Talking Points for Park Public Relations Officers
Night Skies and Light Pollution

Overview
Efforts by the NPS to measure light pollution in parks, will be covered in an article in Science News to be released March 18th. The article will cover the degree to which even remote parks are affected by artificial light, and the link between artificial light and ecological disruption. To accompany this, the NPS Night Sky Team is posting several datasets from parks and launching a website to describe the program.

Parks mentioned in the Science News article include Joshua Tree, Mojave Desert, Death Valley, Lake Mead, Great Basin, Bryce Canyon and Arches. With the exception of Arches, the parks are mentioned due to their ability to see lights from Las Vegas. The article presents a positive opinion of the NPS and parks, but does not mention what the NPS is doing about correcting light pollution or park specific studies that address artificial light impact. It will inform the public that distant cities can produce a major impact upon parks at great distances and inform the public and many park managers that there is a documented link between artificial light and ecosystem health.

The NPS Night Sky Team website provides a full discussion of the topic, data from several parks, and management actions. Data will be presented from the following parks: LAVO, YOSE, SEKI, JOTR, MOJA, DEVA, LAME, GRBA, CRMO, YELL, ARCH, CANY, NABR, HOVE, PARA, WACA, SUCR, and GRSA. Only a few datasets are being released at this time as data from only one of the five instruments has been fully analyzed. Additional parks and data will be posted in the coming months.

The NPS Night Sky internet website is available at:
http://www2.nature.nps.gov/air/lightscapes

What is light pollution?
Light pollution is the illumination of the night sky caused by artificial light. It decreases the visibility of stars and other natural sky and space phenomena (meteors, nebulae, galaxies, the Milky Way, zodiacal light, etc), and is sometimes called “sky glow.” Light pollution can also refer to obtrusive aspects of outdoor light such as glare, trespass into areas not needing light, disturbance of natural nighttime landscapes, and disruption of ecological processes.

Where does the light pollution come from?
Light pollution originates from outdoor lights, is scattered by various particles in the atmosphere, and affects nocturnal landscapes near and far from the light source. The biggest source is outdoor lights that direct light upward or sideways, and lights that are too bright for their application. A minor amount of light comes from light that reflects off the ground and then into the atmosphere. Light pollution may come from large cities, small towns, roadways, industrial facilities, and the park’s own facilities.

Does the NPS know what light pollution is affecting?

We know that certain amounts of light pollution correlate to a loss in visibility of the night sky. For example, light pollution at a given level will make it difficult or impossible to see the Milky Way. The agency is beginning to understand how light pollution affects other aspects of park scenery, cultural resource landscapes, and ecosystems. Important research is now being conducted by scientists outside the agency to better understand the connection between wildlife and artificial light.

What is the NPS doing about light pollution?

Though perhaps neglected as a problem for decades by everyone except astronomers, the NPS is now a leader in understanding and preventing light pollution. It has funded the NPS Night Sky Team to develop ways to measure light pollution, take an inventory of the night sky resource, and pass this information back to parks and other scientists. It has provided guidelines to parks on preserving natural lightscapes (NPS Management Policy 4.10- Natural Lightscapes) that directs parks to minimize light pollution whenever possible. It has incorporated night skies into the Vital Signs program, and is treating night skies as both a Wilderness Characteristic and Air Quality Related Value.

Many new park facilities are designed with night sky friendly lighting. Some parks have begun to retrofit their lights to produce less light pollution. Recent grants from the National Park Foundation and the GE Foundation have helped parks improve or replace their lights. Also, the NPS Night Sky Team has just been funded to begin improving lights in multiple parks with Recreational Land Enhancement (formally 30% Fee Demo) funds. This will be a four year project to make further assessments of the night sky, track changes in night sky quality, and retrofit outdoor lights. The participating parks have not yet been determined.

Why are we measuring light pollution?

Inventorying the resources found in parks is a critical first step in protecting them for future generations, and allows the agency to make sound decisions based on science. Actual measurements of light pollution have only existed at large astronomical observatories, thus it became necessary for the NPS to develop a system to measure light pollution from within parks.

"*We have to know what we have, how and why it is changing, what changes we can accommodate, and which we must combat*"- Fran Mainella

We now know that artificial light can potentially impact nocturnal species. We also know that stargazing is a popular visitor activity in parks and part of the park's scenery. Facts such as these compel us to extend our stewardship of the park to encompass the night sky.

What does the data show?

The data generally show that light pollution is detectable from every park. The two darkest parks presented are Great Basin and Natural Bridges. Both have excellent night

skies and natural lightscapes, but even in those two parks trace amounts of light pollution are detectable. It is unclear if there are any national parks in the 48 states devoid of at least some light pollution. The data also show that parks such as Lake Meade have substantial light pollution in some areas within the park.

The data supports computer models of light pollution, indicating that the extent of light pollution is at least as severe as the models indicate. Arid climates with clear air are particularly prone to light pollution as it can travel long distances.

With this data, the NPS can now track changes in brightness from light sources and the impact to park landscapes.

Why is only a portion of the data now being made public?

The NPS Night Sky Team has five instrument sets; the data published is only from one of the five instruments. We must rigorously check and compare each instrument, and then calibrate all data to a known standard and prepare the reports. This has only been completed from one instrument, though the remainder should be completed in the next few months. The currently released data represents about 25% of total data collected.

What do visitors think about night skies?

Many parks report that stargazing and night hikes are their most popular ranger-led activity. Several parks in the West note that one reason visitors come to the park is to view the night sky, camp beneath the stars, or look through telescopes. As the public loses the experience of the night sky at their homes, they appear to be seeking this out in their national parks.

But it is more than just light-weary city dwellers that seek out dark skies. Starry nights are an important facet of the rural West. Many who moved to or retired in more remote areas did so, in part, to see the stars. Protecting the night sky is an important goal for a wide spectrum of the American public. In some areas, night skies are becoming a source of ecotourism.

What makes a light “night sky friendly”?

Outdoor light fixtures that direct all light downward are considered “night sky friendly.” These fixtures are also referred to as “fully shielded” or “full cut-off.” Because all light is directed downward, very little light escapes upward- only a fraction reflects off the ground and contributes to sky glow. Almost all the light that causes light pollution is essentially wasted light- light that never strikes its intended target but is spilled uselessly into the night sky.

Fixtures that direct all light downward can use less energy, since you can generally use half the wattage bulb to produce the same illumination on the ground. Such lighting also reduces glare, improves visibility, and improve safety. Other methods such as timers, motion sensors, and using sodium lights will benefit the night. With improved lighting, it may be possible to reduce light pollution to a third of its present value in parks.

Can night skies be restored?

Yes they can! Light pollution is one of the easiest environmental problems to fix— it is straightforward, instantaneous, and economical. Retrofitting lighting can pay for itself in a few years.

What are the sources of light pollution and which parks are most affected?

Virtually every major city and population center produces light pollution. The degree of light pollution is correlated to the distance from major cities- the farther away from population centers, the darker the sky is likely to be. Some municipalities have pursued better lighting through education and laws, and should thus produce less light pollution per resident. We have not used the data the NPS has collected to investigate this question, though such a study is quite feasible.

Because most of the country's population resides in the eastern half, it is expected that the greatest amount of light pollution would also be in the east. Other studies show this to be true.

Thus the greatest impact from light pollution will likely be found at parks near large cities or surrounded by dense population areas. Parks that are remote but have accelerated development nearby will experience the most rapid change in sky quality, unless outdoor lighting is closely managed.

What do you say to nearby communities that pollute your sky?

Currently, there is no specific law protecting night skies, though it is clearly under the prevue of parks and protected areas to pursue its protection. Many communities and some parks have a large installed base of old or poor quality lighting. Improving lighting is a substantial investment, but is economically beneficial in the long-run. Parks and surrounding communities live in partnership, and increasingly this partnership is focused on night skies. Some surrounding communities have realized the negative impact and waste related to light pollution, and are installing better lighting. Tourism based communities often see an economical benefit related to public stargazing due to the increased length of visitor stay. The NPS has also provided technical assistance to communities when requested by its citizens, and will continue this in the future.

Key themes:

• Light pollution is a problem in many parks, and potentially has natural, cultural, and visitor impacts.

• Light pollution is caused by sources outside the park boundary, near and far, small and large, as well as from sources inside the park to a lesser degree.

• Stargazing and other visitor activities related to natural lightscapes are increasing in popularity in parks.

• Starry skies are appreciated by a wide spectrum of the public, being an important respite for city dwellers and embodying a part of the rural West.

• The forecast for the growth in light pollution is alarming, yet there are easily identifiable solutions and a growing number of success stories in protecting and restoring night skies.

• The potential for artificial light to impact ecosystems is a cause for concern, and there is a substantial amount of research that needs to take place for this problem to be understood.

• We are not suggesting turning lights off or returning to the dark ages, we are simply encouraging the use of smart, well designed, modern lights.

• Night sky friendly lighting typically saves energy, reduces glare, improves nighttime visibility, and thereby improves safety.

• It costs more to pollute the night sky than to protect it.

• The NPS has become a leader in protecting and restoring night skies, though substantial work remains.

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