV ~20 degrees, as the Milky Way passage is much more pronounced. Based on these readings, we estimate that SQM-L readings pointed near the Milky Way need a roughly 0.4 mag correction to correspond to "dark sky" measurements. About 9 hours after sunset, the brightening effect of dawn starts to appear in the field of view of both detectors. "

Figure 14 from the AURA IDA application clearly shows a 0.5 magnitude change in a matter of hours at a premier astronomical site.

Chile AURA Observatory Site [Continued]

Table 1 and Caption from AURA IDA Application

Chile	AURA	Observatory	Site
April	and	May	2015
Location	South	West	AVGSQM-L
1	30.089750	70.836972	21.39
2	30.194056	70.818917	21.45
3	30.195806	70.779889	21.43
4	30.179583	70.794406	21.41
5	30.169167	70.806389	21.45
6	30.228611	70.772556	21.37
7	30.250167	70.739750	21.37
8	30.238167	70.733806	21.36
9	30.182472	70.840278	21.40
10	30.140260	70.854400	21.42
11	30.116111	70.860972	21.39
12	30.073028	70.816500	21.40
		Average	21.40
		stdev	0.03

"Table 1: SQM-L Measurements made in April and May 2015 along the road to the summits of Cerro Tololo and Cerro Pachon. The SQM-L measurements are generally an average of between 3 and 7 measurements at slightly different points in the sky. For most these measurements, the Milky Way was directly overhead, so a correction of approx. 0.4 is appropriate, as shown in Figure 14. Thus the AVERAGE corrected SQM2L value for dark sky at the site without Milky Way contamination is approximately 21.8 magnitudes, which corresponds to a V magnitude of about 21.9 at solar minimum."

The AURA IDA application reports at Cerro Pachon at 6 C readings of 21.34, 21.34, and 21.41 magnitudes per square arc-second were recorded.

The AURA IDA application states "Based on these readings, we estimate that SQM-L readings pointed near the Milky Way need a roughly 0.4 mag correction to correspond to "dark sky" measurements. "

During the same time period an SQM-L at the Cosmic Campground recorded 21.63 *magnitudes per square arc-second* [stddev 0.06] with no adjustments.

Kitt Peak National Observatory

In 2009 and 2010, Neugent and Massey [PASP, 122, 896, pp 1246-1253] obtained new absolute spectrophotometry of the Kitt Peak night sky using the 2.1m GoldCam CCD spectrograph on moonless photometric nights. The results show no sky brightness changes at zenith for the period 1988 to 2010 which confirms Kitt Peak at zenith is still a naturally dark site. Their results shown below were extracted from Table 1 of their paper:

Section 2: The Night Sky at the Cosmic Campground

Kitt Peak Night Sky Brightness

	0	5	0		
Day Azimuth	V	В	4250	4450	5150
24.4 Zenith	21.96	22.85	23.00	22.78	22.44
17.2 Zenith	21.57	22.54	22.69	22.58	22.22
17.3 Zenith	21.51	22.52	22.69	22.53	22.16
14.3 Zenith	21.91	22.75	22.94	22.62	22.27
15.3 Zenith	21.98	22.77	22.95	22.66	22.31
13.2 Zenith	22.32	23.00	23.16	22.98	22.69
13.3 Zenith	22.32	22.85	22.99	22.85	22.64
14.3 Zenith	22.36	22.96	23.11	22.95	22.73
average	21.99	22.78	22.94	22.74	22.43
stdev	0.33	0.18	0.17	0.17	0.23
	Day Azimuth 24.4 Zenith 17.2 Zenith 17.3 Zenith 14.3 Zenith 13.2 Zenith 13.2 Zenith 13.3 Zenith 14.3 Zenith average stdev	Day Azimuth V 24.4 Zenith 21.96 17.2 Zenith 21.57 17.3 Zenith 21.51 14.3 Zenith 21.91 15.3 Zenith 21.93 13.2 Zenith 22.32 13.3 Zenith 22.32 14.3 Zenith 22.32 14.3 Zenith 22.32 14.3 Zenith 22.32 average 21.99 33	Day AzimuthVB24.4 Zenith21.9622.8517.2 Zenith21.5722.5417.3 Zenith21.5122.5214.3 Zenith21.9122.7515.3 Zenith21.9822.7713.2 Zenith22.3223.0013.3 Zenith22.3222.8514.3 Zenith22.3622.96average21.9922.78stdev0.330.18	Day AzimuthVB425024.4 Zenith21.9622.8523.0017.2 Zenith21.5722.5422.6917.3 Zenith21.5122.5222.6914.3 Zenith21.9122.7522.9415.3 Zenith21.9822.7722.9513.2 Zenith22.3223.0023.1613.3 Zenith22.3222.8522.9914.3 Zenith22.3622.9623.11average21.9922.7822.94stdev0.330.180.17	Day AzimuthVB4250445024.4 Zenith21.9622.8523.0022.7817.2 Zenith21.5722.5422.6922.5317.3 Zenith21.5122.5222.6922.5314.3 Zenith21.9122.7522.9422.6215.3 Zenith21.9823.0023.1622.9813.3 Zenith22.3223.0023.1622.9814.3 Zenith22.3222.8522.9922.8514.3 Zenith22.3622.9623.1122.95average21.9922.7822.9422.74stdev0.330.180.170.17

These results taken at Solar Minimum show an average V magnitude of 21.99 magnitudes per arc-second squared verifying Kitt Peak remains a naturally dark site at zenith.

These results, also, show 0.79 magnitudes difference between October of 2009 and June of 2010. This is a seasonal change. There is no way this difference was caused by changes in man made lighting.

La Palma Observatory

During the period from 1987 to 1996 the moonless night sky on La Palma was measured using 427 scientific grade CCD images on 63 different nights.

La Palma is a mountain observatory on a relatively small island and there are light pollution domes visible on the horizon from towns between 10 and 15 km from the observatory. Even so, it is designated as an IAU dark site with less than 0.1% of the night sky light being a result of artificial lighting. The measured La Palma night sky brightness near the zenith, at high galactic latitude, high ecliptic



latitude, and at solar minimum has a V = 21.8 magnitudes per arc-second squared.

La Palma results are similar to the night sky at other professional dark sky observatories: McDonald, Sacramento Peak, Kitt Peak, Mauna Kea, and Cerro Tololo. [Image credit: La Palma Observatory}

Of special interest to observers of the natural night sky is the finding at La Palma the sky is brighter by 0.4 magnitudes at solar maximum, is 0.4 magnitudes brighter near the plane of the solar system, and is several tenths of a magnitude brighter due to suspended dust in our atmosphere scattering star light into the darker parts of the sky.

Thus, at La Palma, an IAU dark sky site, the natural sky brightness has been measured to vary between a V of 21.0 and 21.9 magnitudes per square arc second.

Mt. Lemmon Observatory

Thanks to the IDA and the efforts of others, the skies on Mt. Lemmon are still dark enough to find faint Earth approaching objects and do other significant astronomy projects.



Light pollution map for Mt. Lemmon Observatory suggests that the night sky is approximately 21.0 magnitudes per arc-second squared. It is not clear this map properly accounts for elevation above sea level.

[Map above from Light Pollution Atlas 2006 used by by permission of the author Dr. David Lorenz]

The table below is a summary of Mt. Lemmon SQM and SQM-L measurements:

Summary Mt. Lemmon					
	Avg SQM	STDEV	Avg-SQM-L	STDEV	Solar Conditions
Date	fwhm80d	SQM	fwhm20d	SQM-L	
0000 May 4 0	04.44	0.00			(4)
2008 May 1-2	21.41	0.03	na	na	(1)
2008 May 2-3	21.35	0.13	na	na	(2)
2008 May 3-4	21.45	na	na	na	(3)
2008 May 4-5	21.29	0.04	na	na	(4)
2014 November 17-18	20.98	0.06	21.00	0.04	(5)
2015 March 22-23	21.15	0.04	21.23	0.06	(6)
2015 April 9-10	21.16	0.02	21.23	0.04	(7)
2015 May10-11	21.22	0.04	21.34	0.00	(8)
2015 June 19-20	21.18	0.04	21.29	0.03	(9)
2015 June 20-21	21.13	0.01	21.25	0.01	(10)
Averages 2014-2015	21.14	0.04	21.22	0.03	

(1) No sunspots (2)No sunspots (3) 12 sunspots (4) 12 sunspots 5) 95 sunspots Sunspot AR2192 active (6) 159 sunspots For the 5th day (7)159 sunspots (8)134 sunspots (9) (10) Sun relatively quiet

Section 4: Comparison with Other Astronomical Sites

The average sky brightness on Mt. Lemmon in 2008 was 21.38 magnitudes per arc second squared. In 2014-2015 it is 21.13 magnitudes per arc second squared. This 0.3 magnitudes likely reflects the data were taken at solar minimum and solar maximum respectively. All of the data were taken by Dr. Al Grauer.

The effect of solar activity and seasonal changes in the sky brightness on Mount Lemmon show the night sky was about ¼ of a magnitude per arc-second squared darker in June of 2015 than it was in November of 2014. It is extremely unlikely this difference was caused by changes in artificial lighting.

The visual appearance of the night sky on Mt. Lemmon is heavily impacted by artificial lighting. There is really no direction undamaged by light pollution. To the south and west the light dome of Tucson extends to near the zenith. The light dome of Phoenix, extends, perhaps, 15 degrees above the horizon. You can see only the very brightest stars when they are near the horizon. You can see the Milky Way overhead but never near the horizon.

Oracle State Park



This map indicates that the night sky brightness at Oracle State Park should be about 21.51 magnitudes per square arc second.

[Map above from Light Pollution Atlas 2006 used by permission of the author Dr. David Lorenz]

Section 4: Comparison with Other Astronomical Sites

The following data was extracted from the IDA certification proposal for Oracle State Park.

Oracle State Park					
	Avg SQM	STDEV	Avg-SQM-L	STDEV	Solar Conditions
Date	fwhm80d	SQM	fwhm20d	SQM-L	
2014 April 28	na	na	21.28	0.06	(1)
2014 APRIL 29	na	na	21.37	0.03	(2)
2014 May 02	na	na	21.39	0.02	(3)
2014 May 03	na	na	21.42	na	(4)
2014 May 21	na	na	21.41	0.03	(5)
2014 May 27	na	na	21.33	0.03	(6)
2014 June 21	na	na	21.45	0.02	(7)
2014 June 24	na	na	21.37	0.01	(8)

X-rays take 8.3 minutes to reach Earth. Particles may take several days.

(1) 84 sunspots Solar activity remains low. Only a few sunspots are facing Earth, and none has the kind of complex magnetic field that harbors energy for strong explosions. (2) 79 sunspots

(3) 83 sunspots NOAA forecasters have boosted the odds of an <u>M-class</u> flare today to 35%.

(4) 114 sunspots Two days ago, sunspot AR2051 didn't exist. Now it is three times wider than Earth and still growing.

(5) 126 sunspots High-latitude auroras are possible on May 22nd when Earth crosses through a fold in the heliospheric current sheet.

(6) 110 sunspots Solar activity is low.

(7) 75 sunspots NOAA forecasters have finished analyzing the CME described below in the news item "Corkscrew Eruption." The cloud is expected to sideswipe Earth's magnetic field on June 22nd with a 35% chance of minor geomagnetic storms in response to the impact.

(8)Arriving about a day later than expected, a CME hit Earth's magnetic field on June 23rd at 2300 UT. The impact did not spark a geomagnetic storm. A second CME following close behind could, however, push the geomagnetic field over the threshold into storm conditions. A glancing blow is expected during the early hours of June 24th.

It is interesting to note that these SQM-L measurements were all taken when both the ecliptic and the Milky Way were far from the zenith at a time solar activity was very low.



According to <u>Tourism in New Mexico</u> [2011 Analysis] visitors to the state of New Mexico spent \$5.5 billion creating more than 85,000 jobs which generated \$1.2 billion in taxes.

The same study shows the rural counties of Catron, Grant, Hidalgo, Luna, Sierra, and Socorro in Southwest New Mexico were in the lowest category of visitor spending.

When tourists bring money from the outside economic world and buy gas, eat in restaurants, stay in motels, and purchase items from local businesses jobs are created in the local community.

In 2011, in Catron County, home of the Cosmic Campground, 124 people were employed in tourism. This amounted to 22% of its labor income. The Cosmic Campground will improve on these figures.

What will bring tourists to Southwest New Mexico? One answer is naturally dark night skies.

According to "The First World Atlas of the Artificial Night Sky Brightness," a report on global light pollution published in volume 328, issue 3 (2001) of the Monthly Notices of the Royal Astronomical Society, two-thirds of the U.S. population and more than one-half of the European population have already lost the ability to see the Milky Way with the naked eye. Moreover, 63% of the world population and 99% of the population of the European Union and the United States (excluding Alaska and Hawaii) live in areas where the night sky is brighter than the threshold for light-polluted status set by the International Astronomical Union—that is, the artificial sky brightness is greater than 10% of the natural sky brightness above 45° of elevation.



This map from the Light Pollution Atlas 2006 shows the Cosmic Campground to be one of the few remaining natural night sky locations in the USA.

[Map above from Light Pollution Atlas 2006 used by permission of the author Dr. David Lorenz]

Union County New Mexico the home of Clayton Lake State Park is similar to Catron County the home of the Cosmic Campground. Both are small rural New Mexico counties.

According to the 2010 US Census, Union County had a population of 4,297 and Catron County had a population of 3,536. This gives them population rank in New Mexico of 30 and 31 respectively. They are both away from the heaviest traveled tourist paths. They are both in the bottom tier of New Mexico counties when it comes to visitor



Mexico counties when it comes to visitor spending

Interestingly, in 2010-2011 visitor spending in Union County increased by +15.6% while in Catron County it increased by only +1.9%.

What could possibly contribute this increase in Union County's visitor spending?

The following is an excerpt from a press release:

29 June 2010 - Tucson, AZ: The International Dark-Sky Association (IDA) Board of Directors and Dark Sky Places Committee announced the designation of two International Dark Sky Parks at its 22nd Annual General Meeting and Conference in Tucson, Arizona, USA. Clayton Lake State Park in northeast New Mexico received Gold Tier recognition of their efforts to preserve and protect the nighttime environment while Goldendale Observatory State Park in southern Washington received provisional status for a Silver Tier designation.

Clayton Lake State Park, located in Union County, New Mexico hosts approximately 65,000 visitors per year, many of whom attend star parties at the park's observatory facility. Park staff and volunteers worked closely with the town of Clayton and the New Mexico State Parks System to ensure quality lighting guidelines both within the park and in the surrounding community. In 2010 the park completed lighting retrofits to conform 100% with the shielding and spectral considerations for low-light areas. The Reach for the Stars program, initiated in 2004, promotes the night sky as a valuable educational and economic resource for New Mexico.

David J. Simon, director of New Mexico State Parks, states, "We are grateful for this recognition and hope that Clayton Lake State Park is merely the first of many New Mexico State Parks to achieve this distinction."

The Dark Sky Places Program was started by IDA in 2001 to encourage communities around the world to preserve and protect dark sites through responsible lighting polices and public education. As of late 2014, IDA has certified 42 Dark Sky Places, extending protection of dark skies to 43,100 square kilometers (16,640 square miles) in nine countries on four continents.

Being Dark Skies Friendly is good for business. According to <u>Tourism in New</u> <u>Mexico [2011 Analysis]</u>, an increase in Catron County' visitor spending by 15.6% could amount to 1.8 million dollars per year. The same study indicates that a 15.6% increase in tourism employment could result in approximately 20 new jobs in Catron County. Tourism labor income could increase by \$280,000 in this economically depressed rural county.

The Cosmic Campground's website <u>cosmiccampground.org</u> has attracted more than 2,000 visitors despite not being widely advertised and the Cosmic Campground is still in a primitive under-construction phase. Amazingly enough, 25% of the visitors to the Cosmic Campground website are from outside the USA.

An important page on the Cosmic Campground website lists <u>local business</u> <u>information</u>. The concern for the local economy has been and will continue to be an integral part of the planning of this facility.

Currently, the local economy has been adversely effected since a primary area attraction, <u>The Catwalk</u>, has been closed for several years due to flood damage.

The Cosmic Campground will help offset this loss.

Section 6: The Cosmic Campground's Education and Outreach Programs

The Cosmic Campground is an opportunity for astronomers to use the naturally dark skies of the Gila National forest for research, education and observations. Even before it has been completed the Cosmic Campground has been used by school groups, the <u>Silver City Astronomical Society</u>, the <u>Western Institute for Lifelong learning in Silver City</u>, NM, and members of the <u>Astronomical Society</u> of Las Cruces. Students from kindergarten to high school have visited the site. As additional construction phases are completed, many other Astronomy Groups will use these facilities.

Of long term importance to rural communities is the education of their children. The Cosmic Campground continues to introduce rural students to the wonders of modern science and technology. Currently, plans are under way to bring the <u>Cliff Schools</u> [Teacher Katie Skaggs] and <u>Reserve Independent Schools</u> [Teacher Roger Skaggs] to the Cosmic Campground during the 2015-2016 school year.





A third group from the Western Institute for Life Long Learning in Silver City [WILL] plans a night class 10 October 2015. [Star Party photographs above by David Thornburg, local resident]



[photograph Patricia Grauer]

"The Cosmic Campground was designed to be used just this way. This is a group of people interested in astronomy enjoying one of the most perfect places on the Planet Earth to experience a star party." [Annie Grauer]

Section 7: Friends of The Cosmic Campground



The Friends of the Cosmic Campground is an informal group of individuals with the common purpose of advancing progress on the Cosmic Campground.

The current list of member can be found on the website. Access the list by clicking on:

Friends of Cosmic Campground

Patricia A. Grauer, for the Friends of the Cosmic Campground, applied to be a part of the Adopt-A Highway (AHA) program. The signs were installed in November of 2014.

From the beginning, one of the primary goals of the Cosmic Campground has been to help support local businesses in an economically depressed rural community.

To this end on our website, <u>cosmiccampground.org</u>, we include all the local businesses that have requested to be on this website.

Click on: <u>Night Sky Country</u>. <u>When a business installs night sky friendly</u> <u>lighting, ie full cut off fixtures, they are listed to be a "Natural Night Sky</u> <u>Friendly Business" on the website. They may then include this designation in</u> <u>their advertising.</u>

A recent list includes:

Fuel:	Alma Store, Glenwood Trading Post
Food and Beverages:	The Adobe Cafe & Bakery, Alma Grill, Mario's Pizza, Golden Girls Cafe, The Purple Onion, Uncle Bill's Bar
Lodging:	Double TT Homestead, Los Olmos Lodge, Hidden Springs Inn, Whitewater Motel, The Lariat Motel, D and D's Organic Haven B&B, The Guest House, Silver Creek Inn
Specialty:	Udder Delight-
Recreation:	Natural goat milk soaps, lotions, & creams's U-Trail Outfitters, Horse Back Vacations

An important milestone is the decision by the owner, Jennifer Sweson, of the Hidden Springs Inn and the Adobe Cafe & Bakery to enthusiastically become the first night sky friendly business in Reserve, New Mexico. She plans to make her outdoor lighting conform to IDA standards and advertise as a "Night Sky Friendly Business".



Section 9: Natural Night Sky Country



The Gila National Forest is partnering with Dr. Albert D. Grauer, Patricia A. Grauer, Friends of the Cosmic Campground, and with Catron County and the communities of Alma, Glenwood, Reserve, Datil, Pietown, and Pleasanton to support the Cosmic Campground. In turn <u>cosmiccampground.org</u> supports local businesses to encourage ecotourism.

This diverse group is working together to ensure current natural night sky conditions continue to prevail in the entire area. We are utilizing the <u>Navopache Electric Cooperative</u>'s program of replacing 175 watt with 100 watt security lights. By replacing inappropriate fixtures we are preserving the natural night sky. Further information about appropriate lighting is available by clicking on International Dark-Sky Association.

We are using personal contact, <u>websites</u>, and <u>podcasting</u> to accomplish these goals.

Conclusions

Our evidence proves the Cosmic Campground is equal to the best professional observatory and national park sites for astronomical observing on planet Earth. It is one of the most accessible natural night sky viewing areas in the USA.

Seasonal Variations in a naturally illuminated night sky cannot be determined with certainty without access to a data base which extends over many years. Some things are apparent with the data on hand. The AURA Chile IDA application attributes changes of 0.4 magnitude per square arc-second to the Milky Way and an additional factor to the solar cycle. This is appropriate based on our experience and from data published in the literature.

The darkest measurements to date at the Cosmic Campground were in the first half of the night in June of 2015. Both the ecliptic and the Milky Way were far from the zenith. This effect can be clearly seen in the Neugent and Massey [PASP, 122, 896, pp 1246-1253] paper. It is the reason the Oracle State Park SQM readings were as faint as recorded. We suspect that SQM readings taken at other natural dark sky sites in June will be at their dimmest annual levels. It interesting to note at Kitt Peak and the Cosmic Campground night skies were brightest in October. This could be due to the position of the ecliptic and the Milky Way.

Changes in solar activity have an effect on night sky brightness.

La Palma Observatory measured night sky variations due to solar activity averaging 0.4 magnitudes per square arc-second over the course of a solar cycle. In the extreme, it was possible to read a newspaper in Boston at night in 1859 by the atmospheric excitation from the Carrington Event.

Continuing Sky Brightness Measurements at the Cosmic Campground

The Friends of the Cosmic Campground will continue the monitoring program with an SQM and the SQM-L.

A special use permit will be obtained from the Gila National Forest to place an automatic weather station and sky brightness measurement station at the Cosmic Campground.

The results will be made available to all interested parties.

All of the data on the following pages were obtained with this strictly adhered to protocol:

1) Data were recorded only when the sky was visibly clear and the

Cosmic Campground Clear Sky Chart

listed *Cloud Cover* as either Clear or 10% covered

and *Transparency* as either Above average or Transparent.

- 2) The SQM and/or the SQM-L was at ambient temperature before the first reading was taken. This situation was assured by placing the instrument in the free air for at least 10 minutes before it was used.
- 3) The first reading in each set was discarded.
- 4) The next three readings were averaged and the result along with the ambient temperature were recorded.

Section 10: Cosmic Campground SQM and SQM-L Data

Cosmic	Campgro	ound	Dark	Sky	Measurements		
Summarv	Table						
Cannary	10010		Average C	AVERAGE	STDEV	AVERAGE	STDEV
Date	e	Location	Temperature	SQMfwhm80c	SQM old	SQM-Lfwhm20d	SQM New
2014October27-28	Average		. 16.78	}		21.34	0.04
2014October28-29	Average		13.11			21.31	0.04
2014November19-20	Average		11.14	21.54	0.03	21.45	0.05
2014November20-21	Average		8.13	21.57	0.02	21.55	0.02
2014December19-20	Average		0.78	21.57	0.03	21.45	0.03
2015January24-25	Average		4.00	21.68	0.04	21.68	0.04
2015February17-18	Average		3.90	21.59	0.02	21.44	0.10
2015 March 10-11	Average		12.20) 21.42	0.03	21.38	0.07
2015 March 15-16	Average		7.25	21.47	0.02	21.37	0.07
2015 April 21-22	Average		7.44	21.63	0.06	21.63	0.06
2015 June 13-14	Average		21.86	6 21.73	0.03	21.74	0.03
	:	=	=	=	=	=	=
Grand Averages	140ct-15	June		21.58	8 0.01	21.52	0.13
				N 12 N 12			
Individual	Nights		Individual	Nights	Individual	Nights	ndividual
Date	Location		Time	Temperature C	SQMfwhm80d	SQM-Lfwhm20d	
2014October27-28	CC1		09:49:00 PM	. 16	6	21.33	
2014October27-28	CC10		09:53:00 PM	16	6	21.31	
2014October27-28	CC5		09:57:00 PM	17	7	21.30	
2014October27-28	CC1		10:01:00 PM	17	7	21.34	
2014October27-28	CC10		10:04:00 PM	17	7	21.28	
2014October27-28	CC5		10:09:00 PM	17	7	21.36	
2014October27-28	CC12		10:27:00 PM	17	7	21.39	
2014October27-28	CC16		10:33:00 PM	17	7	21.37	
2014October27-28	CC17		10:45:00 PM	17	7	21.39	
			AVERAGES	16.78	3	21.34	
			stdev			0.04	

Date	Location	Time	Temperature C	SQMfwhm80d	SQM-Lfwhm20d
2014October28-29	CC1	11:18:00 PM	18		21.35
2014October28-29	CC10	11:21:00 PM	16		21.35
2014October28-29	CC5	11:27:00 PM	14		21.34
2014October28-29	CC1	11:30:00 PM	13		21.29
2014October28-29	CC10	11:33:00 PM	11		21.32
2014October28-29	CC5	11:36:00 PM	12		21.28
2014October28-29	CC10	11:40:00 PM	12		21.35
2014October28-29	CC12	11:52:00 PM	13		21.28
2014October28-29	CC16	11:59:00 PM	13		21.31
2014October28-29	CC17	12:11:00 AM	14		21.25
2014October28-29		AVERAGES	13.11		21.31
		stdev			0.04
Date	Location	Time	Temperature C	SQMfwhm80d	SQM-Lfwhm20d
2014November19-20	CC10	07:23:00 PM	11	21.57	21.45
2014November19-20	CC5	07:28:00 PM	10	21.52	21.45
2014November19-20	CC1	07:32:00 PM	9	21.57	21.52
2014November19-20	CC10	07:37:00 PM	9	21.57	21.50
2014November19-20	CC12	07:52:00 PM	13	21.52	21.40
2014November19-20	CC16	08:00:00 PM	13	21.53	21.40
2014November19-20	CC14	08:12:00 PM	13	21.52	21.44
		AVERAGES	11.14	21.54	21.45
		stdev		0.03	0.05

Section 10: Cosmic Campground SQM and SQM-L Data

Data	Location	Timo	Tomporaturo C	SOMfwbm80d	SOM fwbm20d
2014Novombor20.21		09-10-00 DM		21 50	3QIVI-LIWIIII200
2014November20-21	001	00.19.00 FIVI	7	21.09	21.00
2014November20-21		08.22.00 PIVI	1	21.00	21.57
2014November20-21	001	08:28:00 PM	10	21.57	21.55
2014November20-21	CC10	08:39:00 PM	10	21.56	21.54
2014November20-21	CC5	08:43:00 PM	9	21.53	21.56
2014November20-21	CC12	09:12:00 PM	5	21.57	21.56
2014November20-21	CC16	09:27:00 PM	10	21.58	21.57
2014November20-21	CC17	09:38:00 PM	7	21.57	21.53
		AVERAGES	8.13	21.57	21.55
		stdev		0.02	0.02
Date	Location	Time	Temperature C	SQMfwhm80d	SQM-Lfwhm20d
2014December19-20	CC10	07:33:00 PM	2	21.56	21.51
2014December19-20	CC10	07:40:00 PM	0	21.56	21.51
2014December19-20	CC1	08:00:00 PM	2	21.57	21.44
2014December19-20	CC1	08:10:00 PM	0	21.57	21.44
2014December19-20	CC10	08·20·00 PM	1	21 59	21 42
2014December19-20	CC10	08:30:00 PM	0	21.57	21 44
2014December19-20	0010	08:35:00 PM	0	21.61	21 44
2014December19-20	CC12	08:50:00 PM	0	21.52	21.46
2014December10-20	CC16		5	21.02	21.40
2014December 19-20	CC10	09.00.00 T M	3	21.02	21.40
201406061106119-20	0017		0.79	21.00	21.43
		AVERAGES	0.78	21.57	21.40
		stdev		0.03	0.03

Location	lime	Temperature C	SQMfwhm80d	SQM-Lfwhm20d
CC1	11:10:00 PM	4	21.70	21.62
CC1	11:17:00 PM	4	21.69	21.65
CC1	11:26:00 PM	4	21.69	21.72
CC10	11:38:00 PM	4	21.69	21.65
CC5	11:45:00 PM	2	21.71	21.75
CC12	12:10:00 AM	4	21.72	21.68
CC12	12:15:00 AM	4	21.69	21.71
CC16	12:30:00 AM	4	21.60	21.64
CC17	12:45:00 AM	6	21.66	21.69
	AVERAGES	4.00	21.68	21.68
	stdev		0.04	0.04
			old	new
Location	Time	Temperature C	SOMfwhm80d	SOM-I fwhm20d
		i oniporataro o	o a minimo o a	
CC1	07:35:00 PM	4	21.57	21.38
CC1 CC1	07:35:00 PM 07:45:00 PM	4 4	21.57 21.59	21.38 21.34
CC1 CC1 CC1	07:35:00 PM 07:45:00 PM 08:06:00 PM	4 4 5	21.57 21.59 21.60	21.38 21.34 21.35
CC1 CC1 CC1 CC1 CC1	07:35:00 PM 07:45:00 PM 08:06:00 PM 08:35:00 PM	4 4 5 5	21.57 21.59 21.60 21.55	21.38 21.34 21.35 21.35
CC1 CC1 CC1 CC1 CC1 CC1	07:35:00 PM 07:45:00 PM 08:06:00 PM 08:35:00 PM 09:00:00 PM	4 4 5 5 1	21.57 21.59 21.60 21.55 21.57	21.38 21.34 21.35 21.35 21.35
CC1 CC1 CC1 CC1 CC1 CC1 CC10	07:35:00 PM 07:45:00 PM 08:06:00 PM 08:35:00 PM 09:00:00 PM 09:15:00 PM	4 4 5 5 1 0	21.57 21.59 21.60 21.55 21.57 21.57 21.59	21.38 21.34 21.35 21.35 21.35 21.35 21.47
CC1 CC1 CC1 CC1 CC1 CC10 CC10 CC12	07:35:00 PM 07:45:00 PM 08:06:00 PM 08:35:00 PM 09:00:00 PM 09:15:00 PM 09:30:00 PM	4 4 5 5 1 0 4	21.57 21.59 21.60 21.55 21.57 21.57 21.59 21.61	21.38 21.34 21.35 21.35 21.35 21.35 21.47 21.54
CC1 CC1 CC1 CC1 CC1 CC10 CC12 CC16	07:35:00 PM 07:45:00 PM 08:06:00 PM 08:35:00 PM 09:00:00 PM 09:15:00 PM 09:30:00 PM 09:45:00 PM	4 4 5 5 1 0 4 3	21.57 21.59 21.60 21.55 21.57 21.59 21.61 21.61 21.60	21.38 21.34 21.35 21.35 21.35 21.35 21.47 21.54 21.56
CC1 CC1 CC1 CC1 CC10 CC10 CC12 CC16 CC17	07:35:00 PM 07:45:00 PM 08:06:00 PM 08:35:00 PM 09:00:00 PM 09:15:00 PM 09:30:00 PM 09:45:00 PM 10:00:00 PM	4 4 5 5 1 0 4 3 4	21.57 21.59 21.60 21.55 21.57 21.59 21.61 21.60 21.62	21.38 21.34 21.35 21.35 21.35 21.47 21.54 21.56 21.56
CC1 CC1 CC1 CC1 CC10 CC10 CC12 CC16 CC17 Pleasanton	07:35:00 PM 07:45:00 PM 08:06:00 PM 08:35:00 PM 09:00:00 PM 09:15:00 PM 09:30:00 PM 09:45:00 PM 10:00:00 PM	4 4 5 5 1 0 4 3 4 9	21.57 21.59 21.60 21.55 21.57 21.59 21.61 21.60 21.62 21.55	21.38 21.34 21.35 21.35 21.35 21.47 21.54 21.56 21.56 21.51
CC1 CC1 CC1 CC1 CC10 CC12 CC16 CC17 Pleasanton	07:35:00 PM 07:45:00 PM 08:06:00 PM 08:35:00 PM 09:00:00 PM 09:15:00 PM 09:30:00 PM 10:00:00 PM 10:30:00 PM AVERAGES	4 4 5 5 1 0 4 3 4 9 3.90	21.57 21.59 21.60 21.55 21.57 21.59 21.61 21.60 21.62 21.55 21.59	21.38 21.34 21.35 21.35 21.35 21.47 21.54 21.56 21.56 21.51 21.44
	CC1 CC1 CC10 CC5 CC12 CC12 CC16 CC17	CC1 11:10:00 PM CC1 11:17:00 PM CC1 11:26:00 PM CC10 11:38:00 PM CC5 11:45:00 PM CC12 12:10:00 AM CC12 12:15:00 AM CC16 12:30:00 AM CC17 12:45:00 AM AVERAGES stdev	CC1 11:10:00 PM 4 CC1 11:17:00 PM 4 CC1 11:26:00 PM 4 CC10 11:38:00 PM 4 CC5 11:45:00 PM 2 CC12 12:10:00 AM 4 CC12 12:15:00 AM 4 CC16 12:30:00 AM 4 CC17 12:45:00 AM 6 AVERAGES 4.00 stdev Location Time_Temperature C	CC1 11:10:00 PM 4 21.70 CC1 11:17:00 PM 4 21.69 CC1 11:26:00 PM 4 21.69 CC10 11:38:00 PM 4 21.69 CC5 11:45:00 PM 2 21.71 CC12 12:10:00 AM 4 21.69 CC12 12:10:00 AM 4 21.69 CC12 12:15:00 AM 4 21.69 CC16 12:30:00 AM 4 21.60 CC16 12:30:00 AM 4 21.60 CC17 12:45:00 AM 6 21.66 AVERAGES 4.00 21.68 stdev 0.04 old 0.04 0.04 0.04 0.04

Section 10: Cosmic Campground SQM and SQM-L Data

Date	Location	Time	Temperature C	old	new
2410	2000.011		remperatare e	SQMfwhm80d	SQM-Lfwhm20d
2015 March 10-11	CC1	09:06:00 PM	11	21.42	21.26
2015 March 10-11	CC1	09:16:00 PM	12	21.37	21.35
2015 March 10-11	CC1	09:18:00 PM	12	21.41	21.41
2015 March 10-11	CC1	09:20:00 PM	12	21.37	21.37
2015 March 10-11	CC1	09:41:00 PM	14	21.39	21.33
2015 March 10-11	CC1	09:45:00 PM	13	21.41	21.30
2015 March 10-11	CC5	10:01:00 PM	14	21.42	21.40
2015 March 10-11	CC5	10:05:00 PM	14	21.44	21.44
2015 March 10-11	CC12	10:30:00 PM	11	21.43	21.43
2015 March 10-11	CC16	10:45:00 PM	14	21.47	21.47
2015 March 10-11	CC17	11:01:00 PM	6	21.46	21.46
		AVERAGES	12.20	21.42	21.38
		stdev		0.03	0.07
2015 March 15-16	CC1	08:53:00 PM	13	21.44	21.27
2015 March 15-16	CC1	09:22:00 PM	9	21.48	21.31
2015 March 15-16	CC1	09:36:00 PM	3	21.43	21.41
2015 March 15-16	CC1	10:01:00 PM	3	21.48	21.35
2015 March 15-16	CC10	10:20:00 PM	5	21.49	21.34
2015 March 15-16	CC12	10:30:00 PM	9	21.47	21.41
2015 March 15-16	CC16	10:45:00 PM	7	21.48	21.41
2015 March 15-16	CC17	11:00:00 PM	9	21.49	21.49
		AVERAGES	7.25	21.47	21.37
		stdev		0.02	0.07

D (- · · ·		
Date	Location	lime	Temperature C	old	new
0045 4 21 04 00	0.04	11.00.00 DM	-	SQIVITWNM80d	SQIVI-LTWNm20d
2015 April 21-22	001	11:36:00 PM	/	21.63	21.63
2015 April 21-22		11:45:00 PM	8	21.00	21.08
2015 April 21-22		12:05:00 AM	5	21.00	21.00
2015 April 21-22		12:15:00 AM	5	21.08	21.70
2015 April 21-22	001	12:25:00 AM	5	21.68	21.69
2015 April 21-22	005	12:50:00 AM	5	21.68	21.69
2015 April 21-22	0012	01:11:00 AM	1	21.64	21.65
2015 April 21-22	CC16	02:05:00 AM	13	21.54	21.55
2015 April 21-22	CC17	02:27:00 AM	12	21.54	21.54
		AVERAGES	7.44	21.63	21.64
		stdev		0.06	0.06
2015 June 13-14	CC12	10:25:00 PM	26	21.75	21.71
2015 June 13-14	CC12	10:25:00 PM	26	21.78	21.70
2015 June 13-14	CC12	10:25:00 PM	26	21.72	21.69
2015 June 13-14	CC12	10:33:00 PM	22	21.73	21.79
2015 June 13-14	CC12	10:33:00 PM	22	21.76	21.73
2015 June 13-14	CC12	10:33:00 PM	22	21.72	21.72
2015 June 13-14	CC12	10:40:00 PM	22	21.78	21.79
2015 June 13-14	CC12	10:40:00 PM	22	21.76	21.76
2015 June 13-14	CC12	10:40:00 PM	22	21.76	21.75
2015 June 13-14	CC12	10:45:00 PM	20	21.75	21.76
2015 June 13-14	CC12	10:45:00 PM	20	21.78	21.76
2015 June 13-14	CC12	10:45:00 PM	20	21.73	21.76
2015 June 13-14	CC12	11:00:00 PM	20	21.75	21.74
2015 June 13-14	CC12	11:00:00 PM	20	21.72	21.76
2015 June 13-14	CC12	11:00:00 PM	20	21.70	21.79
2015 June 13-14	CC17	11:13:00 PM	23	21.73	21.73
2015 June 13-14	CC17	11:13:00 PM	23	21.72	21.75
2015 June 13-14	CC17	11:13:00 PM	23	21.72	21.74
2015 June 13-14	CC16	11:25:00 PM	20	21.67	21.76
2015 June 13-14	CC16	11:25:00 PM	20	21.66	21.74
2015 June 13-14	CC16	11:25:00 PM	20	21.69	21.71
		AVERAGES	21.86	21.73	21.74
		stdev		0.03	0.03

Letter of Nomination to International Dark-Sky Association for

Certification of the Cosmic Campground as an International Dark Sky Sanctuary

IDA Board of Directors 3223 N. First Avenue Tucson, AZ 85719 USA

Dear Board of Directors,

I nominate the Cosmic Campground for Certification by the International Dark-Sky Association as an International Dark Sky Sanctuary. Residents of communities across southern NM support this request.

The Cosmic Campground is located at 5300' with a 360 degree view of the horizon. Its location within the Gila National Forest provides a natural night sky. There are no artificial lights visible from the site. Natural terrain prevents lights of any night traffic on Hwy 180 from affecting night vision of observers.

Urbanites of Albuquerque, El Paso, Las Cruces, Tucson and Phoenix have access with less than a six hour drive to enjoy the natural night sky in the cool mountain air of the Gila National forest of New Mexico. The Cosmic Campground had local visitors, Las Cruces Astronomical Society members, and and an astrophotographer from Missouri in 2015.

The site is designed as multi-use according to FS rules.

The Glenwood Ranger District supports our project, helped locate the site, had NEPA and other requirements fulfilled, and aided us in applying for and receiving awards from The Southern NewMexico Resource Advisory Committee (RAC). Awards totaling \$90,000 were used to construct a hard surface road, an Observing area, RV parking, and buy/install a two station CDX toilet.

Adam Mendonca, Forest Supervisor, Gila National Forest, submitted a letter of support to the IDA for certification of the Cosmic Campground. Mendonca is working with us to complete a Forest Service facility to provide a safe and welcoming place for the public to enjoy both the night sky and day time activities. A bulletin board structure and a safety apron to the CDX toilet will be FS added improvements.

The Cosmic Campground deserves to be an International Dark Sky Sanctuary. There are fewer places on Planet Earth where the natural night sky is visible to people and other terrestrials every day. The IDA needs to certify the Cosmic Campground. This peaceful, starry, quiet place will be an ideal first International Dark Sky Sanctuary in the United States, the Gila National Forest, and the Northern Hemisphere.

Please grant Cosmic Campground this honor. We will, in turn, honor our commitment to the IDA.

Sincerely yours,

Satricia a. Graner

Patricia A Grauer, B.A. Friends of the Cosmic Campground cosmiccampground.org

Letter From The Managing Agency of the Cosmic Campground

11



United States Forest Gila National Forest Department of Service Supervisor's Office Agriculture 3005 East Camino Del Bosque Silver City, NM 88061 575-388-8201 TDD: 575-388-8489 FAX: 575-388-8204



File Code: 2300 Date: September 3, 2015

IDA Board of Directors 3223 North First Avenue Tucson, AZ 85719

Dear Board of Directors:

The Gila National Forest has partnered with the Grauer's to develop an opportunity for forest users to enjoy the "Dark Skies" that naturally occur on the forest. I am writing this letter in support of the proposal to certify the Cosmic Campground as an International Dark Sky Association International Dark Sky Sanctuary (DSS). As part of my support, I would like to outline actions the forest will take to support the certification; actions that can occur through an MOU to support the certification; and actions that may not occur which may affect the certification.

The Cosmic Campground is located entirely on National Forest System lands administered by the United States Forest Service. The agency's mission is to sustain the health, diversity, and productivity of the nation's forests and grasslands to meet the needs of present and future generations. The lands administered by the Forest Service provide great opportunity for public enjoyment through regular visitation by the public.

Based on our mission, governing laws, and mandates, the following activities will be completed by the Forest Service to support the certification:

- No lighting will be installed at the Cosmic Campground. This will ensure that a Lightscape Management Plan is not needed. This will also allow the DSS to meet both the 5 and 10 year lighting requirements, thereby demonstrating a commitment to the DSS.
- The forest will work with all parties involved to install signage indicating the Dark Sky Sanctuary designation.
- The forest will work with all parties involved to permit the automatic weather station and sky brightness measurement station.

Based on our mission, governing laws, and mandates, the following activities can be completed but will require an MOU with an interest group to support the certification:



Caring for the Land and Serving People

Letter From The Managing Agency of the Cosmic Campground [continued]

IDA Board of Directors

2

• A brightness measurement program. As indicated above, the forest will work with an interest group to permit any equipment that needs to reside within the DSS. The interest group will be responsible for monitoring and evaluating the information collected at the site.

• Public outreach and education including any interpretive programs. The forest will work with an interest group to authorize all outreach, education, and interpretive programs; however, it will be the responsibility of the interest group to complete all aspects of the programs.

• Establishing night sky quality. All light pollution determinations will be the responsibility of an interest group.

Based on our mission, governing laws, and mandates, the following activities will not occur on Forest Service lands:

• Inclusion of the protected area in our long term plan. All activities on the forest are guided by our Gila National Forest Plan. Currently, the forest is in the process of revising the current forest plan. While the forest may choose to briefly describe the night sky as a resource within the plan, the forest will not include specific management for the DSS. In addition, the forest will not include in its plan any action items for addressing current and future threats to the DSS.

I believe this project provides unique opportunities to visitors of the Gila National Forest. As such, I welcome this opportunity to speak in support of this proposal. I hope this proposal will aid the Forest Service in meeting our mission to sustain the health of an ecosystem and one of its unique features for future generations.

Sincerely,

am Mendonen

ADAM MENDONCA Forest Supervisor

From: Cordelia Rose cordelia.rose3@gmail.com Subject: Cosmic Campground, Alma, NM Date: August 10, 2015 at 9:57 AM To: john@darksky.org Cc: algrauer@me.com

Cordelia Rose

Whitewater Mesa Labyrinths

355 Bursum Road, HC61 Box 299

Glenwood, NM 88039

www.wmlabyrinths.com

10 August 2015

Board of Directors, attn: John Barentine International Dark Sky Association (IDA) 3223 North First Avenue Tucson, AZ 85719

Dear Dr. Barentine,

Re: Certification of the Cosmic Campground as a Dark-Sky Sanctuary

I grew up in England in the WW11 black-out, then lived in the post-war bright lights of London, then under the dark sky of the Rift Valley of Kenya, then in Midtown Manhattan dazzled by Times Square. Now, living under the glorious dark skies of the Alma and Glenwood area, with our naked eyes we can see the Milky Way again at last.

It was in 2002 at our house located at the west entrance to the Gila Wilderness that Dr. Al Grauer first brought his telescope to show our dinner guests the night sky. I will never forget Al saying that Good Heavens he could see things through his binoculars here that he could not even see through a telescope in Peru. The Cosmic Campground is the reality of Al's vision.

The Cosmic Campground deserves to be a Certified Dark-Sky Sanctuary because it is one of the darkest locations on Planet Earth. Its location within the Gila National Forest near Alma, NM is many miles from the nearest artificial light. Access is easy off NM180 along a USFS road where natural barriers protect observers from the headlights of the minimal night traffic.

I am sure the Cosmic Campground will be an asset to the area helping the economy of local businesses by attracting tourists, professional and children's groups. There are plenty of places to stay, eat and get supplies in the area.

This area is a place of beauty, history and a rural way of life. We love to introduce visitors to the local daytime activities like hiking, fishing, horseback riding and of course walking along the Catwalk, our National Monument. With the addition of the Cosmic Campground we can camp overnight to enjoy the night sky as well. We look forward to sharing all this with the new visitors that Certification of the Cosmic Campground as a Dark-Sky Sanctuary would bring us.

I urge you to look favorably upon our request and grant us Certification as a Dark-Sky Sanctuary.

CR

Yours sincerely, Cordelia Rose

575 313 1002 cordelia.rose3@gmail.com

cc. Dr. Al Grauer

Cordelia Rose Whitewater Mesa Labyrinths & Glenwood Yoga P O Box 281, Glenwood, NM 88039 575 313-1002 mobile www.wmlabyrinths.com

Glenwood Yoga classes 4 pm Mondays and Thursdays call Cordelia for details and more classes.

Cordelia Rose Whitewater Mesa Labyrinths 355 Bursum Road, HC61 Box 299 Glenwood, NM 88039 www.wmlabyrinths.com

10 August 2015

Board of Directors, attn: John Barentine International Dark Sky Association (IDA) 3223 North First Avenue Tucson, AZ 85719

Dear Dr. Barentine,

Re: Certification of the Cosmic Campground as a Dark-Sky Sanctuary

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I urge you to look favorably upon our request and grant us Certification as a Dark-Sky Sanctuary.

Yours sincerely,

ordena Rose

Cordelia Rose 575 313 1002 <u>cordelia.rose3@gmail.com</u>

cc. Dr. Al Grauer

Dear Mr. Barentine

I have been to the cosmic campground star parties several times. Spectacular to witness the beauty of nature. As we gather grant money, the area continue to be more and more appealing and user friendly. . I love and appreciate the dark skies in Alma/Glenwood.

I had no idea that we are one of the darkest locations on Planet Earth.

Wow! that information makes me stand up and take notice. This area has very few job opportunities and with the Catwalk temporary closing, the tourist population has diminished.

Having a Certified Dark-Sky Sanctuary would be a great draw to our area with economic benefits. There are several hotels, B & B's, artists galleries, beautiful library with free wifi, a Senior Center, Community Center and many hiking trails in the Gila Wilderness.

It is a quite easy place to find and I love to show our guests the new treasurer right here in Alma/Glenwood area.

Please Certify the Cosmic Campground as a Dark-Sky Sanctuary.

Thank you, Judith Michaels Safford P.O.Box 334 Glenwood, NM 575 539 2114

"If we go down into ourselves, we find that we possess exactly what we desire." -- Simone Weil

Judith Michaels Safford "Don't Sell Your Soul - Memoirs of a Guru Junkie" "Joyful Surrender" Amazon.com 575-539-2114 13 August 2015

Blaire McPherson 3626 Coltwood Dr Spring TX 77388

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

Re: Nomination of Cosmic Campground, Catron County NM

Dear IDA Board:

I'm writing in support of the nomination of the Cosmic Campground (Gila National Forest near Alma NM, USA) as a Dark-Sky Sanctuary. As a former resident of the frontier community of Glenwood / Alma, I have visited the Cosmic Campground numerous times and can attest to its extreme darkness; panoramic low-horizon sky view; strong local support; relative convenience for visitors; and the near-laughable unlikelihood of commercial development in this area.

Although the Cosmic Campground was born entirely of private local effort, its proximity to a research university astronomy program (New Mexico Tech Astrophysics, Socorro NM, 575/835-5328) and USGS Ranger District (Glenwood NM, 575/539-2481) have strengthened its technical, logistic, and PR support in recent years. Great public sky talks, good dirt and gravel roads, new signage, and now...restrooms! Permanent telescope pads coming soon, I'm told.

The Cosmic Campground is about 70 miles from the nearest city of 10,000 (Silver City NM) and 140 miles from the NRAO Very Large Array (Socorro County NM). It is highly accessible from the low-traffic "blue highway" of NM 180, from which it is hidden on a treeless plain behind low, rolling hills. But it is within very easy distance of the many hiking, camping, hunting, and fishing attractions of the forests of the Mogollon (NM) and Black (AZ) Ranges. For those unable to camp, good food and lodging (also fuel) are available in Alma and Glenwood. There are no medical facilities or public airfields closer than tiny Reserve NM (30 mi) or larger Silver City (70 mi).

These are the honest recollections of a ten-year Glenwood resident, away from the area for eight months now. Please certify the Cosmic Campground as a Dark-Sky Sanctuary.

Thanks so much, IDA, for your important ecological work.

Remembering stars in light-polluted north Houston,

Blaire McPherson

August 13, 2015

IDA Board of Directors 3223 North First Avenue Tucson, AZ 85719

Dear Board of Directors:

The Cosmic Campground deserves to be a Certified Dark-Sky Sanctuary because it is one of the darkest locations on the planet Earth. Our Gila Wilderness National Forest, near Alma, NM is one of the last remaining pristine areas in the continuous 48 states of America, and many miles from any big city or conglomeration of artificial light. The location, with its natural barriers and surrounding government owned land will prevent any major future development.

A Dark-Sky Sanctuary designation will be an asset to the area as there are few social/educational opportunities in the area and it will be a boon to local community economy, providing both recovery and assisting further sustainability by attracting world-wide attention.

As a licensed professional counselor in New Mexico, it would be wonderful to add to my repertoire of therapeutic suggestions, the availability of an overnight camping adventure filled with what has exhilarated and motivated mankind for thousands of years – to show folks a way to de-stress and broaden their horizons!

For years I, personally, have enjoyed the wonders of the night skies in the Gila, and been able to share with family and friends this unique and wondrous panorama of inspiration, in addition to the many geographical, ecological and historical specialties of the Southwest. Would be outstanding to be able to share it with the world!

Please Certify the Cosmic Campground as a Dark-Sky Sanctuary.

Sincerely, 1211

Durelle Freeman, MA, LPCC, NCC P O Box 120 Glenwood, NM 88039 575-539-2304 575-590-5666 cell/office Dear John Barentine -

We love our dark skies, here in Catron County. Now we have something that caters to that love – The Cosmic Campground.

This is great for me and all the other sky-huggers hereabouts. It will also be a great attraction for the tourist once they learn of it, and for the local economy once the tourists start rolling in. And they will be more likely to come if the CC is certified by the IDA as a Dark-Sky Sanctuary. It more than qualifies.

Sincerely,

Mike Rose

Mike Rose HC61 Box299 Glenwood NM 88039 USA

Telephone: 575 539 2868

 August 15, 2015

Board of Directors International Dark Sky Association (IDA) 3223 North First Avenue Tucson, AZ 85719

Re: Cosmic Campground, Alma, New Mexico Request for Certification of Dark-Sky Sanctuary

Dear Int'l Dark Sky Assoc. Board of Directors,

I am writing in support of your consideration of certifying the Cosmic Campground in Alma, New Mexico as a Dark Sky Sanctuary.

My husband and I purchased 40 acres in Glenwood, NM (a few miles south of Alma, NM) in 1998 and proceeded to build our home, moving here from the Portland, Oregon area, and having grown up in the San Francisco Bay Area with visits to the Sierra National Forest. We <u>CHOSE</u> this location for its remoteness, juxtaposed with the Gila National Forest, rural aspect, and the fact that is a dark sky region.

Before the campground was established, we attended "star parties" on the mesa above Glenwood (enroute to the old mining town of Mogollon, NM), arranged by locals and interested individuals. It was such a privilege and incredibly inspiring.

We have had friends come to visit us from out of state. They remark on the sky and the darkness of the nights. The most profound statement one of our guests made was when we lingered on our porch outside after dinner into the night, she said "it would be perfect if it were not for those clouds". The "clouds" she was referring to was the Milky Way! She had never seen the Milky Way in a dark sky.

We were elated when Bill McCabe initiated plans for the Cosmic Campground and saw this as a draw of those who could appreciate the dark sky and astronomy. We knew it would become a destination for those interested in the night sky and provide an additional "tourist activity" for our town which already draws many tourists, many of whom are interested in the historical "Catwalk"

https://en.wikipedia.org/wiki/Glenwood, New Mexico, visiting the Gila National Forest, the old mining town of Mogollon and "history of the West", and as a weekend getaway from many locations within driving distance.

The Cosmic Campground is located on Hwy 180 which travels north from Silver City, NM on in to the high country of Arizona. My neighbor started a Bed & Breakfast a few years ago which has become very successful for those seeking respite from the city. It is one of numerous accommodations locally available, but simply an indication of the attractiveness of this area.

Please consider the Cosmic Campground for certification as a Dark Sky Sanctuary to best protect this treasure and further enhance the ability of individuals to enjoy a dark sky and all it has to offer.

Respectfully, " Thetin A Lud

Victoria Linehan resident, Glenwood, NM (a few miles south of the Cosmic Campground) From: mnewkirk@wildblue.net

Subject: Dark-Sky Sanctuary Certification for Cosmic Campground

- Date: August 21, 2015 at 1:06 PM
 - To: John Barentine john@darksky.org
 - Cc: Ann Grauer alsannie@mac.com, Bill&Val billval@gilanet.com

Dear Mr. Barentine,

I am writing in support of the Dark-Sky Sanctuary certification for the Cosmic Campground in the Gila National Forest, near Glenwood, New Mexico. The proposed Cosmic Campground offers an astronomical observation site with some of the darkest skies in the continental United States. For amateurs and professionals alike, the setting affords an easily accessible, world class, astronomical site.

For more than a decade, local residents have partnered with astronomers and representatives of the Glenwood Ranger District to create the Cosmic Campground. The site is many miles from the nearest artificial light and is protected from headlights from any highway traffic. The community wants to preserve the precious asset of its dark skies and the IDA's Dark Sky Sanctuary certification is critical to achieving this goal.

I encourage the IDA Board of Directors to grant the Cosmic Campground's request for Dark Sky Sanctuary certification. Sincerely, Mary Newkirk

Mary E. Newkirk P.O. Box 129 Glenwood, NM 88039 575.539.2841 phone 575.539.2842 fax mnewkirk@wildblue.net Dear IDA Board of Directors,

I am writing in support of IDA Certification for the Cosmic Campground near Alma New Mexico. My interest in this endeavor goes back for more than a decade.

After retiring from the Los Alamos National Laboratory in 1993 my wife and I retired to this dark and wild area where we bought a small country store in Alma.

Our intense interest in the local business community led us to seek the natural attractions of the area. The Dark Sky is the premier asset of the area.

We have been involved in the development of this asset for more than a decade, realizing that a campground for both amateur and professional astronomers would certainly occur. Certification of the Cosmic Campground as a Dark Sky Sanctuary is a most desirable event and would certainly encourage participation in the delights of our wonderful sky.

Sincerely yours,

Bill and Val McCabe

From: Robert Robinson powerpeen@yahoo.com

Date: August 25, 2015 at 9:48 AM

Cc: alsannie@mac.com, Bill and Val McCabe billval@gilanet.com

IDA Board of Directors 3223 North First Avenue Tucson, AZ 85719

Dear Board of Directors,

I am writing to encourage your approval of the application for Dark Sky Sanctuary certification on behalf of the Cosmic Campground in the Gila National Forest near Glenwood, New Mexico.

The Cosmic Campground is a rare and exceptional opportunity. It is an opportunity for amateur and professional astronomers to preserve a truly dark sky viewing sight and it is an opportunity for our community to welcome low-impact visitors to appreciate this beautiful rural setting.

Our Catron County is large and sparsely populated, with less than 3,000 residents in approximately 8000 square miles. More than 90% of the land is preserved as forest or wilderness. Combine these facts with our semi-arid climate and mile-high location and the Cosmic Campground offers the ideal setting for dark sky viewing now and for many years to come.

As a business-owner, I also support the Cosmic Campground because it can attract visitors for our local small business-owners.

For years our county and some dedicated people have been working to create a dark sky campground in Catron County. Today, the Cosmic Campground is on track to becoming something very special. What is needed now is recognition as a Dark Sky Sanctuary. I strongly encourage your approval of the application for Dark Sky Sanctuary certification for the Cosmic Campground in the Gila National Forest near Glenwood, New Mexico.

Sincerely, Robert Robinson Media Blast Sales 575 539 2861 www.mediablast.com

Robert Robinson

RR

Subject: Dark Sky Sanctuary Certification for Cosmic Campground, Glenwood New Mexico

To: john@darksky.org



United States Forest Department of Service Agriculture Gila National Forest Supervisor's Office 3005 East Camino Del Bosque Silver City, NM 88061 575-388-8201 TDD: 575-388-8489 FAX: 575-388-8204

File Code:2300Date:September 3, 2015

IDA Board of Directors 3223 North First Avenue Tucson, AZ 85719

Dear Board of Directors:

The Gila National Forest has partnered with the Grauer's to develop an opportunity for forest users to enjoy the "Dark Skies" that naturally occur on the forest. I am writing this letter in support of the proposal to certify the Cosmic Campground as an International Dark Sky Association International Dark Sky Sanctuary (DSS). As part of my support, I would like to outline actions the forest will take to support the certification; actions that can occur through an MOU to support the certification; and actions that may not occur which may affect the certification.

The Cosmic Campground is located entirely on National Forest System lands administered by the United States Forest Service. The agency's mission is to sustain the health, diversity, and productivity of the nation's forests and grasslands to meet the needs of present and future generations. The lands administered by the Forest Service provide great opportunity for public enjoyment through regular visitation by the public.

Based on our mission, governing laws, and mandates, the following activities will be completed by the Forest Service to support the certification:

- No lighting will be installed at the Cosmic Campground. This will ensure that a Lightscape Management Plan is not needed. This will also allow the DSS to meet both the 5 and 10 year lighting requirements, thereby demonstrating a commitment to the DSS.
- The forest will work with all parties involved to install signage indicating the Dark Sky Sanctuary designation.
- The forest will work with all parties involved to permit the automatic weather station and sky brightness measurement station.

Based on our mission, governing laws, and mandates, the following activities can be completed but will require an MOU with an interest group to support the certification:

- A brightness measurement program. As indicated above, the forest will work with an interest group to permit any equipment that needs to reside within the DSS. The interest group will be responsible for monitoring and evaluating the information collected at the site.
- Public outreach and education including any interpretive programs. The forest will work with an interest group to authorize all outreach, education, and interpretive programs; however, it will be the responsibility of the interest group to complete all aspects of the programs.
- Establishing night sky quality. All light pollution determinations will be the responsibility of an interest group.

Based on our mission, governing laws, and mandates, the following activities will not occur on Forest Service lands:

• Inclusion of the protected area in our long term plan. All activities on the forest are guided by our Gila National Forest Plan. Currently, the forest is in the process of revising the current forest plan. While the forest may choose to briefly describe the night sky as a resource within the plan, the forest will not include specific management for the DSS. In addition, the forest will not include in its plan any action items for addressing current and future threats to the DSS.

I believe this project provides unique opportunities to visitors of the Gila National Forest. As such, I welcome this opportunity to speak in support of this proposal. I hope this proposal will aid the Forest Service in meeting our mission to sustain the health of an ecosystem and one of its unique features for future generations.

Sincerely,

m Mendonen

ADAM MENDONCA Forest Supervisor

M. Keith Riddle Clerk – PO Box 197 (575) 533-6400

Connie Sue Shipley Treasurer – PO Box 407 (575) 533-6384

Susan E. Griffin Assessor – PO Box 416 (575) 533-6577

Ian Fletcher Sheriff – PO Box 467 (575) 533-6222

Ed Wehrheim Probate Judge



September 10, 2015

Anita A. Hand Commissioner District No. 1

Glyn Griffin Commissioner District No. 2

Van J. (Bucky) Allred Commissioner District No. 3

Commission Office PO Box 507 – (575) 533-6423 FAX (575) 533-6433

> Kate Fletcher County Manager

IDA Board of Directors Attn: John Barentine 3223 North First Avenue Tucson, Arizona 85719 john@darksky.org

RE: Letter of Support

Dear Board of Directors;

Catron County would like the Cosmic Campground to be designated at an International Dark-Sky Association (IDA) Certified International Dark-Sky Sanctuary. This is one of the darkest location on Planet Earth and offers excellent night sky viewing. The Cosmic Campground is nestled within the Gila National Forest near Alma, New Mexico and can be accessed from US 180. The campground is located within natural barriers which limits headlights and offers observers an excellent view of the night skies.

Catron County believes this site will be beneficial to our local economy by increasing tourism. Our local businesses provide a friendly and comfortable atmosphere during visits to our restaurants, motels, or stores for supplies.

The campground offers easy access to friends and family wishing to view night skies while the area offers a rich frontier history to visitors wishing to take day trips. The area is rich in wildlife, has numerous hiking trails, and sights such as the ghost town of Mogollon, to name just a few.

Catron County would greatly appreciate your consideration to certify the Cosmic Campground as an International Dark-Sky Sanctuary.

Respectfully,

Kate Fletchel

Catron County Manager

(202) 224–5521 (202) 228–2841 FAX Heinrich.Senate.Gov

United States Senate

WASHINGTON, DC 20510

COMMITTEES: ARMED SERVICES ENERGY AND NATURAL RESOURCES INTELLIGENCE JOINT ECONOMIC

September 10, 2015

Mr. Adam Mendonca Forest Supervisor Gila National Forest 3005 East Camino del Bosque Silver City, NM 88061

Dear Mr. Mendonca:

Thank you for your recent letter to the International Dark Sky Association in support of the Cosmic Campground's efforts to attain recognition as a Dark Sky Sanctuary. I also appreciate your commitments to work with the site's sponsors on wayfinding signage and educational and interpretive programs.

Outdoor recreation activities in New Mexico generate \$6.1 billion annually in consumer spending and are directly responsible for 68,000 New Mexico jobs. Recreation provides good paying, sustainable jobs to rural communities. The Friends of the Cosmic Campground partner with local businesses, and the proposal is supported by the communities of Alma, Glenwood, Reserve, Datil, and Pietown.

Places like the Cosmic Campground bring visitors from around the United States and the world to enjoy New Mexico's unmatched wild places. Our state is already home to two Dark Sky Parks, and the development of the Cosmic Campground represents an opportunity for western New Mexico to become a true destination for stargazers.

I hope we can continue to work together to promote New Mexico's outdoor recreation economy, and thank you for your service to conserve and protect our nation's natural resources.

Sincerely

MARTIN HEINRICH United States Senator

cc: International Dark Sky Association Cal Joyner, Regional Forester Albert D. and Patricia A. Grauer

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9-12-15

IDA Board of Directors 3223 North First Avenue Tucson, AZ 85719

Dear Sirs:

I strongly support the initiative to recognize the Gila National Forest's Cosmic Campground as an international "Dark Sky Sanctuary", certified by the International Dark-Sky Association.

Not only does the quality of the dark sky at the site rival that of the AURA Observatory in the Elqui Valley, Chile but it is located less than a six hour drive from the metropolitan areas of Phoenix, Tucson, El Paso, Las Cruces and Albuquerque. This offers a unique opportunity to connect urban dwellers to the joys of observing the natural night sky. Combined with this proximity to population centers, the site is open to the public year round making it one of the most easily accessible public dark sky sites in the nation. Located in the Gila National Forest, Cosmic Campground offers a unique opportunity to preserve a spot of darkness in an increasingly urbanized and light polluted west.

Thank you for considering this site as a Dark Sky Sanctuary.

At Moring.

Pat Morrison