8/3/2015

Kissimmee Prairie Preserve State Park's IDA Dark Sky Park Application

Department of Environmental Protection
Division of Parks and Recreation
Florida State Parks

Compiled by:
Jennifer M. Benson-Hughes
PARK SERVICES SPECIALIST
MIKE ROESS GOLD HEAD BRANCH STATE PARK
formerly of
KISSIMMEE PRAIRIE PRESERVE STATE PARK
33104 NW 192nd Ave Okeechobee, FL 34972
863-462-5360 office

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Photo by Christina Evans in June 2014

Executive Summary

Kissimmee Prairie Preserve State Park (hereafter KPPSP) is one of largest state parks within the Florida State Park System. There are over 170 state parks and state trail systems in Florida. Less than 20 years ago, KPPSP was purchased and since then is becoming one of the most talked about locations to see the Milky Way and other dark sky features.

Located away from the population centers, KPPSP is a prime destination for people who want to get away from the stresses of their everyday life. They come to experience the long prairie views, the song of Eastern Meadowlark, the wind through the palmettos and grasses. And they stay the night for the peaceful and star-studded evenings.

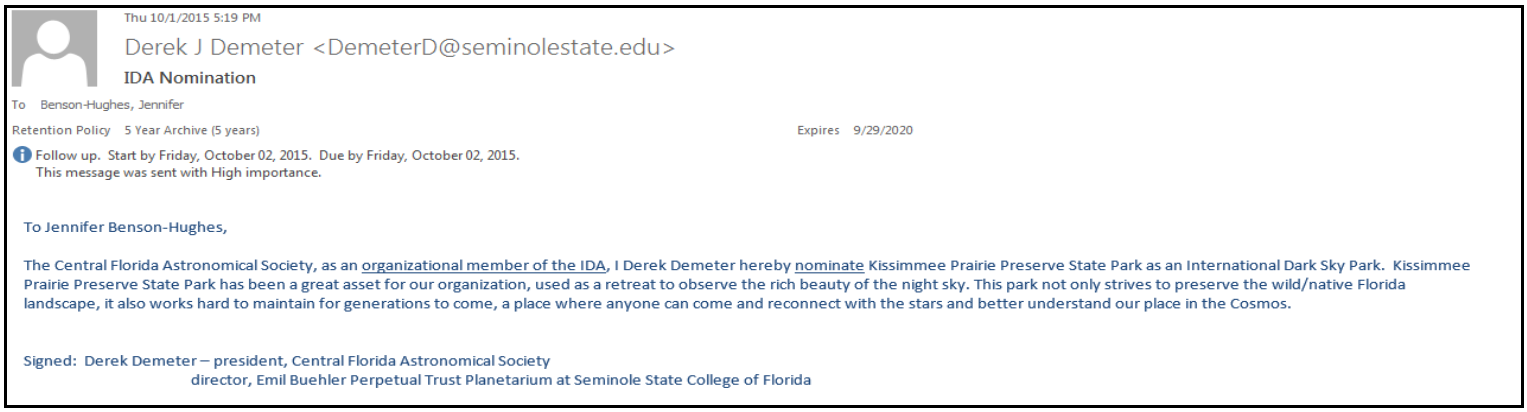
"There are several thousand people with telescopes in Florida and many 'snowbirds' bring them in the winter. [Our] user group is running out of [location] options to use their sophisticated equipment. [We] would prefer to use them in the dark to view thousands of dim galaxies and nebulae; to capture an image with modern digital cameras and computers."- Bill Nigg, KPPSP volunteer astronomer, January 2014.

The Florida Park Service recognizes the value of our resources and the importance of preserving them for the past, present, and future influences. The Mission Statement for the Florida Park Service is "to provide resource-based recreation while preserving, interpreting and restoring natural and cultural resources". "The Florida State Park System creates a sense of place and is recognized as containing the best of Florida's diverse natural and cultural heritage sustained for future generations while providing quality and appropriate resource-based recreational opportunities, interpretation and education that help visitors connect to "The Real Florida" (About the Florida Park Service, 2013). The dark sky around KPPSP is a cultural and natural resource.

Ecosystems are always working, even in the dark. Darkness plays a significant role in the health of wildlife and humans. Circadian rhythms are affected by obtrusive light at night. By using sensible lighting techniques and by educating the public, wildlife and humans can have a safe and beneficial night environment.

We are responsible for our actions and KPPSP wants to be good neighbors and a useful resource for the surrounding communities providing education and an example of appropriate lighting.

A) Nomination from Central Florida Astronomical Society



Thu 10/1/2015 5:19 PM

Derek J Demeter <DemeterD@seminolestate.edu>

IDA Nomination

To Benson-Hughes, Jennifer

Retention Policy 5 Year Archive (5 years) Expires 9/29/2020

Follow up. Start by Friday, October 02, 2015. Due by Friday, October 02, 2015.
This message was sent with High importance.

To Jennifer Benson-Hughes,

The Central Florida Astronomical Society, as an organizational member of the IDA, I Derek Demeter hereby nominate Kissimmee Prairie Preserve State Park as an International Dark Sky Park. Kissimmee Prairie Preserve State Park has been a great asset for our organization, used as a retreat to observe the rich beauty of the night sky. This park not only strives to preserve the wild/native Florida landscape, it also works hard to maintain for generations to come, a place where anyone can come and reconnect with the stars and better understand our place in the Cosmos.

Signed: Derek Demeter – president, Central Florida Astronomical Society
director, Emil Buehler Perpetual Trust Planetarium at Seminole State College of Florida

B) Description of Kissimmee Prairie Preserve State Park's Night Sky Resources

Photo by Judd Patterson in May 2009.

Location and Description of Kissimmee Prairie Preserve State Park

KPPSP is located in a remote area of south central Florida. The majority of KPPSP is positioned in Okeechobee County and the northwestern finger lies in Osceola County. The Kissimmee River is the western boundary. KPPSP lies south of State Road 60, west of State Road 441, and north of State Road 98. Neighboring lands include South Florida Water Management District properties, Avon Park Air Force Range, several large ranches, The Community of Destiny (near Yeehaw Junction), Coquina Water Control District (aka Viking Estates), and other various land owners (see figures 1, 2, 3).

In 1996, the state began acquisition of KPPSP. Today KPPSP is one of the largest state parks in Florida. It encompasses 53,732 acres of a globally imperiled ecosystem. There is only 9% of the

Florida dry prairie ecosystem left (Noss p.7) and KPPSP protects the largest tract (Noss p.230). The dry prairie ecosystem is home to at least 12 designated plants and 36 designated animals. Designated species include species of special concern, and threatened and endangered wildlife listed by Florida Fish and Wildlife Conservation Commission, US Fish and Wildlife Service, and Florida Natural Areas Inventory (Unit Management Plan, pA5-1-7). Some of the threatened and endangered species include Catesby's lily, hooded pitcherplant, Florida beargrass, yellow butterwort, eastern indigo snake, eastern diamondback rattlesnake, gopher tortoise, wood stork, white-tailed kite, snail kite, crested caracara, Florida sandhill crane, burrowing owl, Florida scrub-jay, Florida grasshopper sparrow, and the Florida panther. Many of KPPSP's invertebrates have not been inventoried. With approximately 30% of all vertebrates and more than 60% of all invertebrates world-wide being nocturnal (Hölker et al. p.681-682), the nighttime environment certainly plays an essential role at KPPSP too.

Hiking, biking, and by horseback are the only permissible ways for the public to navigate the more than 110 miles of trails/firebreaks that cross the fire endemic natural communities (see figure 4). Only resource-based recreation is permitted. Hunting is not permitted in most Florida State Parks. Parks provide a dependable, safe environment for families throughout the year.

There are currently two campgrounds (Family and Equestrian), three primitive camping areas (five sites), one Astro Pad (five observing pads), a bathhouse, horse paddocks, a small visitors center (office), a shop complex, bunkhouse, travel trailer for hosting burn crews/researchers, and four residences (see figure 5, 6). There are sufficient resource-based amenities for visitors and facility support for staff to perform their duties.

Currently there are six full time employees: Park Manager, Environmental Specialist, three Park Services Specialists, and an Administrative Assistant. Resident employees are able to assist visitors after hours and effectively deal with emergencies (wildfires, health, etc.).

The night sky at KPPSP is one of the best in the peninsula of Florida. There are several astronomy groups that venture to the Preserve for imagery, to capture photos, star hopping, Star Parties, Messier Marathons, or to simply gaze into the universe. KPPSP is the first state park to

build an astronomy pad dedicated for the use of observing the night sky. The astronomy pad is located away from the campgrounds to minimize light from campfires and other bright intrusions (see figure 5).

Volunteers are essential in Florida State Parks. Volunteers have worked 10,625 hours in fiscal year 2012-2013 at KPPSP. For the past couple of years, KPPSP has had a resident astronomy volunteer. In one season, he donated ~165 hours in 2 months (average 26.25 hours/week). During 2013-2014, individuals in astronomy groups have been officially donating their time conducting interpretation and outreach to visitors and staff.

In the fiscal year 2012-2013, KPPSP was visited by 19,086 people- this is a 24.3% increase from the year before. Every year there are more and more people that visit KPPSP. The majority of the guests, including astronomers, visit during the cooler months which also correspond with the dry season.

KPPSP is a young management unit. There are still many plans that have not been fulfilled yet. The Florida Trail now ventures through the Preserve. To accommodate Florida Trail hikers, more primitive campsites will be created. A water trail on the Kissimmee River has been proposed and a picnic area may be installed to accommodate river users. The equestrian campground has been hosting more visitors since water and electric were installed at the sites, therefore a bathhouse in the Equestrian campground will eventually be built. There are many other features proposed that will focus attention on the Preserve's natural resources.

There is one inholding within KPPSP. The ~20 acre Olfhaffe property is in the north central area. It is visible in the Figure 2. There is nothing on the 20 acres and no activity is foreseen in the future either.

Maps of Kissimmee Prairie Preserve State Park

Figure 1. Vicinity Map of Kissimmee Prairie Preserve State Park

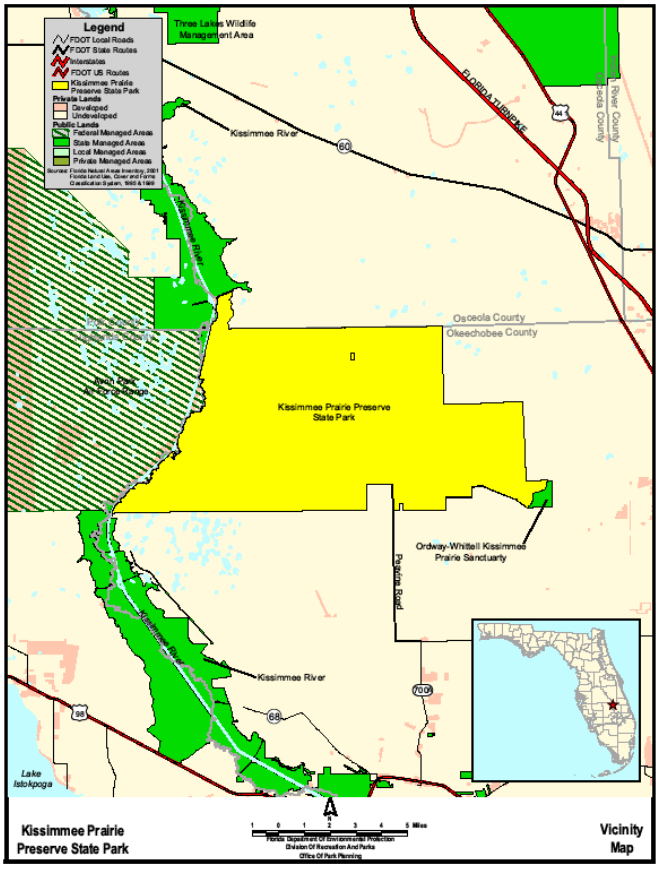


Figure 2. Closer Vicinity Map for Kissimmee Prairie Preserve State Park

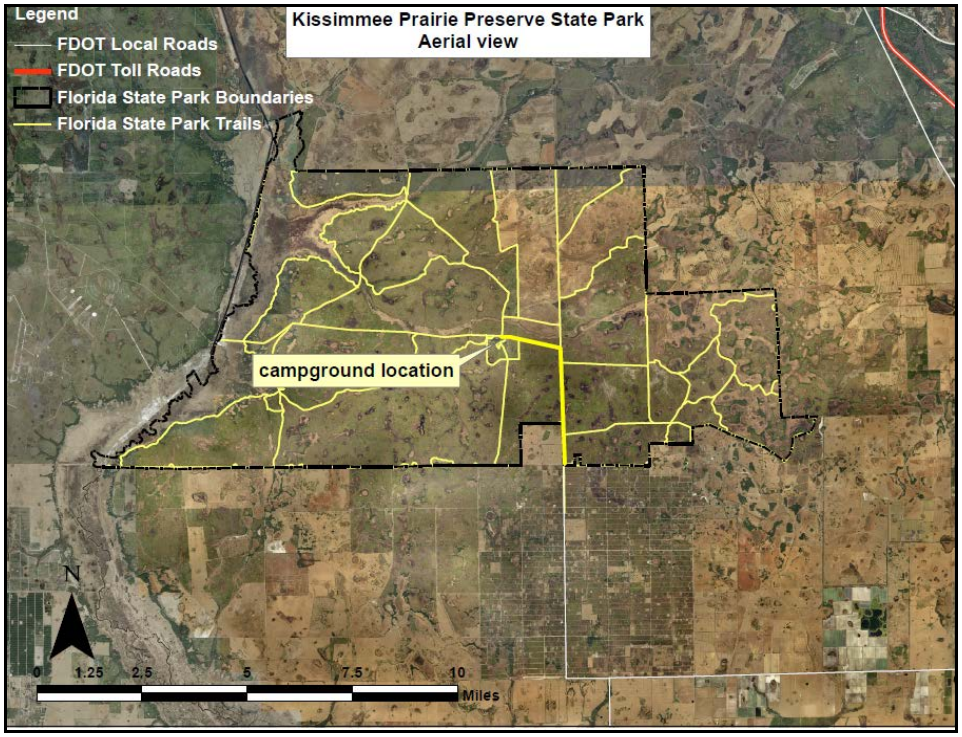


Figure 3. Kissimmee Prairie Preserve State Park Aerial View

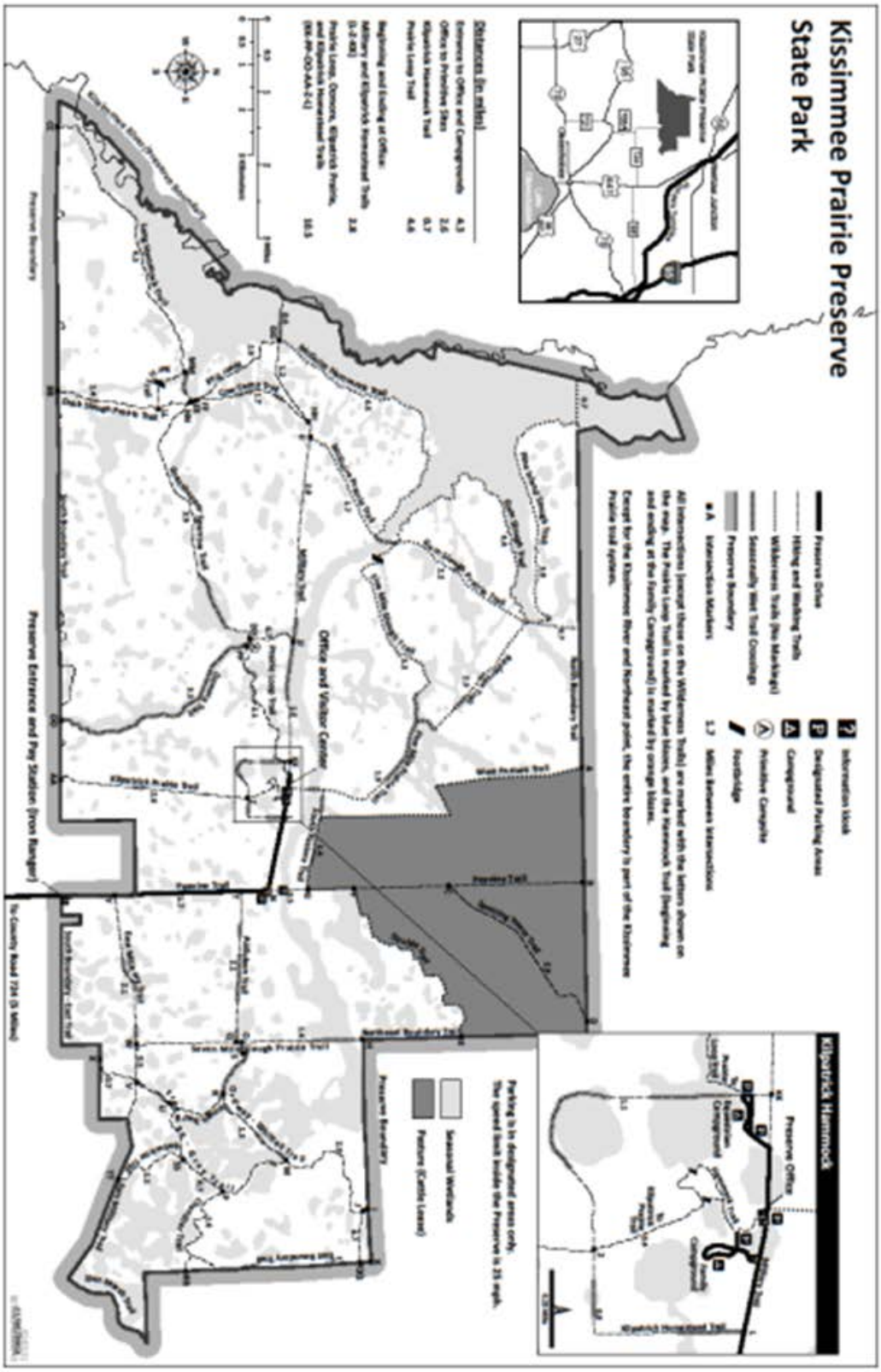


Figure 4. Kissimmee Prairie Preserve State Park Trail Map

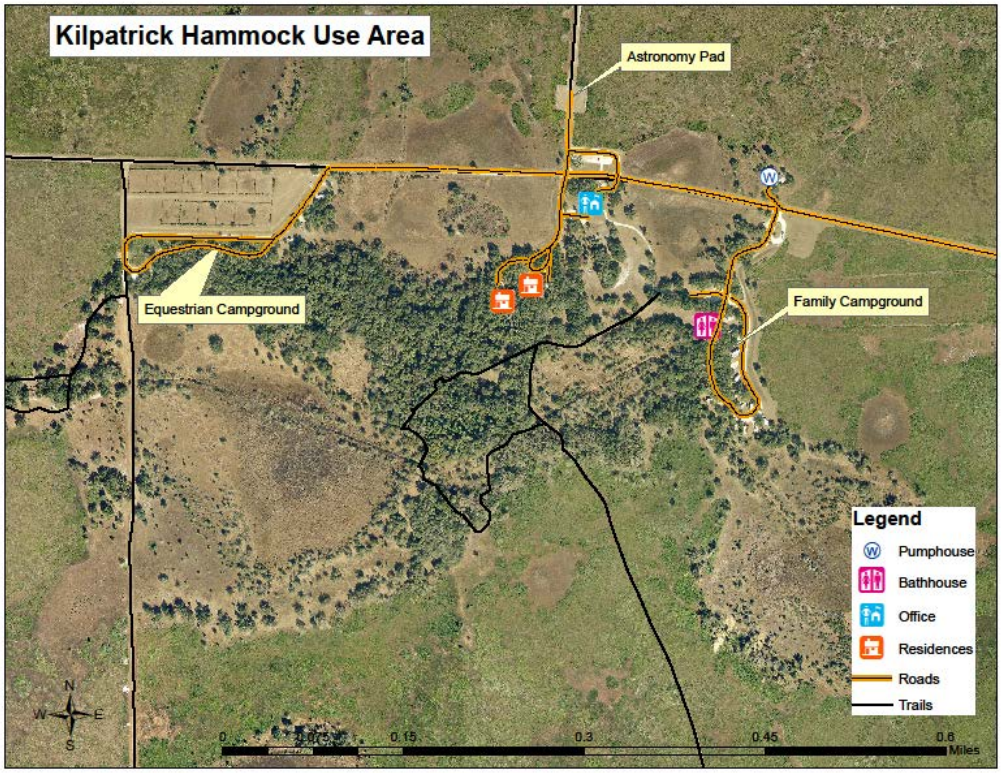


Figure 5. Kilpatrick Hammock Use Area. This area encompasses the two campgrounds, astronomy pad, office, bathhouse, pumphouse, and residences 3 and 4. Also in this area but not labeled is the day use area including parking lots, cooking grills, and picnic tables.

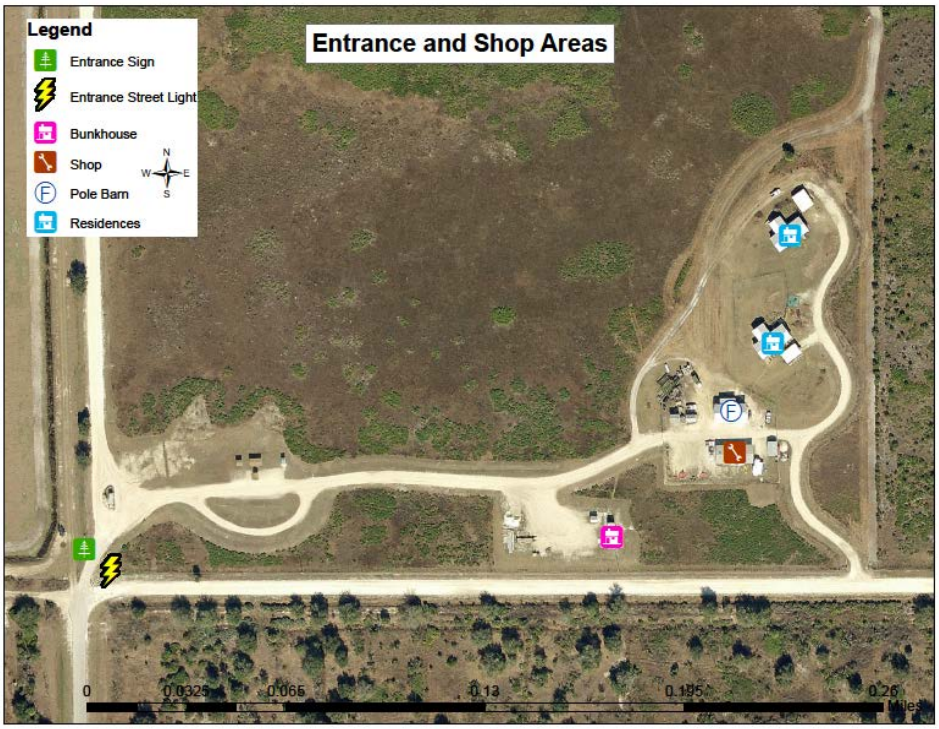


Figure 6. Entrance and Shop Area. This area encompasses the entrance sign, street light, bunkhouse shop, pole barn, and residences 1 and 2.

C) Park Manager Support Letter

Florida Department of Environmental Protection

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Rick Scott
Governor

Carlos Lopez-Cantera
Lt. Governor

Jonathan P. Steverson
Secretary

October 6, 2015

Mr. J. Scott Feierabend, Executive Director
International Dark-Sky
Association 3223 North First
Ave.
Tucson, AZ 85719

Dear Mr. Feierabend,

I am writing in support of the Dark-Sky Designation application being submitted for Kissimmee Prairie Preserve State Park. We here at Kissimmee Prairie Preserve State Park take great pride in our nighttime sky and ability to showcase it for our users, both those already aware and interested in dark skies, and those whom we introduce it to.

Our staff, led by Jennifer Benson-Hughes, have taken great care to reduce our lighting impact and interpret the importance of dark skies to cultural heritage and ecological processes. As we have a small staff with limited hours in the day (and night), I see this designation as a tool in our tool chest (a force-multiplier, if you will) to improve and continue to get our message out to the public.

If you have any questions, please don't hesitate to contact me at Evan.Hall@dep.state.fl.us or my office number, (863)462-5360.

Sincerely,

Evan Hall
Park Manager
Kissimmee Prairie Preserve State Park
Okeechobee Battlefield Historic State Park

D) Bureau of Natural and Cultural Resources -- Letter of Support

Florida Department of Environmental Protection

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Rick Scott
Governor

Carlos Lopez-Cantera
Lt. Governor

Jonathan P. Steverson
Secretary

August 28, 2015

Mr. J. Scott Feierabend, Executive Director
International Dark-Sky Association
3223 North First Ave.
Tucson, AZ 85719

Dear Mr. Feierabend,

I am writing in support of the Dark-Sky Designation application being submitted for Kissimmee Prairie Preserve State Park. Part of the legislative charge of the Florida Park Service is to conserve Florida's natural resources for all time without depleting them. As you know all too well, dark sky has become a much more rare natural condition. You too know of the biological disruptions that can be caused by the loss of dark sky. While the Division has always been aware of these changing of conditions and the value of dark sky, we have not always done all that we could do to protect dark sky. The staff effort at Kissimmee Prairie is serving as a catalyst to remind us of our responsibility and to point out opportunity for improvement.

I had the honor to serve as the manager of Kissimmee Prairie Preserve State as we first opened the preserve to the public. I was part of the team that constructed the campground and developed the first public tours. I was able to welcome the very first astronomy group to the park and was educated with their knowledge and passion. I was also on point for the beginning of the preserve's biological monitoring and resource management programs. While many aspects of the preserve have improved greatly since then, some of the biological indicators we track have not. Hopefully by improving our protection of dark-sky, we will remove one of the environmental stresses of this rare system while improving conditions for the public to enjoy and value dark sky.

Staff have already done an outstanding job improving lighting conditions at the preserve and have identified further additional steps. I intend to use their successes as an example for other state parks to follow. I was part of the Florida team that reviewed and awarded the contract for assessing sea turtle nesting beach lighting conditions on Florida Panhandle public lands which your organization won and completed. In one of the status

Mr. J. Scott Feierabend
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reports I reviewed during the project, one of your staff included a comment that Florida State Parks were already doing a great job with lighting and should be an example for others to follow. It is my hope that by pursing your designation, we will be able to bring additional attention to this issue and be an even better example for others to follow.

Sincerely,

Parks Small, Chief
Bureau of Natural and Cultural Resources
Division of Recreation and Parks
Florida Department of Environmental Protection

PS/jp

E) Park Management Documents Regarding the Night Sky

KPPSP is in the process of updating the Unit Management Plan. It is updated every 10 years. The current UMP for KPPSP (2005) states that "the Preserve is one of only a handful of rare jewels in the State where landscape-level processes may still occur. Daytime vistas of a landscape devoid of man-made objects stretch for several miles. The remoteness of the Preserve from urban areas results not only in a true wilderness character, but what have been called some of the darkest skies in Florida. For these reasons, the Preserve offers the opportunity for the public to experience a part of Florida that has largely disappeared. The Preserve is truly one of the last outstanding natural areas in Florida." (UMP p29). The Preserve's large expanse and isolation makes KPPSP a special natural feature.

Around the world, the nighttime environment is becoming fragmented by human caused light pollution. KPPSP is situated in an area that has been minimally impacted by light pollution and therefore an opportunity exists to protect and preserve the night for future generations of people and wildlife. "The following preserve goals and objectives express the Division's long-term

intent in managing the preserve" (UMP p.5). They also align with the International Dark Sky's objectives.

1. "Improve public awareness and encourage stewardship and protection of the natural resources through education, interpretation, and enforcement of rules and regulations." (UMP p.5)
2. "Protect, restore and maintain native plant and animal diversity, and natural resource abundance." (UMP p.5)
3. "Protect the visual resources and preserve the unique wilderness character of the landscape." (UMP p.6)
4. "Continue to provide quality resource based outdoor recreational and interpretive programs and facilities at the Preserve." (UMP p.6)
    A. "Maintain overnight accommodations, including RV and tent camping."
    B. "Maintain opportunities for picnicking, nature observation, hiking, horseback riding, and biking."
    C. "Interpret the natural and cultural resources through static displays, guided tours, and ranger-led talks and guest speakers."
5. "Seek funding to expand recreational and interpretive opportunities through the improvement of programs and the development of new use areas and facilities, as outlined in this management plan." (UMP p.6-7)
    A. "Pursue funding for construction of a stargazing pad." Update: Astro Pad completed in 2009.
    B. "Develop programs with the local public schools' environmental education programs."
6. "Develop Preserve facilities with the maximum sensitivity to the natural and cultural resources of the state preserve through the application of principles of sustainable design and development." (UMP p.7)
7. "Develop and implement strategies to provide opportunities and to recruit volunteers for the Preserve." (UMP p.7)
8. "Coordinate water resources protection and management activities such as restoration, water quality monitoring, facilities design, permitting, construction and

maintenance with the SFWMD" (South Florida Water Management District), "the DEP" (Department of Environmental Protection) "and others." (UMP p. 7)

9. "Maintain a coordinated network of law enforcement agencies, including the Florida Park Patrol, other state agencies, and applicable local governments for the protection of the natural and cultural resources of the state preserve and its visitors." (UMP p.7)

Other statements from the UMP:

- "The Division will continue to protect the unaltered landscape by burying power and telephone lines and avoiding the construction of any building or structures that would interfere with exceptional views of the open prairies." (UMP p.47)
- "Another exceptional resource, yet often overlooked, is the night sky. Due to the Preserve's remote location and lack of light pollution, this area is home to some of the darkest night sky in all of Florida. This high quality resource attracts astronomers and amateur star gazers from the more populated areas of southern and central Florida." (UMP p.47)
- "The conceptual land use plan for the Preserve recommends development of new facilities…. The intent of these projects will be to provide interpretive programs and guided tours, accommodate picnicking, support astronomical observation, and support an extensive hiking, bicycling, horseback riding, and nature trail network with wildlife observation points and primitive campsite destinations."(UMP p.57)
- "In an effort to help preserve the dark sky over the preserve, the Division is committed to minimizing the impact of light pollution. As new facilities are constructed within the preserve, their lighting systems will include full cut-off lights to be sensitive to the night sky resource and its recreational use for stargazing." (UMP p.61)

Okeechobee County does not have an outdoor lighting policy. KPPSP exceeds the policies of the neighboring communities and municipalities.

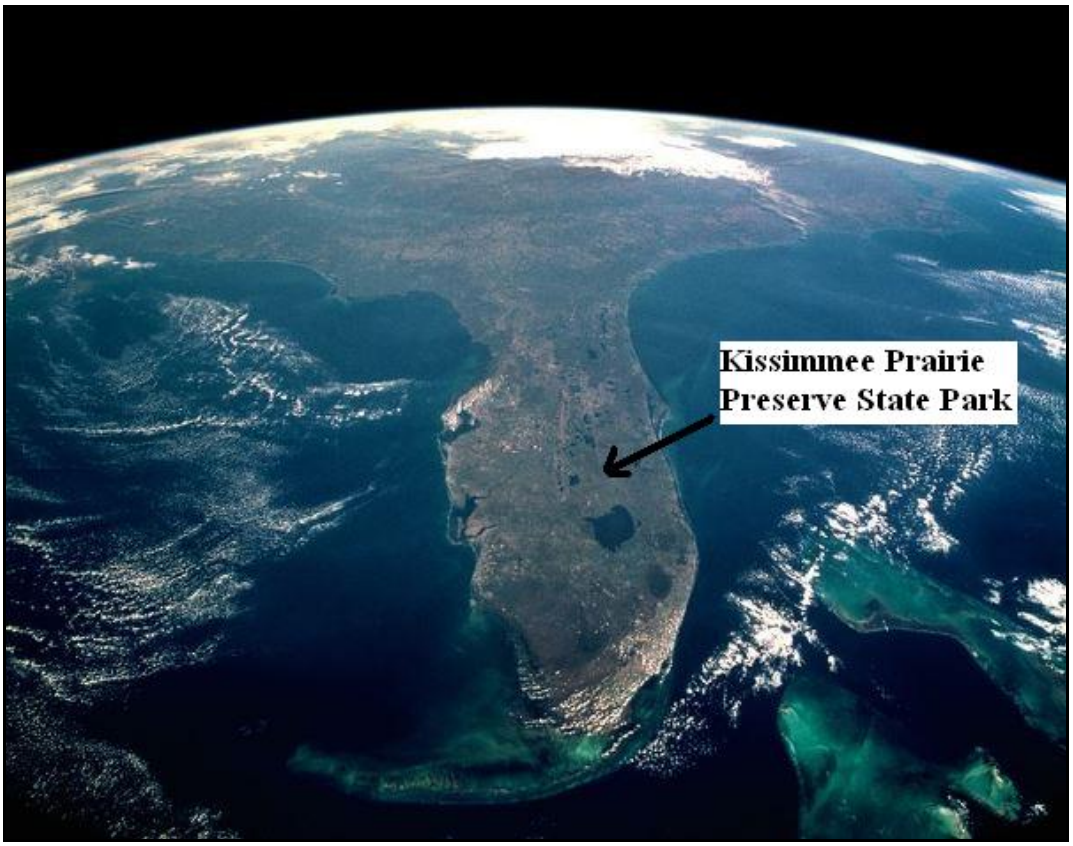


Photo 3. Photograph of Florida taken from space with the location of KPPSP noted. Credit: NASA October 31, 1998.

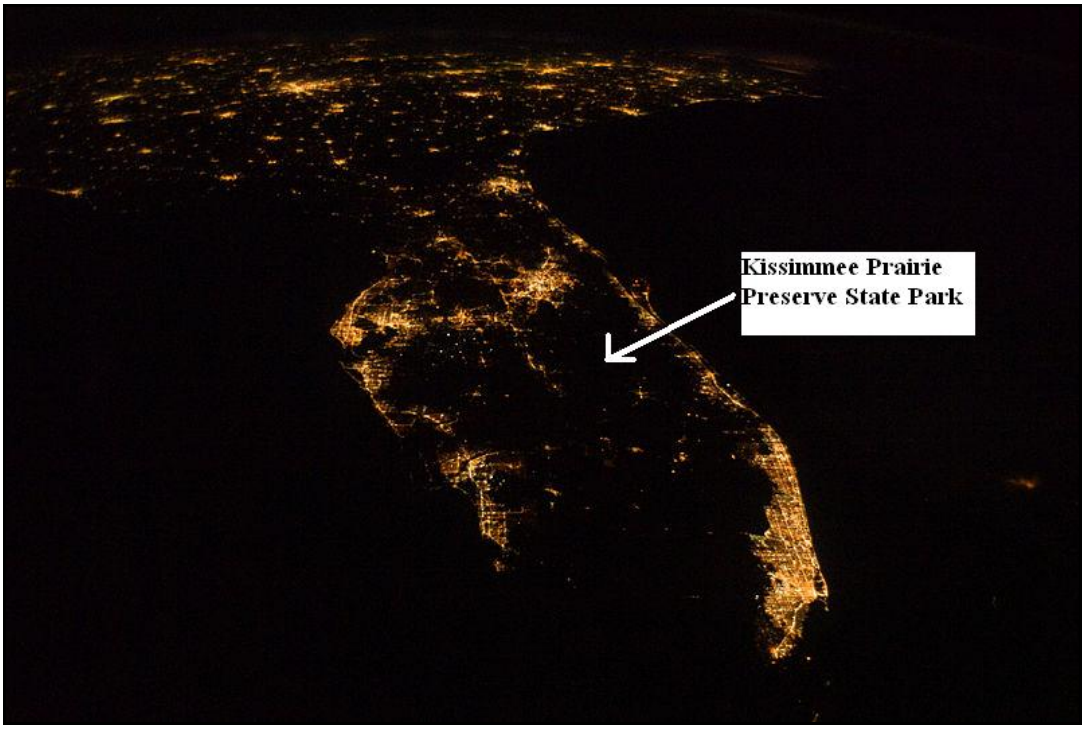


Photo 4. A satellite image of Florida at night as seen from space with KPPSP noted. Image credit: NASA Dec 28, 2010.

F) Florida State Parks Policy

"It shall be the policy of the Division of Recreation and Parks to promote the state park system for the use, enjoyment, and benefit of the people of Florida and visitors; to acquire typical portions of the original domain of the state which will be accessible to all of the people, and of such character as to emblemize the state's natural values; conserve these natural values for all time; administer the development, use and maintenance of these lands and render such public service in so doing, in such a manner as to enable the people of Florida and visitors to enjoy these values without depleting them; to contribute materially to the development of a strong mental, moral, and physical fiber in the people; to provide for perpetual preservation of historic sites and memorials of statewide significance and interpretation of their history to the people; to contribute to the tourist appeal of Florida." This is in accordance with Florida Statutes Chapter 258 and Chapter 62-D of the Florida Administrative Code, the Division of Recreation and Parks. (UMP p.4)

G) Documentation of Data for Kissimmee Prairie Preserve's Noteworthy Resource

Sky Quality Data and Measurement Program

The International Dark Sky Association bestows either a Gold, Silver, or Bronze award to a Dark Sky Park depending on the quality of the night sky. Table 1 describes these tiers in detail and three ways to measurably evaluate the night sky: visual limiting magnitude, the Bortle Sky Class, and the Unihedron sky quality meter. KPPSP is using the Unihedron (SQM- wide view) to assess the sky quality. This monitoring program is maintained by staff or volunteers. In the future this will be continued on a quarterly basis. Other locations can be added in the future.

Indicator	Gold	Silver	Bronze
Philosophy	Nighttime environments that have negligible to minor impacts from light pollution and other artificial light disturbance, yet still display outstanding quality night skies and have superior nighttime lightscapes.	Nighttime environments that have minor impacts from light pollution and other artificial light disturbance, yet still display good quality night skies and have exemplary nighttime lightscapes.	Areas not meeting the requirements of *Silver*, yet still offering people, plants, and animals a respite from a degraded nocturnal environment and suitable for communicating the issue of light pollution and connecting people with the many aspects of the night sky.
Artificial Light and Skyglow	Typical observer is not distracted by glary light sources. Light domes are only dim and restricted to the sky close to horizon.	Point light sources and glary lights do not dominate nighttime scene. Light domes present around horizon but do not stretch to zenith.	Areas with greater artificial light and skyglow than *Silver*, but where aspects of the natural sky are still visible.
Observable Sky Phenomena	The full array of visible sky phenomena can be viewed- eg. Aurora, airglow, Milky Way, zodiacal light, and faint meteors.	Brighter sky phenomena can be regularly viewed, with fainter ones sometimes visible. Milky Way is visible in summer and winter.	Many sky phenomena cannot be seen. Milky Way is seen when pointed out to the average person, as is the Andromeda Galaxy.
Nocturnal Environment	Area is devoid of obvious lights that can cause wildlife disorientation. Artificial light levels are thought to be below the threshold for plant and animal impact. Ecological processes related to nocturnality are unaltered. No lighting atop towers or buildings within park boundary.	Areas that have minor to moderate ground illumination from artificial skyglow. Lights that may cause disorientation to wildlife are distant. Disruption of ecological processes is minor with no impairment to plants or wildlife.	Areas with greater nocturnal impact than Silver, but where ecosystems are still functional.
Visual Limiting Magnitude	Equal or greater than 6.8 under clear skies and good seeing conditions	6.0 to 6.7 under clear skies and good conditions	5.0 to 5.9 under clear skies and good seeing conditions
Bortle Sky Class	1-3	3-5	5-6
Unihedron Sky Quality Meter	>21.75	21.74-21.00	20.99-20.00

Table 1. Gold, Silver, and Bronze Tier Designation from the International Dark Sky Association's Dark Sky Park Designation Guidelines. IDA. May 2013.

The Central Florida Astronomical Society measured the sky quality inside of KPPSP on the Astro Pad on February 3-4, 2014. The lowest reading was 20.78 at 10:00 pm. The highest was 22.12 at 1:00 am (see table 2). They had planned to collect more data but the weather and volunteer's schedule were not in unity.

In May 2014, the Friends of Kissimmee Prairie purchased a Unihedron (SQM- wide view) for the Preserve. KPPSP has been able to opportunistically record sky measurements since then. Data collected during the summer (wet season) will be less favorable than observations made during the winter (dry season). The readings have been consistently silver quality. The cooler months are the best viewing months for night sky activities. Most of our visitors travel to KPPSP during the chiller months, only a few durable guests venture into the prairie during the challenging summer (heat, humidity, dew, *mosquitos*, etc). Seasonality and camper occupancy demarcate the quality of sky that would be viewed by most people.

Sky Quality Measurements_ Unihedron				
Date	Time (24hrs, EDS)	Location	Reading (mag/sq. arcsecond)	Observer
2/4/2014	0100	Astro Pad	22.12	Derek Demeter
5/16/2014	test	Residence 2	21.00	Jen Benson-Hughes
5/28/2014	2300	S	21.47	Jen Benson-Hughes
5/29/2014	2200	Residence 2	21.02	Jen Benson-Hughes
7/27/2014	1015	Residence 2	21.32	Jen Benson-Hughes
8/25/2014	2152	Trail Map N	21.30	Jen Benson-Hughes
8/25/2014	2218	Trail Map Q	21.22	Jen Benson-Hughes
8/25/2014	2252	Trail Map P	21.23	Jen Benson-Hughes
8/25/2014	2322	Audubon Boundary Gate	21.22	Jen Benson-Hughes
8/25/2014	2332	Residence 2	21.25	Jen Benson-Hughes
8/30/2014	2325	Astro Pad	21.34	Jim Pickering
8/31/2014	0039	Astro Pad	21.40	Jim Pickering
8/31/2014	0145	Astro Pad	21.54	Jim Pickering
8/31/2014	0320	Astro Pad	21.51	Jim Pickering
8/31/2014	0440	Astro Pad	21.47	Jim Pickering
8/31/2014	0520	Astro Pad	21.38	Jim Pickering
1/16/2015	2100	Astro Pad	21.20	Bill Nigg
1/17/2015	0345	Astro Pad	21.46	Bill Nigg
1/17/2015	2045	Astro Pad	21.30	Bill Nigg
1/17/2015	0440	Astro Pad	21.46	Bill Nigg
1/20/2015	2330	Astro Pad	21.31	Bill Nigg
1/21/2015	2122	Astro Pad	21.16	Bill Nigg
2/11/2015	2040	Astro Pad	21.18	Bill Nigg
2/11/2015	2330	Astro Pad	21.28	Bill Nigg
2/12/2015	2115	Astro Pad	21.26	Bill Nigg
3/20/2015	2215	Rain Guage	21.39	Paul Miller
3/20/2015	2215	Rain Guage	21.36	Paul Miller
3/20/2015	2215	Rain Guage	21.39	Paul Miller
3/23/2015	2350	Near Office	21.56	Paul Miller
3/23/2015	2350	Near Office	21.53	Paul Miller
3/23/2015	2350	Near Office	21.44	Paul Miller
4/18/2015	0122	Residence 2	21.12	Chris Clauson
4/19/2015	0418	Residence 2	20.78	Chris Clauson
4/20/2015	2215	Residence 2	21.27	Chris Clauson
4/20/2015	2120	Residence 2	21.20	Missy Clauson
5/17/2015	0157	Residence 2	21.24	Chris Clauson
5/17/2015	2118	Residence 2	20.93	Chris Clauson
5/19/2015	0307	Residence 2	21.14	Missy Clauson
5/20/2015	0520	Residence 2	20.82	Missy Clauson
5/21/2015	0208	Residence 2	21.26	Chris Clauson
6/7/2015	2154	Residence 2	21.34	Missy Clauson
6/14/2015	2400	Residence 2	21.34	Missy Clauson
6/15/2015	2253	Residence 2	21.32	Missy Clauson
6/16/2015	2215	Residence 2	21.32	Chris Clauson
6/17/2015	2308	Residence 2	21.42	Missy Clauson
6/18/2015	2205	Residence 2	21.26	Chris Clauson
7/16/2015	2240	Residence 2	21.12	Chris Clauson
7/18/2015	2130	Residence 2	20.76	Missy Clauson
7/20/2015	2240	Residence 2	21.27	Chris Clauson
7/21/2015	0300	Residence 2	21.26	Chris Clauson
7/22/2015	0320	Residence 2	21.20	Chris Clauson

Table 2. KPPSP Unihedron Sky Quality Measurements (copied on 7/25/2015)

Satellite Pictures

There are several websites on the internet that have good satellite data available to the public. The Night Sky in the World and Blue Marble Navigator are 2 websites that are user friendly. Maps from "The World Atlas of Artificial Sky Brightness", which is on The Night Sky in World's website, show the brightness (artificial lights) of the night sky at sea level (see figure 7,8). This allows the viewer to identify areas of high and low light pollution and to identify specific areas that are larger sources of light pollution, without the added variable of elevation. These maps were intended to show atmospheric levels of light pollution. The areas with less light in the atmosphere are the darker areas. KPPSP is located in one of the blue sections. Black areas are no longer found in the peninsula of the state. Black areas are found only in the panhandle of Florida.

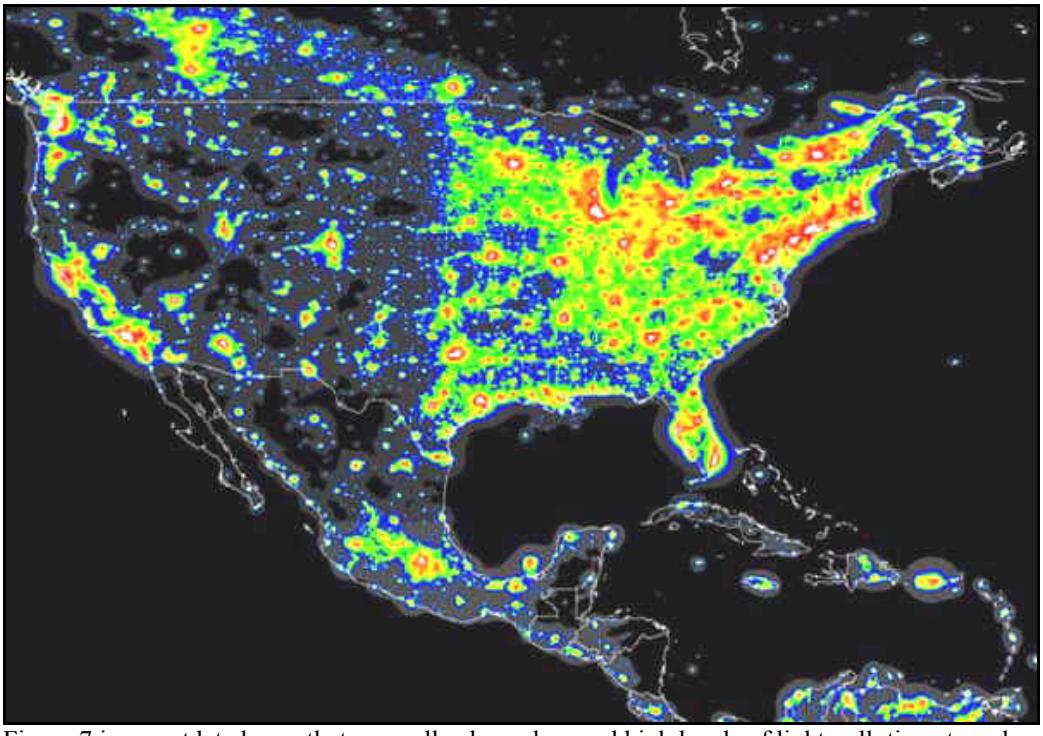


Figure 7 is an outdated map that generally shows low and high levels of light pollution at sea level of the United States and Mexico. Credit: Cinzano, P et al. 1998.

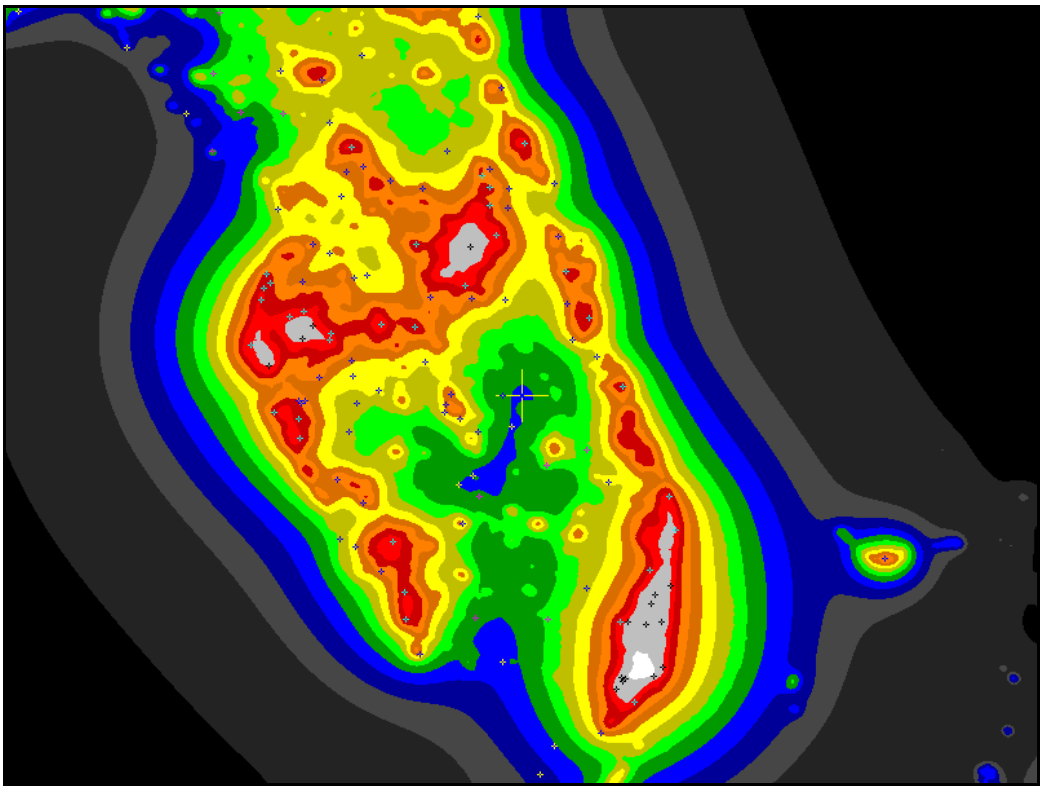


Figure 8 shows levels of light pollution at sea level in central Florida. There are areas of dark blue that indicate low levels of light pollution. The large cross is where KPPSP is located. 2014. Danko. Image credit: David Lorens (University of Wisconsin-Madison).

Blue Marble Navigator shows the lights at night for 2010, 2012, and 2014. Each image looks a little different due to mapping brightness techniques (see figures 9, 10, 11). The captions under the figures explain the differences between each image.

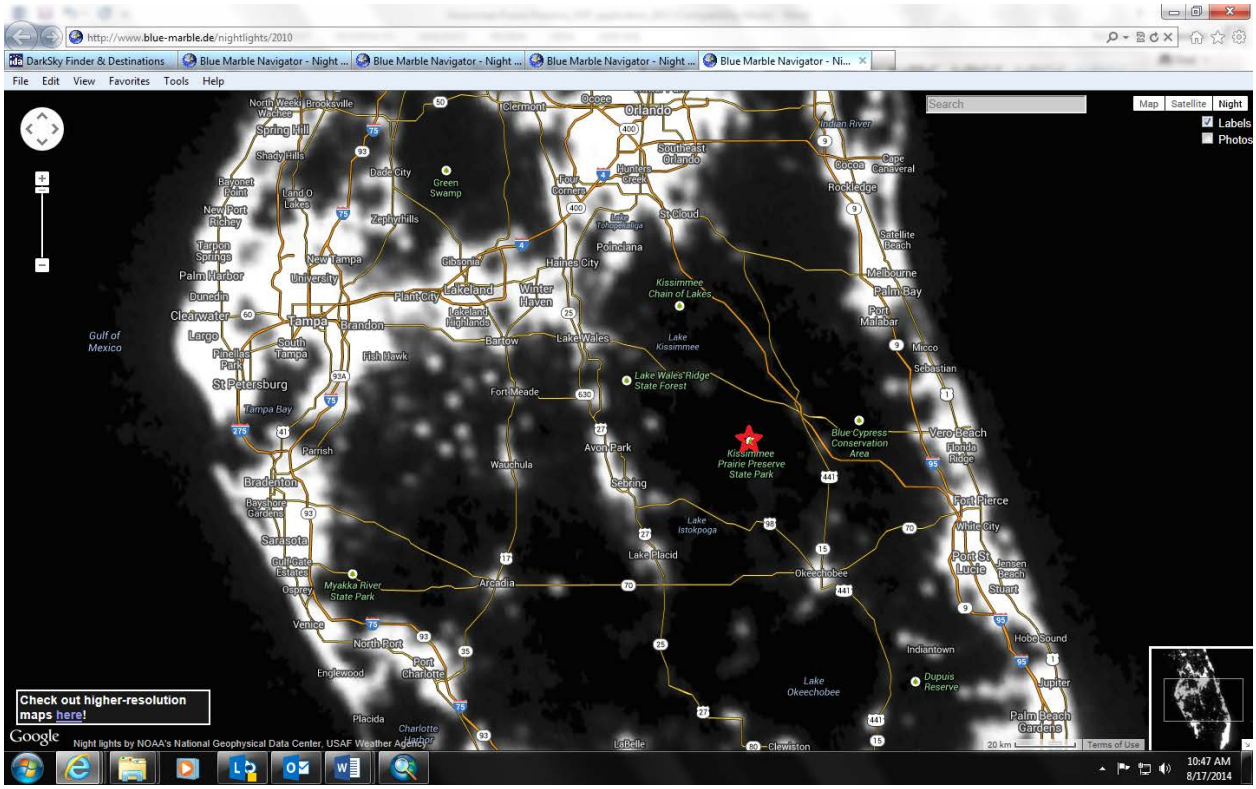


Figure 9. Screen capture shows lights at night in 2010 in central Florida (KPPSP labeled) using technology from the 1970s. Main roads in the area and population centers (cities) are mapped.
Image from Blue Marble Navigator 2010. Google and night lights by NOAA's National Geophysical Data Center, USAF Weather Agency. Sensor: Operational Linescan Systerm (2.7km/pixel, since 1976). Satellite: F-series of the Defense Meteorological Satellite Program. Data: Mosaic created by National Geophysical Data Center's Earth Observational Group.

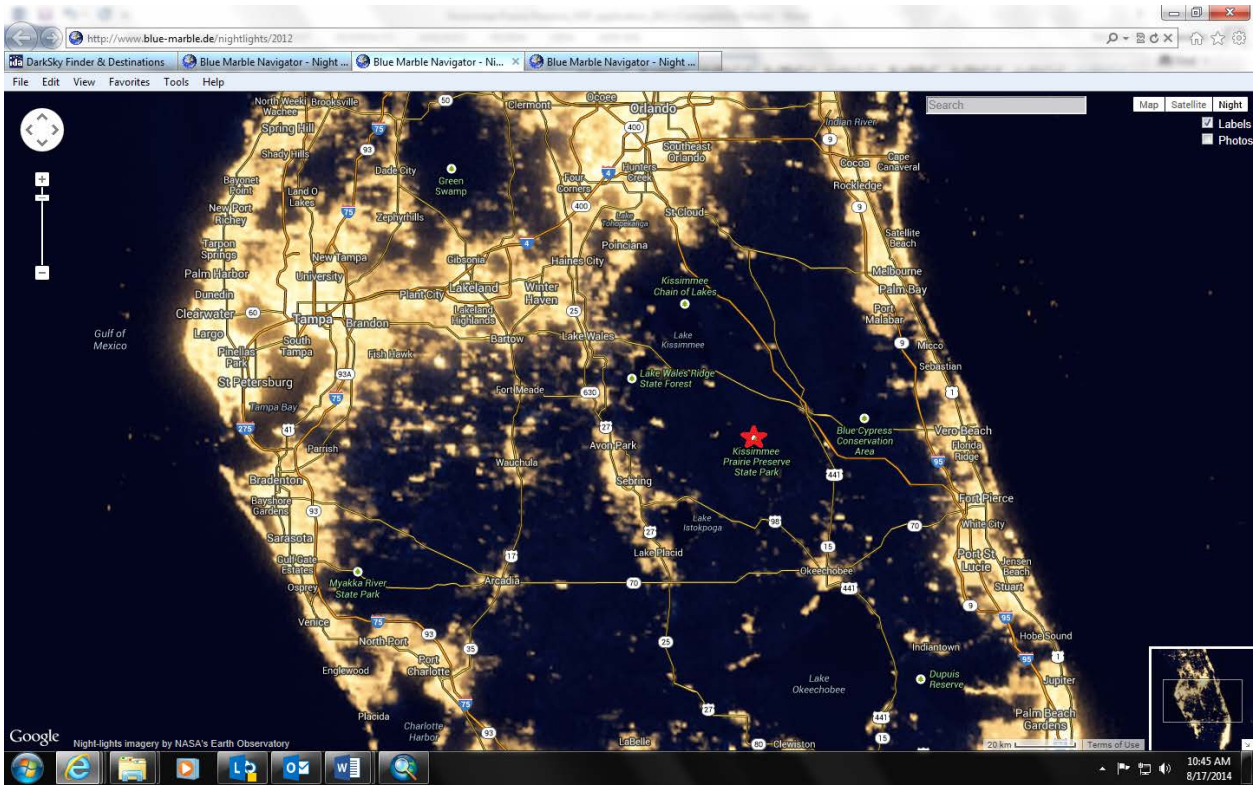


Figure 10. Screen capture shows lights at night in 2012 in central Florida (KPPSP labeled) with updated satellite images. Main roads in the area and population centers (cities) are mapped. NASA enhanced the images by adding yellow tint and by placing them on a bluish background. This image does show town lights but the refined variances in cities is missing.

Image from Blue Marble Navigator. April and October 2012. Google and Night-lights imagery by NASA's Earth Observatory. Sensor: Visible Infrared Imaging Radiometer Suite (0.7 km/pixel, since 2011). Satellite: Suomi National Polar-orbiting Partnership of the Defense Meteorological Satellite Program. Data: night and day composited by NASA's Earth Observatory.

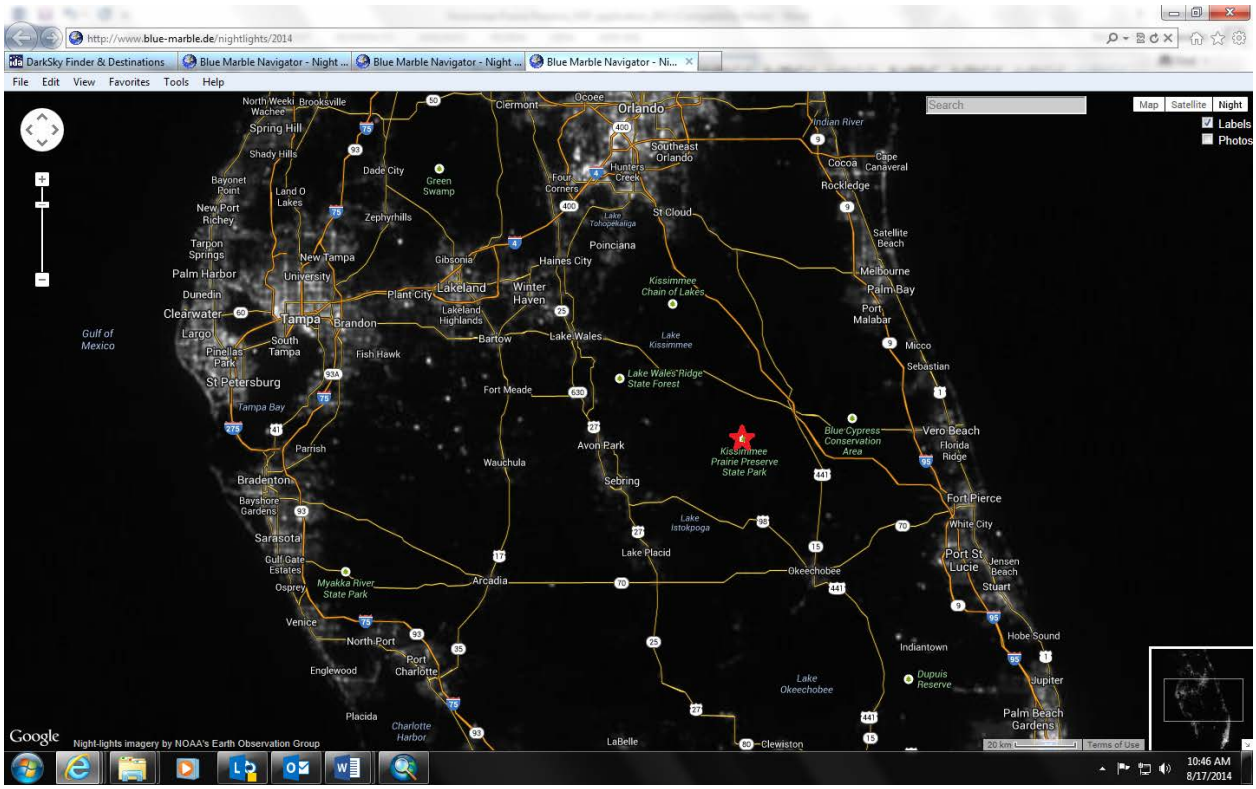


Figure 11. Screen capture shows lights at night in 2014 in central Florida (KPPSP labeled) with updated satellite images. Main roads in the area and population centers (cities) are mapped. In order to see the small changes between city lights, NASA used a different brightness mapping technique than in 2012.
Image from Blue Marble Navigator. 2014. Google and Night-lights imagery by NOAA's Earth Observation Group. Sensor: Visible Infrared Imaging Radiometer Suite (0.7 km/pixel, since 2011). Satellite: Suomi National Polar-orbiting Partnership of the Defense Meteorological Satellite Program. Data: Mosaic created by National Geophysical Data Center's Earth Observation Group.

Climate and Weather of South Central Florida

Written by: Derrick Weitlich, Climate Program Leader at The National Weather Service in Melbourne, FL

"The climate across central Florida can generally be split into two different regimes: the wet season and the dry season. The wet season generally runs from late May through mid-October and is characterized by an increase in moisture and rainfall due to daily sea breeze generated showers and thunderstorms across the area. The overnight and early morning hours tend to remain dry with an increase in convection and cloud cover into the afternoon and early evening period. Temperatures during the wet season are typically less variable with highs normally in the upper 80s to low 90s and lows in the lower 70s."

"The dry season, which normally occurs from late October through early May, is marked by lower humidity values and a general lack of sea breeze boundary activity. Therefore these months tend to be drier with the main source of precipitation and cloud cover being from storm systems and frontal boundaries that cross the area. Temperatures have a larger range during the dry season. Normal highs fluctuate from the low to mid 80s during the early and late portions of the dry season to the low to mid 70s through the winter months. Likewise, average minimum temperatures can vary from the low to mid 60s early and late in the season to the upper 40s to low 50s during the peak of the winter. Freezing temperatures can happen during the winter months, but usually not often, occurring on average just a couple nights each year. However, some years freezing temperatures may not occur at all."

Photo 5 by Stan Czaplicki of the Milky Way from the main drive during a lightning storm in August 2013.

"Tropical Cyclones and the El-Niño and Southern Oscillation (ENSO) pattern can also play a huge role in rainfall across the region throughout the year. The Atlantic tropical season runs from June 1st through November 30th. However much of tropical activity that impacts the area occurs during the peak of the tropical season from August through October. Storm systems that impact the region during the dry season are usually heavily dependent on the phase of the ENSO pattern over the equatorial Pacific waters. During times of El Niño, or warmer than normal sea surface temperatures (SSTs) over the tropical Pacific, a higher number of storm systems typically push across Florida, which in turn brings above normal rainfall and generally more severe weather to the region. This pattern is reversed during times of La Niña, or cooler than normal SSTs over the tropical Pacific waters, with the passage of fewer storm systems and ordinarily below normal rainfall amounts during the winter and much of the spring."

Clear Sky Charts

The Clear Sky Chart for KPPSP is an online reference for amateur astronomers to determine if it is going to be a good night for telescope observing. The chart shows the viewing conditions for the next 48 hours. Other useful tools on their site include a satellite image and topographic map of KPPSP, star maps, satellite predications, and others. (Danko. 2015).

Visitor Photographs

Here is a sample of photographs taken by visitors that show the landscape with the night sky. There have been many astrophotographs donated to KPPSP. We have only included those with landscapes. The light domes in the photos have been increasing in size. We hope that with our encouragement and example, communities will begin to value the benefits of a dark night sky.

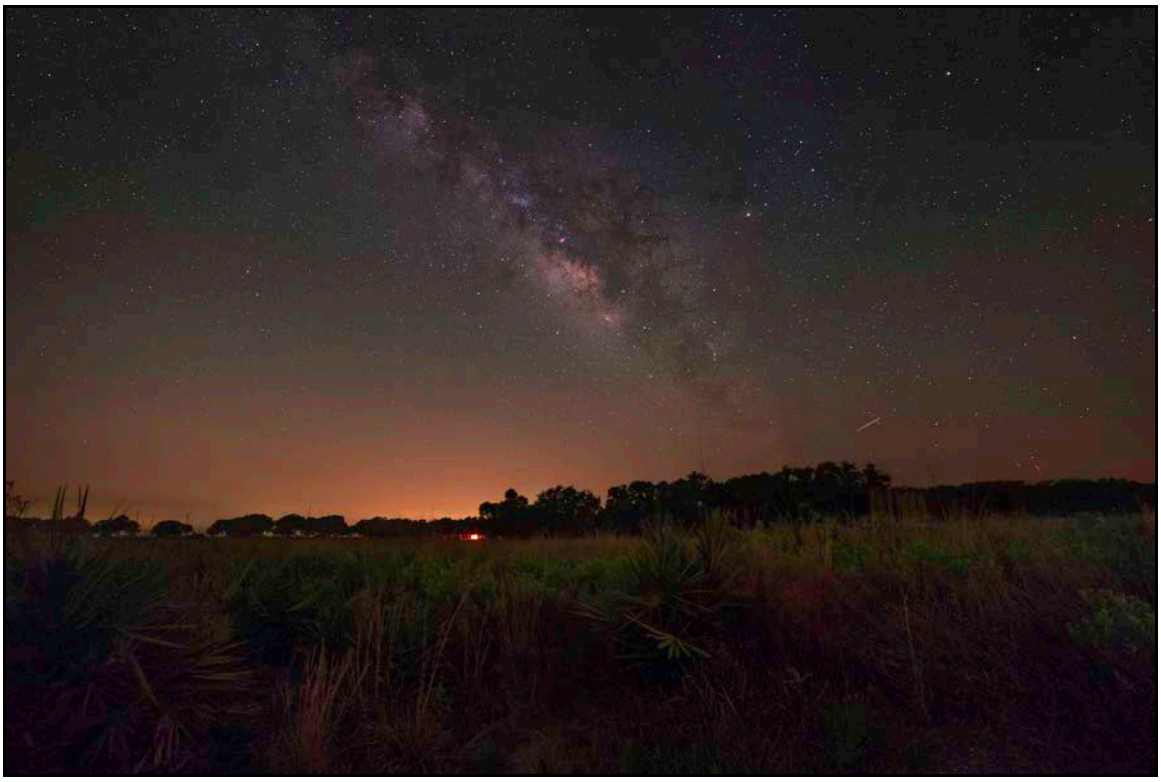


Photo 6 by Derek Demeter taken from the Astro Pad on April 28, 2014 showing the red bathroom lights in the Family Campground and a firefly. The light dome in the background is possibly from the city of Okeechobee.

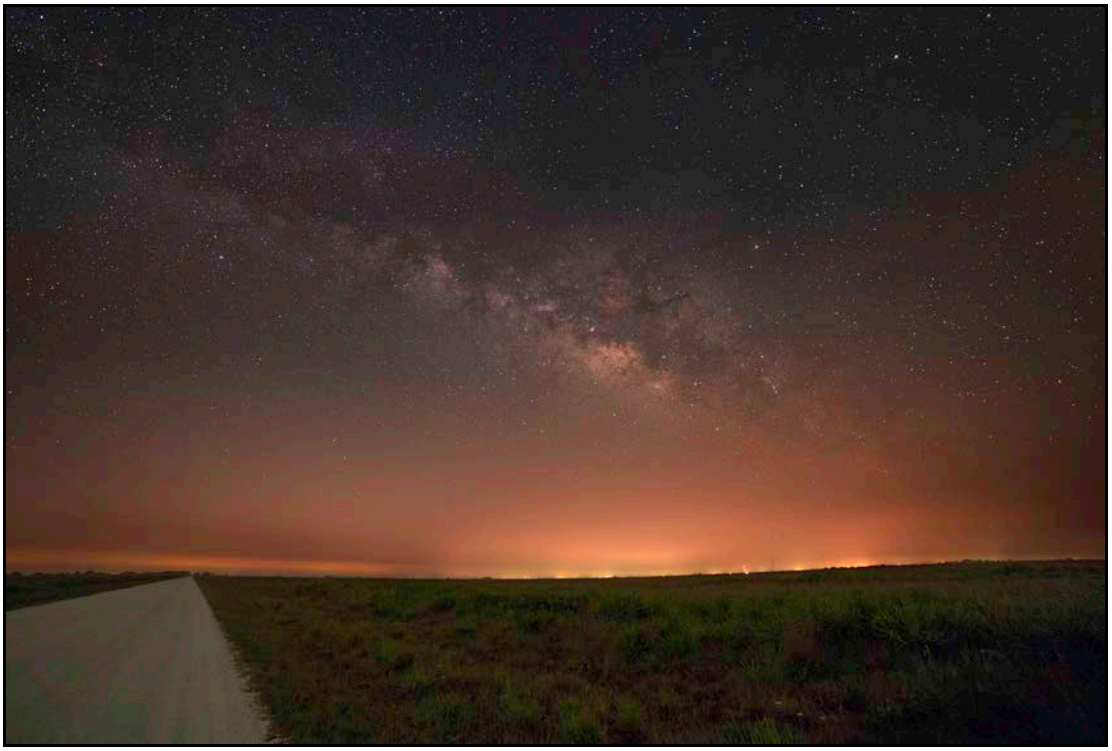


Photo 7 by Derek Demeter taken on the main drive at KPPSP looking east on April 28, 2014. The light dome is possibly from the Florida Turnpike Fort Drum service plaza or the State Prison on US 441.

Photo 8 by A. Kulikauskas in February or March 2014 during a meteor shower. The light dome is possibly from the city of Kissimmee.

Photo 10 by Chris Clauson in February 2015. KPPSP's Astro Pad glowing red from astronomy viewing**.** The light dome is the city of Kissimmee.

Photo 11 by Stan Czaplicki in August 2015. Perseids Meteor Shower.

Letters of Support from Astronomy Groups

Central Florida Astronomical Society, Inc.
Treasurer — Post Office Box 620907— OVIEDO, Florida 32762
Voice 407-971-0143 FAX 407-971-0143

August 17, 2014

International Dark Sky Association
3223 N First Ave.
Tucson, AZ 85719

Re: Kissimmee Prairie Preserve State Park Dark Sky Park Application

To Whom It May Concern,
We, the board members and officers representing the membership of the Central Florida Astronomical Society, Inc. (CFAS) most strongly support the designation of the Kissimmee Prairie Preserve State Park (KPP) as an International Dark Skies Park. As an amateur astronomy organization we greatly appreciate the exceptional dark sky that this location affords our membership and the general public, and recognize the significant efforts that the KPP staff are providing to maintain the skies pristine here and in the surrounding community.

Our organization that was founded in 1977 has watched with concern the steady decline of the quality of the night sky in Florida. Since then our dark sky viewing sites have moved from 20 miles from the Orlando area to now over 100 miles. KPP is now one of the very few locations available in the entire state of Florida that not only provides skies adequate for serious astronomy work, but also is available for the general public to see firsthand the wonders of the night sky including viewing the Milky Way from horizon to horizon.

Recognizing the significance of their skies, KPP established an astronomy viewing area separate from the campsite areas, but in an area convenient for the public to enjoy the night sky through a telescope or view an uninterrupted 360 degree view of the heavens. Since its inception KPP has worked with all the local astronomy organizations, and has been steadfast in preserving the darkness of the site. For example CFAS provides calibrated light meter readings along with Unihedron Sky Quality Meter readings to the KPP staff so they can monitor the dark sky quality scientifically. These readings show the site to meet the requirements of a Gold class site. CFAS also provides monthly astronomy programs for the general public at the site, and has worked with the State Park Service Specialists to ensure the park lighting remains dark sky friendly, and is available to assist with presentations to local businesses and government entities on the importance of reducing light pollution in the area.

Beyond astronomy and the ecotourism, we share the KPP staff's recognition that the protection of the dark skies through the prevention of light pollution offers many additional benefits that align with the Preserve's management plan, including the protection of our natural wildlife species and the preservation of the significance of KPP representing one of the original Florida frontiers and now one of the last dark sky sites.

CFAS fully supports the efforts of KPP to achieve designation as an International Dark Sky Park, and we most strongly ask that you approve their application.

Sincerely ,
The 2014 Board of Directors, Central Florida Astronomical Society,
Francisco Gonzalez, President Derek Demeter, Vice president

Walt Hamler, Secretary Mark Femminineo, Treasurer

Bill Koestring and Bob Vogel, Board Members at Large

TREASURE COAST ASTRONOMICAL SOCIETY, INC.

April ___, 2014

International Dark-Sky Association
3223 N. First Avenue
Tucson, Arizona 85719

Re: Kissimmee Prairie Preserve State Park – Application for Dark Sky Park (DSP) designation

Ladies and Gentlemen:

The members and directors of the Treasure Coast Astronomical Society, Inc. ("TCAS"), have voted unanimously to endorse and support the designation of Kissimmee Prairie Preserve State Park as a Dark Sky Park by the International Dark-Sky Association. We are an astronomy club with over 60 members based in Ft. Pierce, Florida with our base of operations at Indian River State College. As a club and as individual amateur astronomers, we utilize the dark skies of Kissimmee Prairie Preserve State Park dozens of time a year. At the park, we use our telescopes and our knowledge of the night sky to share the wonders of the universe with the park's campers and visitors.

Florida has lost almost all of its dark skies. In south and central Florida the only dark skies which remain intact are deep in the Everglades and the dark oasis of Kissimmee Prairie Preserve State Park. The administrators, specialists, and park rangers at Kissimmee Prairie Preserve State Park recognize the valuable resource which its dark skies provide and the need to protect and preserve this unique nocturnal environment. They have been very accommodating and supportive of TCAS, its members, the members of other astronomy clubs in central Florida and individual amateur astronomers. The park has created a specific wide-horizon camp site for astronomers to utilize in their observations and studies and in educational programs for campers and visitors. The need to preserve dark skies everywhere and to promote the reduction of light pollution is a core element in Kissimmee Prairie Preserve State Park's educational programs.

The designation of Kissimmee Prairie Preserve State Park as a Dark Sky Park will serve as a catalyst to promote and improve light pollution reduction efforts in the surrounding counties and municipalities. This will not only enhance the dark sky environment in the park, but will also result in darker skies and habitats in what is now the over-illuminated urban and suburban areas of a growing state. The attention which a Dark Sky Park will bring to the center of the state will coordinate with the coastal effort to reduce beachfront light pollution for the sake of sea turtle nesting habitats. The net result will be beneficial to the native fauna and flora, amateur astronomers, nature lovers, campers, visitors and the general public of our great state.

The designation of Kissimmee Prairie Preserve State Park as a Dark Sky Park by the International Dark-Sky Association will be greatly appreciated.

Sincerely yours,

David Brown, President

Indian River Astronomical Society
Vero Beach, Florida

May 29, 2014

Kissimmec Prairie Preserve State Park

Ms. Jen Benson-Hughes

Dear Jen,

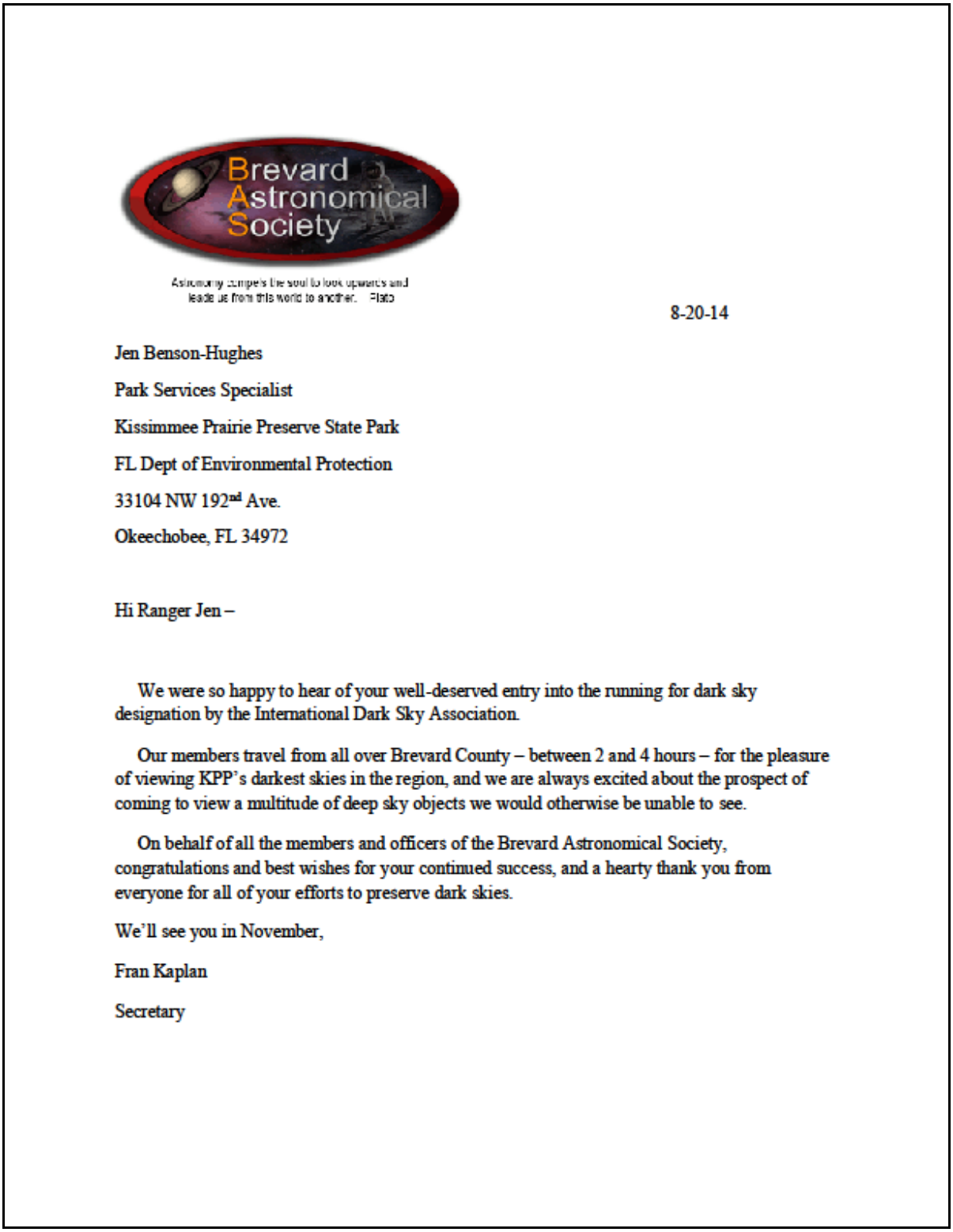
Please accept this letter as our support of designating the park as a dark sky park by the IDA.

As you may know, our club was instrumental in the creation of the astronomy sites at the park.

I might add that the park is, in our opinion, darker than the sites for 2 of the biggest star parties in this country, Chiefland Star Party in Chiefland, and the Winter Star party in the Keys.

Sincerely,

Treasurer and Director


Brevard Astronomical Society

Astronomy compels the soul to look upward and leads us from this world to another. Plato

8-20-14

Jen Benson-Hughes

Park Services Specialist

Kissimmee Prairie Preserve State Park

FL Dept of Environmental Protection

33104 NW 192nd Ave.

Okeechobee, FL 34972

Hi Ranger Jen –

We were so happy to hear of your well-deserved entry into the running for dark sky designation by the International Dark Sky Association.

Our members travel from all over Brevard County – between 2 and 4 hours – for the pleasure of viewing KPP's darkest skies in the region, and we are always excited about the prospect of coming to view a multitude of deep sky objects we would otherwise be unable to see.

On behalf of all the members and officers of the Brevard Astronomical Society, congratulations and best wishes for your continued success, and a hearty thank you from everyone for all of your efforts to preserve dark skies.

We'll see you in November,

Fran Kaplan

Secretary

Brevard Astronomical Society has an informative video that has a segment on KPPSP available on YouTube (Saunders 2014). They have filmed KPPSP and interviewed a staff member in 2014. They will be filming more this fall and the final editing will be completed in the spring 2016. Their new video will highlight KPPSP.

H) Lighting Inventory

**Refer to Appendix – KPPSP Lighting Inventory Photos

Location	Fixture (**Letter.Number** is associated with photos Example A.1 = office back door photo)	Fully-Shielded	Special Purpose <600 lumens	Application	Conformity With LMP
Office Area	**A.1**) 1 – Back door light- painted black shield	Yes	No	Switch light for back door and platform area	Yes- SEE PLAN
	A.2) 9 – Recessed lights in ceiling– high efficiency LED or Halogen	Yes	No	Switch light used sparingly (only when night operations occur- fire, etc)	Yes
Astronomy Pad	**B.1**) 1 – 75 watt flood light	No	No	Switch light to service electric panel (not used)	No – SEE PLAN
Family Campground	**C**) None- except what campers bring with them -no photo-	-	No	-	SEE PLAN
Equestrian Campground	**D**) None- except what campers bring with them -no photo-	-	No	-	SEE PLAN
Bathhouse	**E.1**) 1 – Back door light - compact florescent- painted black shield	Yes	No	Switch light for door into the chase	Yes– SEE PLAN
	E.2) 8 - Recessed lights with red lenses in ceiling. high efficiency LED or Halogen	Yes	No	illuminate the access to the bath house (dusk-dawn)	Yes
	E.3) Indoor high efficiency LEDs or Halogen	Yes	No	Inside switch lights	Yes

Location	Fixture (**Letter.Number** is associated with photos Example A.1 = office back door photo)	Fully-Shielded	Special Purpose <600 lumens	Application	Conformity With LMP
Pumphouse	**F.1**) 6- fluorescent tube lights	Yes under ceiling	No	Switch lights to illuminate the pumphouse area	Yes
	F.2) 1 - flood light	No	No	not used	No- SEE PLAN
Front Entrance	**G.1**) 1 – Solar powered low wattage florescent	No	No	Lights the entrance sign (dusk- dawn)	No - SEE PLAN
	G.2) Street/Gate 1- LED Light 106W	Yes	No	Lights the entrance area (dusk – dawn)	Yes- SEE PLAN
Bunkhouse	**H.1**) White Turtle Friendly Wall Downlight with amber PAR 4 LED bulb	Yes	No	Switch light to illuminate the south door	Yes
	H.2) White Turtle Friendly Wall Downlight with amber PAR 4 LED bulb	Yes	No	Switch light to illuminate the north door	Yes
Shop	**I.1**) 5 – outside lights compact florescent	No	No	Exterior switch lights by doors	No- SEE PLAN
	I.2) 4 sets of 2 – 75W flood lights	No	Yes	Emergency Use Only	No- SEE PLAN
Pole Barn	**I.3**) 3 - florescent tube lights under ceiling- 40W	Yes	No	Switch light to Illuminate inside of pole barn	Yes
	I.4) 1 set of 2 - flood lights- NOT in SERVICE	No	No	Not used	Yes- SEE PLAN

Location	Fixture (**Letter.Number** is associated with photos Example A.1 = office back door photo)	Fully-Shielded	Special Purpose <600 lumens	Application	Conformity With LMP
Travel Trailer	**J.1**) 1 - outside light w/ small camper bulb	No	No	switch light for entry door	No- SEE PLAN
	J.2) 1- outside light with small camper bulb	No	No	switch light for propane area of trailer	No- SEE PLAN
Residence 4 (Bldg. 17)	**K.1**) 1 - Outside light – compact Florescent (orange bulb)	Yes (under ceiling)	No	switch light for entry door	Yes- SEE PLAN
	K.2) 1 – porch light -no photo-	Yes (under ceiling)	No	switch light to Illuminate porch	Yes
Residence 3 (Bldg. 18)	**L.1**) 1 - outside light – compact florescent (red bulb)	Yes (under ceiling)	No	switch light for entry door	Yes- SEE PLAN
	L.2) 1 - porch light	Yes (under ceiling)	No	switch light to Illuminate porch	Yes
Residence 2	**M.1**) White Turtle Friendly Wall Downlight with amber PAR 4 LED	Yes	No	switch light for entry door	Yes
	M.2) White Turtle Friendly Wall Downlight with amber PAR 4 LED	Yes	No	switch light to Illuminate porch	Yes
	M.3) 1- flood light -no photo- NOT in SERVICE	No	No	not used	Yes- SEE PLAN
Residence 1	**N.1)** 1- White Turtle Friendly Wall Downlight	Yes	No	switch light for entry door	Yes
	N.2) 1- White Turtle Friendly Wall Downlight	Yes	No	switch light to illuminate porch	Yes

I) Lightscape Management Plan

The default policy of KPPSP will to *not* use a light unless a specific safety concern dictates otherwise. A 500 lumen limit for unshielded lighting will be adhered to as well a color temperature cutoff for future lighting installations of 4000 K. Ninety percent of the current lights at KPPSP will be changed to appropriate fixtures/lights within 5 years.

Buildings: All buildings will have full cut-off fixtures no higher than 2.5 meters from the door threshold if necessary, the illumination level cannot exceed 2 lux and where possible, and the color of the light should have a short wavelength. Dark time lighting curfews should apply. Dark Time is considered 2 hours after sunset.

Campgrounds: The Family and Equestrian campgrounds only have a total of 41 sites combined and are zoned to allow unshielded lights for access to this unique land by diverse people. While visiting here, the campers can pick up educational flyers/brochures about protecting the night sky. Inside the bathhouse there are friendly reminders to turn off the lights when not in use to help protect the dark skies and conserve energy ($). There will be no other permanent lights within the campground other than the bathhouse.

Parking Lots: Parking lots will not have any illumination.

Roadways: Roadways will not be illuminated other than the front entrance gate (lock). The combination lock needs to be illuminated with a light that has a full cut-off fixture. Ideally the light will be no higher than 2 meters. Campers need to be able to see the combination clearly. The light should produce the least amount of light (amber LED and <2 Lux). A street light with a full cut-off fixture is the next best option.

Pathways: Pathways will not be illuminated. Campers can use flashlights or star/moon light. If for some reason a pathway needs be lit, the lights will be installed 1 meter or less from the ground and will be full cut-off fixtures with amber LED lights with a LUX of ~1.

Signage: No signs will be illuminated. The entrance sign and navigation signs (such as “office”, “campgrounds”, et cetera) are recommended be retro-reflective. If a light must be installed, the light will shine down and be a full cut-off fixture not standing more than 1-2 meters high and containing Amber LED lights with the lowest practical wattage to illuminate the surface to 1 lumen per square meter.

Light Pollution Beyond Park Boundaries: Local municipalities and others will be shown educational presentations about light pollution and the solutions. The goal would be to reduce glare and sky glow from within the protected DSP. KPPSP will contact neighbors whose lights produce unnecessary pollution and impact the night environment and ask them to shield, reduce brightness, or have them removed (if they are not using it).

Wilderness Areas- There is approximately 15,700 acres (or 28% of KPPSP) of wilderness area within the Preserve. It is located north of Military Trail and west of the Cattle Lease area. This area retains its raw character. There are no signs in this area. Bright flashlights (>300 lumens) are not preferred. Red or amber flashlights are a less disruptive form of light in this protected area. Temporary installation of portable outdoor lighting is prohibited unless a permit is obtained for special research.

Astronomy Pad – The Astro Pad is located away from the general camping areas and the potential light intrusions from campfires and camper lights. There will be no permanent light fixtures within the Astro Pad other than then service panel light. Flashlights should have a red filter on them after Dark Time.

Specific Areas and Lights in Need of Improvement

****Refer to H) Lighting Inventory and L) the Appendix – KPPSP Lighting Inventory Photos**

Office Area

It is recommended that in the future the steps in front of the office have a red LED light installed with a shielded fixture for the safety of the visitors at night when using the facilities. The office is in close proximity to the Astro Pad and poses potential light interference for astronomical activities. Astronomical visitors use the bathroom facilities at the office/ visitor center.

A.1) This wall light is rarely used. It is a switch light that is usually only turned on for staff use while loading or unloading supplies at night (working late). The staff has painted the shield black as a temporary measure until a wall mounted canister fixture with a more appropriate bulb (PAR 4 Amber LED) can be purchased to replace the current one.

Astronomy Pad

B.1) This flood light has never been used since installing the Astro Pad sites. The original intention for this light was to illuminate the electrical panel at night if the panel needed to be worked on. It will be replaced with a fully shielded fixture. The fixture will be pointed in the direction of the panel.

Campgrounds

C and D) No permanent lights will be installed in either the Family or Equestrian campgrounds with the exception of the bathhouse(s) [see Bathhouse section]. Campers will be allowed to bring any light they wish into the campground. One option is for the Friends of Kissimmee Prairie Preserve to sell, rent, or give light shields to RV campers.

Bathhouse

The bathhouse can have full cut-off fixtures with red coverings over a CFL, LED, or halogen bulb. The illumination levels cannot exceed 2 lux. The lights in the interior of the bathhouse should be bug yellow or yellow color whenever possible and lighting levels should not exceed 10 lux (when horizontally measured from the floor).

E.1) This wall light is rarely used. It is a switch light that is usually only turned on for staff use at night (working late). The staff has painted the shield black as a temporary measure until a wall mounted canister fixture with a more appropriate bulb (PAR 4 Amber LED) can be purchased to replace the current one.

Pumphouse

F.2) This flood light is rarely used. Recommend removing fixture. The florescent tube lights under the roof of the pumphouse illuminate the area very well if needed.

Front Entrance

G.1) A reflective sign is recommended to replace the existing sign. The solar power could be diverted to an electric gate that is planned to be installed in the future. If a reflective sign cannot be attained, then a shielded fixture will be mounted to the top of the sign that points the light on the sign itself. A low wattage amber light should be used.

G.2) This light is maintained by Glades Electric Cooperative. It is recommended that the wattage on this shielded street light should be reduced. The fixture should be lowered or replaced with a light directly on or above the entrance gate to illuminate the gate and lock.

Shop / Pole Barn

I.1) The five lights on the enclosed shop building are rarely used. Employees tend to use these only when rehabbing equipment at night after a fire. These will be replaced with wall mounted canister fixtures and a more appropriate bulb (PAR 4 Amber LED) will be installed.

I.2) The 4 sets of flood lights on the enclosed shop building are for emergency use only. Fire operations can occur during any part of the day or night. Occasionally, fire crews may need more light to prepare burn equipment. Until new fixtures are needed, it is recommended to augment the current fixtures by applying a Parshield Flood Light Shield (see www.parshield.com)

I.3) The tube lights in the pole barn are used infrequently. Usually the burn crew turns them on to rehabilitate equipment after a burn. They are shielded by the roof of the pole barn and should not cause an issue.

I.4) The 1 set of flood lights in the pole barn is not operational. This fixture was recently removed.

Travel Trailer

J.1 - J.2) See Campgrounds Section. If light shields cannot be found for the travel trailer, then light shields will be made.

Residence 4 (Bldg 17)

"Black out" curtains will be purchased to block most indoor light from the residence due to the close proximity to the Astro Pad.

Residence 3 (Bldg 18)

"Black out" curtains will be purchased to block most indoor light from the residence due to the close proximity to the Astro Pad.

Residence 2

M.3) This flood light is not operational. This fixture was recently removed.

J) Interpretation Description and Night Sky Restoration

KPPSP has a huge sky. Many visitors enjoy the openness of the prairie and revel in the many sky phenomena that can be seen day and night. Some of the daytime sky spectacles that can be seen are marvelous sunsets (especially during the warm months), rainbows, fogbows, sundogs, rocket launches from Kennedy Space Center, the Belt of Venus, green flash, crepuscular and anti-crepuscular rays, halos, zodiacal light, super moons, mammatus clouds, and many other cloud formations. Other visitors may have a UV filter on their telescopes to view the sun and the ever changing sunspots and solar flares. The night offers a different realm of objects and events for the observer to admire.

Astronomy Programs: The astronomy program at KPPSP has several elements.

1. Roving interpretation-

a. The staff are always looking for the opportunity to make a visitor's camping experience more special. With the small campgrounds, the opportunities to be acquainted with a guest are plentiful. Usually near sunset, but not always, the staff are able to point out sky objects whenever the opportunity arises. The objects most often seen are Jupiter, Venus, the moon, the rising Milky Way, the Orion constellation, and Polaris. These brief introductions are approximately 5-15 minutes in length and allow the staff to remind and encourage the visitor to attend one of the formal astronomy presentations.

b. Usually when astronomers occupy the Astro Pad or elsewhere in the campground, they also welcome regular campers to their telescopes. The typical astronomer that visits KPPSP has a natural embrace for outreach with the public. These encounters are not planned and are therefore labeled "roving".

2. Astronomy Presentations-

a. On-site astronomy presentations occur at least twice a month from November – March during the good 'seeing' months. Amateur astronomers from the astronomy societies as well as staff present various topics in 2 phases about astronomy to campers. Topics range from how to observe, telescopes, light pollution, dark skies, solar system, general astronomy, meteor showers, and comets; with more topics being discussed for the future. The educational portion of the program is usually a 30-45 minute indoor PowerPoint presentation in the office/visitors center. The room holds about 15 people comfortably. If we are expecting more than 15 people, the show is held outside and is projected onto the back of the building so as to not interfere with the astronomers at the Astro Pad. Models and hands-on activities are encouraged during this portion. Campers also learn about how to respect astronomy equipment and how to protect night vision. When the skies darken, the show is moved outdoors for either a binocular sky tour aided by a laser pointer or to various types of telescopes (depending on the speaker) where the campers can view night sky objects, many of them for the first time. The outdoor portion can last for as many hours as the weather cooperates or as long as the speaker has time for (range 30 minutes to 4 hours).

b. For the past several years during the months of December and January, KPPSP has had the pleasure of hosting a volunteer astronomer who camps in the campground whose sole responsibility is to interpret the skies to all visitors (campers and day use). A daytime viewing program of the sun occurs several times a week where the volunteer discusses the science and cycles of sunspots and solar flares

and urges visitors to draw what they observe and come back to see what is different. Every evening (weather permitting) campers filter into his site to learn and see various night objects. Ten to fifty people per night have been recorded. We hope to continue to host a volunteer astronomer every year during the winter. This will depend on volunteer time schedules and other variables.

c. The staff has lead moon hikes. The full moon is a fun occurrence for campers. Flashlights are not necessary and binoculars and a walking stick are encouraged. Staff discuss different aspects of the night with campers. Topics range from nocturnal wildlife, light pollution, night sounds, and moon stories. Guests are encouraged to relay their own memories of the night. Star hopping with the aid of a laser pointer is also a highlight.

Astronomy Related Items and Interpretive Displays:

In the family campground, the bathhouse lights are highlighted in a kiosk that will help educate the casual visitor about 'good' lights and the importance of dark skies. The outside bathhouse lights are recessed with red coverings and excellent examples of night sky friendly lights. Most visitors, especially astronomers, appreciate the amount of light that is emitted from them because they are not glaring or offensive. The insect, arachnid, and herpetofauna debris has been significantly reduced with the red coverings which decreases the amount of maintenance needed also.

Information from our Sky Quality Data and Measurement Program will be displayed at the bathhouse and updated on a yearly basis. This data will also be incorporated into our community outreach. Currently this data is being verbally conveyed to visitors during our roving/personal interpretation.

Natural occurrences found in KPPSP are listed in a kiosk in the Family Campground. Topics include Animals Observations, Flowering Plants, Night Sky, and Interpretive Programs. This board is changed on a monthly basis.

Many types of brochures from the International Dark Sky are available at the office and/or near the bathhouse in Kilpatrick Campground.

A staff member has participated in the online Sky Rangers Workshop in the spring of 2013 prepared by the Astronomical Society of the Pacific. It is a 3 month course which allows the student to familiarize themselves with the features in the sky and provides materials to KPPSP to conduct programs for the

public such as banners that describe the life of a star, our magnetic sun, ultraviolet light beads, red lights, children's book, planisphere, model of the solar system with distances, and others. The program materials are still at KPPSP, but the staff member has transferred (October 2014) to a different state park within Florida. She is still available to answer questions and help in whatever way she can.

KPPSP has an 8" Celestron NexStar GPS telescope that was purchased after a Florida Legislative Tour visited KPPSP when the campground was constructed in 2002. The representatives and/or their staff happened to camp on a beautiful evening and the astronomers that were incidentally camping at KPPSP showed them dark sky objects in their telescopes. The representatives decided that KPPSP needed a telescope to interpret that resource to the public and money was allocated to buy one.

Letter from Visitors after Attending an Astronomy Program

July 7th, 2014

Our Astronomy Story

We visited Kissimmee Prairie Preserve in early March of this year.

During that stay we attended a class presented by Ranger Jenn. She explained to us the fact of the Prairie being the darkest sky in central Florida due its remoteness. She also explained the effects of human made light on nature's animals.

We learned a lot about colored lighting and its effects on humans and wildlife alike. After the class, we spent time on the Astro-Pad with a few of the different astronomers set up for that evening. We learned how they take the pictures of the stars and galaxies. And we got to see a lot in the scope's!

I guess the biggest thing we took from that night was "red light" awareness. We came home to change all of our exterior lighting to red lamps; we even changed our alarm clocks to red LED. Some of the neighbors think we are little nuts – but we know we are doing our part to better our community, after the sun goes down.

We are changing our camping habits as well to include red- led rope lights and exterior red lamps for evening lighting on the camp site. Less bugs as well!

We came back this weekend to the prairie and saw Ranger Jenn again. We thanked her for teaching that Astro class that March evening and we look forward to spending A LOT more time on the Prairie in the near future.

Brian & Michelle Hill

(Site #11)

Florida Park Service Properties

KPPSP will be an example within the Florida Park Service. Other state parks can build on our success to achieve a broader spectrum of protection and education. Night friendly lightscape management designs could be instituted throughout the Florida Park Service. At minimum our efforts will help elevate the night sky discussions.

Community Outreach and External Partners

In order to ensure the preservation of the night, KPPSP must be an example of good lighting and to be of service to the surrounding communities through educational workshops and presentations.

KPPSP has been making connections with our neighbors (residences, communities, local groups, county municipalities, electric companies) in an effort to preserve and potentially improve the dark skies in this area of Florida. During the presentation, there is an emphasis on the opportunity Okeechobee County and the surrounding counties have on their doorstep – this is one of the last dark spots in the peninsula of the state. The communities may decide to enact a policy and adopt a program on night time lighting. People will flock to this area for the night time views and peace that they bring. And perhaps property values will increase, more people will be buying the land (because the night environment is protected), and there will be more money on the tax rolls. According to Economic Impact Assessment from 2012-2013, non-local visitors have spent $826,939 in the local area while visiting state parks. In total the estimated total direct economic impact for the local area was $1,253,033. One method by which state parks enrich local communities is by bringing in visitors which in turn spend money locally. Visitors may decide to put down roots in an area that aligns with their quality of life. Okeechobee County is a rural landscape with the capacity to maintain the beauty and culture while increasing the tax rolls.

A Treasure Coast Astronomical Society member spoke to the Okeechobee Economic Council in late 2014 and he had very good reviews. This member has offered to speak with Okeechobee County Commissioners. We are anticipating a meeting with the County Commissioners within the next year (2015-2016).

The Friends of Kissimmee Prairie Preserve, Inc. is a non-profit organization that is dedicated to helping KPPSP. “The Friends of Kissimmee Prairie Preserve, Inc. was formed in 2011 to work for the preservation, protection, interpretation, and promotion of and in the best interest of Kissimmee Prairie Preserve. The Friends organization is a Florida not-for-profit 501(c)(3) corporation and relies on membership fees and private donations to pursue activities on behalf of the Preserve” (Friends 2011). They also put out a newsletter educating the members about various happenings around the Preserve. *News from the Florida Prairie* is their newsletter to members. They highlighted the night sky in their first edition with an entire segment on “Preserving the Night” (Bollenbach 2014). People visiting their website or KPPSP can donate specifically to a Dark Sky Fund with all proceeds staying in KPPSP.

Making partnerships and working together for a common goal are essential. Avon Park Air Force Range has been promoting dark skies for several years now. Dark skies are beneficial for military training missions. Other organizations that may want to help are electric companies, County Commissions, real estate companies, Department of Transportation, Sheriffs’ offices, Florida Fish and Wildlife Conservation Commission, hospitals, airports, civic organizations, schools, and more. A dark sky would benefit all of these in some manner for different reasons.

The following letters of support show that a region-wide interest and network is present. This network can be expanded and strengthened over time. There is already a robust wildland fire community in this area with well-rooted bonds. The inclusion of dark sky topics is an easy segway for wildlife and land managers.

Friends of
Kissimmee Prairie Preserve, Inc.

June 1, 2014

To: International Dark Sky Association
3223 N First Ave., Tucson, AZ 85719

Re: **Kissimmee Prairie Preserve SP Dark Sky Park Application**

To Whom It May Concern:

We, the board members and officers representing Friends of Kissimmee Prairie Preserve, Inc. wholeheartedly support the designation of the Kissimmee Prairie Preserve as an International Dark Skies Park. We recognize and appreciate the exceptional quality of the night sky at this remote location and wish to preserve and protect this scarce natural resource.

Since its opening in 2005, Kissimmee Prairie Preserve State Park has been a premier stargazing location for astronomers throughout Florida. A special "astronomy pad" area is even provided for them to ramp and set up their equipment. This area is apart from the regular campground lights and campfires, but is close enough for campers to visit and get a look through the telescopes.

Beyond astronomy and the ecotourism value, we recognize that the protection of the dark skies and the prevention of light pollution offers many other benefits that align with our mission and the Preserve's management plan, including, but not limited to, the protection of our nocturnal wildlife species and the preservation of our historical significance as one of the original frontiers in Florida.

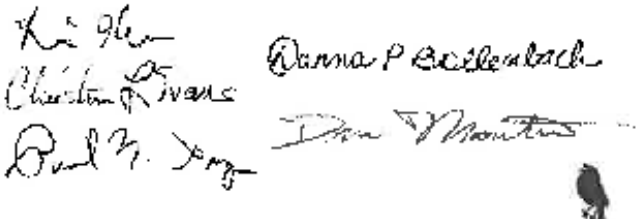
Our support is also financial and educational: When Park Service Specialist Jen Benson began the initiative to designate the Preserve as a Dark Sky Park, we set up a *Dark Sky Fund* to accept donations specifically allocated to this cause, and we have included information about the initiative in our newsletters and on our website. The *Dark Sky Fund* will be used to retrofit lighting in the Preserve and nearby community, to fund interpretive programs, to provide signage once designation is approved, and for other related purposes. We recently purchased a Unihedron Sky Quality Meter for the Preserve so they can measure the light in the Florida prairie on a regular basis. Our support will not end after the application is approved. We will continue to help ensure that Kissimmee Prairie Preserve meets the requirements of the initiative and preserves the night sky for future generations.

In conclusion, Friends of Kissimmee Prairie Preserve fully supports the efforts of the Preserve to achieve designation as an International Dark Sky Park and we ask that you approve their application.

Sincerely,

The 2014 Board of Directors, Friends of Kissimmee Prairie Preserve Inc.:

Tim Kozusko, President
Christina Evans, Treasurer
Paul Gray, Ph.D., Secretary
Donna Bollenbach
Deen Mountain



www.kissimmeeprairiefriends.org
35104 192nd Avenue, Okeechobee, Florida 34972

GLADES
Electric Cooperative, Inc.
"Neighbors Working for Neighbors"
A Touchstone Energy® Cooperative

April 9, 2014

Jen Benson-Hughes
Park Services Specialist
Kissimmee Prairie Preserve State Park
Florida Department of Environmental Protection
33104 NW 192nd Ave
Okeechobee, FL 34972

Dear Jen,

We would like to commend you and the entire staff of the Kissimmee Prairie Preserve State Park on your efforts toward an IDA Dark Sky Park designation. We certainly support the preservation of our beautiful night skies and the viewing opportunities they afford our friends, neighbors, and visitors.

Glades Electric Cooperative has recently introduced night sky friendly outdoor lighting options for our members. We now proudly offer commercial, residential, and street fixtures in down lighting LEDs. These fixtures drastically reduce light intrusion into neighboring yards, as well as virtually eliminate upwards glare.

We advertise the new options to our membership via our monthly magazine (Florida Currents), website (gladesec.com), and Facebook page.

Again, we commend you on your efforts and support your application for an IDA Dark Sky Park designation. Keep looking up!

Best regards,

Paul McGehee
Director of Business Development

P.O. Box 519 • Moore Haven, FL 33471 • 800 226-4024 • Fax 863 946-6262 • www.gladesec.com
Lake Placid 800 226-4025 • Fax 863 531-5012 Okeechobee 800 226-4023 • Fax 863 467-0855

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

November 6, 2014

Jen Benson-Hughes
Park Services Specialist
Kissimmee Prairie Preserve State Park
Florida Department of Environmental Protection
33104 NW 192nd Avenue
Okeechobee, Florida 34972

SUBJECT: Kissimmee Prairie Preserve State Park-Dark Sky Application

Dear Ms. Benson-Hughes:

The South Florida Water Management District (District) is supportive of the Florida Department of Environmental Protection, Kissimmee Prairie Preserve State Park's application for the designation as an International Dark Skies Park. The District encourages a wide variety of nature-based recreation opportunities, including astronomy, on District lands provided the uses are compatible and consistent with the District's mission and with the purpose for which the lands were acquired.

Please feel free to contact myself at (561) 682-2603 or Dan Cotter at (561) 682-2301 if we can be of any further assistance in support of this effort.

Sincerely,

Steve Coughlin
Section Administrator
Land Stewardship Section

3301 Gun Club Road, West Palm Beach, Florida 33406 • (561) 686-8800 • FL WATS 1-800-432-2045
Mailing Address: P.O. Box 24680, West Palm Beach, FL 33416-4680 • www.sfwmd.gov

DEPARTMENT OF THE AIR FORCE
DETACHMENT 1, 23D FIGHTER GROUP (ACC)
MACDILL AIR FORCE BASE, FLORIDA, AND AVON PARK AIR FORCE RANGE, FLORIDA

02 February 2015

MEMORANDUM FOR KISSIMMEE PRAIRIE PRESERVE STATE PARK
ATTN: MR. PAUL MILLER
33104 NW 192nd Ave
Okeechobee, FL 34972

FROM: DET 1, 23FG/CC
29 South Blvd
Avon Park Air Force Range, FL 33825-9381

SUBJECT: Kissimmee Prairie Preserve State Park's Dark Sky Park Application

1. As the Commanding Officer of Avon Park Air Force Range (APAFR), I strongly support the designation of the Kissimmee Prairie Preserve State Park (KPPSP) as an IDA Dark Sky Park. Separated only by the Kissimmee River, APAFR shares its southeastern border with KPPSP and the dark skies over KPPSP are extremely beneficial for military training missions.

2. APAFR is a premier air/ground training complex used extensively by all branches of the military and other federal and state agencies. It is the largest United States Air Force training range on the East Coast. Combat units from across the US report a quality of training that they cannot get at any other location. To protect this national asset, APAFR staff has worked closely with local governments to encourage implementation of outdoor lighting standards which reduce light pollution.

3. Our nation's combat forces have a distinct advantage operating under the cover of darkness however they cannot do so effectively without first having the opportunity to train under similar conditions. The absence of light pollution in the region, particularly from KPPSP, makes APAFR an ideal night training location and helps ensure the most realistic environment possible for the Air Force, Navy, Marine, Army, National Guard, Coast Guard, and other federal and state agencies utilizing the range.

KEVIN R. BEEKER, Lt Col, USAF
Commander

Global Power for America

ARCHBOLD BIOLOGICAL STATION
123 MAIN DRIVE • VENUS, FLORIDA 33960

August 28, 2015

International Dark Sky Association
3223 North First Ave., Tucson, AZ 85719

Re: Kissimmee Prairie Preserve State Park Dark Sky Application

To Whom It May Concern:

We, the Senior Scientific Staff at Archbold Biological Station, wholeheartedly support the designation of Kissimmee Prairie Preserve State Park as an International Dark Skies Park. As light pollution has increased globally, fewer and fewer of us can remember and appreciate the glow of the Milky Way across a truly dark sky. One of the most startling icons of recent years are nighttime images of Earth from space, where the extent and magnitude of artificial light is obvious – and yet we are just beginning to understand the ecological impacts of light pollution. The Kissimmee Prairie Preserve State Park (KPPSP) has one of the darkest skies in Florida, unaffected by light pollution. It is one of the best and last remaining tracts of Florida Dry Prairie, a biologically diverse landscape unique to south-central Florida still subject to natural ecological processes, such as fire and the daily rhythm of night and day, dark and light. Preservation of such processes is an essential component of effective conservation and designation of KPPSP as an International Dark Skies Park will aid in the battle to maintain those dark skies.

The impacts of light pollution can be both subtle and dramatic. Many species, both plants and animals, use day length to time seasonal events, such as bud formation in plants or egg laying in birds. Many studies have shown seasonal advances in the timing of egg-laying in urban-nesting birds. Exposure to nighttime light, even low levels, can affect circadian rhythms and melatonin levels, DNA repair, activity and energy budgets of crepuscular animals, and a host of other physiological and behavioral processes. Studies have suggested the potential for impacts on species affected even by widespread low-level light such as urban sky glow or even transient lighting sources such as vehicle lights.

In conclusion, we fully support the efforts of Florida Department of Environmental Protection and the Preserve's efforts to obtain designation as an International Dark Skies Park.

Sincerely,

Reed Bowman, Ph.D.
Program Director, Avian Ecology

Betsey Boughton, Ph.D
Program Director, MAERC

Mark Deyrup
Mark Deyrup, Ph.D.
Program Director, Entomology

Eric S. Menges
Eric Menges, Ph.D
Program Director, Plant Ecology

Betsie Rothermel, Ph.D
Program Director, Rest. Ecology /Herpetology

Hilary Swain, Ph.D
Executive Director

PHONE (863) 465-2571 • FAX (863) 699-1927
www.archbold-station.org

Byrum and Linda Cooper
558 Sunshine Boulevard
Haines City, FL 33844

August 20, 2015
International Dark Sky Association
3223 North First Avenue
Phoenix, AZ 85719

Re: Kissimmee Prairie Preserve State Park Dark Sky Application

To Whom It May Concern

As citizen scientists and members of the North American Butterfly Association, we have been involved with KPPSP prior to its designation as a state park in 2005. This park is one of the most diverse in Florida for butterflies with 88 species - more than half of Florida's butterfly species. Although our involvement has been limited to butterfly surveys we are also fortunate to have camped here in one of the darkest spots on the Florida peninsula.

The location of this 54,000 acre park, separated on its western border from the 106,000 acre Avon Park Air Force Range by the Kissimmee River in the Northern Everglades Watershed and almost 100 miles from the brightly-lit city of Orlando, makes it an ideal candidate for IDA Dark Sky Park designation. North of it are 164, 000 acres of publicly-owned wildlife management lands. Below KPPSP lies the Southern Everglades Watershed and the one and one half million acres of Everglades National Park.

You already know the importance of natural darkness and light to life's circadian rhythm. Does the butterfly diversity here have to do with natural circadian rhythm, habitat diversity or some unknown factor? Whatever the reason we do know this: KPPSP is a very special place where you can experience what native peoples and early settlers experienced - wide open spaces where manmade structures aren't visible; where the only sounds you hear are birds and insects; and before you head in for the night you can look up in wonder and see very dark skies.

We would like to add this letter of support for the designation of KPPSP as in IDA Dark Sky Park.

Sincerely yours,

Byrum Cooper
Linda Cooper

Byrum and Linda Cooper

558 Sunshine Blvd Haines City, FL 33844 **T:** 863-439-2704

Audubon FLORIDA

308 North Monroe
Tallahassee, FL 32301
850-222-2473.
www.audubonofflorida.org
EDraper@Audubon.org

August 21, 2015

International Dark Sky Association
3223 N First Avenue
Tucson, AZ 85719

To Whom It May Concern:

I am pleased to write this letter of support for designation of the Kissimmee Prairie Preserve State Park (Preserve) in Florida, USA, as an International Dark Sky Park by the International Dark Sky Association. Audubon's mission is to conserve and restore natural ecosystems, focusing on birds, other wildlife, and their habitats for the benefit of humanity and the earth's biological diversity. Because of Audubon's long-standing work on the Kissimmee Prairie ecosystem, and the growing recognition that light pollution has negative impacts on species and ecosystems, our goal to avoid light pollution on the Preserve overlaps with yours.

Audubon has had staff working on Florida's endemic Dry Prairie Ecosystem continuously since 1936, when our wardens began patrolling the Preserve's property to protect wading bird nesting colonies and other birds. Recognizing that native prairie was being lost to human conversions, Audubon purchased the 7,300 acre Ordway-Whittell Kissimmee Prairie Sanctuary in 1980. In 1997, Audubon was instrumental in lobbying the state acquire the property that now is the 54,000 acre Preserve. Our Sanctuary was added to it in 2001. We are very gratified to have helped conserve such a large tract of almost-pristine Florida prairie, but many long-term issues with ecosystem management, such as managing light pollution, remain a concern.

Light is the dominant factor in the circadian clocks of living organisms ranging from microbes to plants to animals, and affects all aspects of physiology. Day length change governs annual breeding patterns, growing seasons, migration and more. Artificial light at night disrupts these internal patterns. Artificial light also interferes with species by altering predator-prey relationships, affecting bioluminescent organisms, changing animal movement patterns (through attraction or repulsion), and generally creating novel influences that, in turn, increase or decrease the success of species. Differential changes to interacting species create cascading effects in ecosystems that can extend even to diurnal species.

It surprises most people that the interior of Florida still has large areas of wilderness and dark skies. The dark skies have made the Preserve one of the premiere astronomy

Audubon's Letter continued

destinations in Florida and a special astronomy pad has been built. Audubon's long-term goal is to keep the Preserve in the most natural condition possible and we think an integral part of that will be maintaining the darkness of night to the extent possible. Having a Dark Sky Park designation will help create standards to avoid unnecessary light at night, and help maintain awareness of the various reasons to do so.

For the reasons listed above, I am excited to support the KPPSP application to become Florida's first designated Dark Sky Park.

Sincerely,

Eric Draper,
Executive Director

The Nature Conservancy- Central Florida Programs

August 27, 2015

Jen Hughes
Park Services Specialist
Mike Roess Gold Head Branch State Park

Jen,

As a land manager and conservationist I strongly support the designation of Kissimmee Prairie Preserve State Park as an International Dark Skies Park. Light pollution disrupts the natural balance of many species; it interferes with predator/prey relationships, migration, reproduction and natural processes. The Kissimmee Prairie is a critical landscape for wildlife and natural communities; to have such a large and important ecosystem's circadian rhythm preserved would be a great benefit to the biodiversity of the region.

Sincerely,

Adam Peterson
Fire & Land Management Specialist

apeterson@tnc.org
Cell: (863) 443-0630
Fax: (407) 935-0005
nature.org

Central Florida Programs

2700 Scrub Jay Trail

Kissimmee, FL 34759

K) Future Plans

KPPSP is a young management unit and is situated in a fantastic night sky arena! KPPSP plans on continuing to work with the many varieties of neighbors and spreading the message to other neighbors not yet reached (such as the city of Okeechobee, Sebring, Avon Park, Yeehaw Junction, Florida Turnpike, etc.). The astronomical societies and other volunteers will be instrumental with spreading the good news. The staff and volunteers will be presenting more astronomy related presentations at the local libraries and to the various groups in the area such as the Boy Scouts organization, CampFire USA, 4-H, homeschooled kids, Kiwanis, and many others.

More interpretive displays will be created in different areas of the Preserve. A self-guided star walk with interpretive panels for low light conditions is a worthy project. The direction and length of the trail will need to be determined. One possible existing trail option is the Five Mile Prairie Trail: starting at the office parking lot, through the Astro Pad, and ending at Seven Mile Slough on a mound of dirt that has a cultural significance. Another option would be west on Military Trail. The Treasure Coast Astronomical Society has expressed interest in creating a night sky themed display for the public.

Currently to view the night sky in KPPSP, a person must be a registered camper. On occasion in the future, KPPSP would like to keep the gate open after sunset to invite non-campers to the astronomy programs. Visitors would have to leave by 11pm (quiet time) on these specific evenings. There may be an additional charge to stay after sunset.

KPPSP will continue to improve and update the lighting within the preserve by modifying 2 buildings/areas per year with proper lighting. Within 5 years, KPPSP will have all dark sky friendly lights within the property.

L) Appendix – KPPSP Lighting Inventory Photos

A.1 Office back door light

A.1 Office back door light

A.2 Office recessed ceiling lights

A.2 Office recessed ceiling light

B.1 Astronomy Pad light

B.1 Astronomy Pad light

E.1 Bathhouse back door light

E.1 Bathhouse back door light

E.2 Bathhouse recessed red-covered lights

E.2 Bathhouse recessed red-covered lights

E.2 Bathhouse recessed red-covered lights

E.2 Bathhouse recessed red-covered lights at night

E.3 Bathhouse skylights

E.3 Bathhouse indoor lights

E.3 Bathhouse indoor light

E.3 Bathhouse indoor light sign

F.1 Pumphouse

F.1 Pumphouse tube light under ceiling

F.2 Pumphouse floodlight

F.2 Pumphouse floodlight

G.1 Entrance sign solar powered light

G.1 Entrance sign solar powered light

G.1 Entrance sign light

G.2 Entrance gate shielded light

G.2 Entrance gate shielded light

H.1 Bunkhouse south door light

H.1 Bunkhouse **OLD** south door light

H.2 Bunkhouse north door light

H.1, H.2 Bunkhouse light comparison (OLD fixture on left, NEW fixture on right)

I.1 Shop door lights

I.1 Shop door lights

I.1, I.2 Shop door and flood lights

I.2 Shop flood lights

I.3 Shop/Pole Barn ceiling lights

I.4 Shop/Pole Barn flood

I.4 Shop/Pole Barn flood

J.1 Travel trailer door light

J.2 Travel trailer front light

K. 1 Residence 4 door light

K.1 Residence 4 door light

L.1 Residence 3 door light

L.1 Residence 3 door light

L.1 Residence 3 porch light

M.1 Residence 2 door light

M.2 Residence 2 porch light

N.1 Residence 1 door light

N.2 Residence 2 porch light

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