



The Night Sky Program

A nearly pristine night sky above Death Valley's Devil's Racetrack

Background

Natural night skies have become rare and are threatened by light pollution—the cumulative glow of poorly designed outdoor lighting. By some estimates, truly dark night skies in the 48 states may be lost by 2025. Even remote national parks often show substantial alteration of the nighttime scenery. As the public loses the experience of a dark sky in their backyards, they are increasingly seeking it out in their national parks. In dozens of parks, stargazing events are the most popular ranger-led activity.

The National Park Service (NPS) Night Sky Program was started by park field scientists in 1999 who initially set out to develop instrumentation and methods to quantify night sky quality. The program now serves parks nationwide and has been adopted by the Natural Resource Program Center. It has become recognized as a leader in the field worldwide, setting the standard for sky measurement, often sought by the media regarding light pollution issues, and working closely with parks to preserve the last of our nation's starry skies.

The Night Sky Program now works on several levels to protect *natural lightscapes*—the visual quality of a park's nighttime landscape that is dependent on natural light sources and darkness. This is accomplished by developing methods for measuring night sky quality, facilitating the science of lightscape management, reporting on existing conditions, encouraging the enjoyment and public understanding of the night, safeguarding nocturnal habitat, restoring starry skies through lighting retrofits, collaborating with gateway communities, and leading the agency and nation in lightscape stewardship.



The U.S. as seen from space, enhanced to show the overflow from cities and towns.

Accomplishments

This Night Sky Program is in the midst of an ambitious inventory of night sky quality in parks. The data and images we collect provide a qualitative measure of sky brightness and its deviation from natural conditions. We are frequently able to identify light sources (e.g. nearby energy facilities, towns, or distant cities) and quantify their individual impacts. The maps and data are essential for park managers and interpreters to convey to the public the ramifications of current outdoor lighting practices. At the same time, these images evoke a sense of awe and beauty and frame the night sky as part of the park scenery. Some of the results of this inventory:

- Light domes from large cities are visible up to 300 km away.
- Even small amounts of artificial light have a large impact on dark skies, rendering many faint features of the night sky invisible.
- Poor air quality can greatly exacerbate night sky degradation.
- Light pollution levels in parks sometimes exceed the brightness of the crescent moon, an illumination level thought to be biologically significant.
- Only a handful of parks have sites within them described as truly natural or pristine.

In addition to the basic inventory and assessment of night sky quality, this program has conducted several outdoor lighting retrofits. By making park lighting *night sky friendly* park visitors are more likely to see the Milky Way and other features of a natural night while the park realizes substantial energy savings. The first lighting retrofit was conducted by the Program at Natural Bridges National Monument, Utah, resulting in proclamation by a non-profit group as the "First International Dark Sky Park." These efforts address both deferred maintenance and natural resource restoration simultaneously.

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More Information

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Arches National Park at night can be spectacular, but is marred by the bright glow from nearby Moab, Utah. The sandstone cliffs of Park Avenue are seen here, illuminated by artificial light. The park is beginning to work cooperatively with the community to recognize the problem and find solutions that benefit everyone. Data and experience provided by the Night Sky Program is crucial to such partnering efforts.

The Night Sky Program is also actively involved in the development and review of several high profile National Environmental Policy Act (NEPA) documents, management plans, and community projects. By doing so, parks have the information necessary to set a leadership example for the public and “walk the talk” of energy and resource conservation. Additionally, visitor surveys show substantial support and interest in dark skies. A sampling of active issues include:

- Assess the lightscape impact of the Alton Coal Mine project on three nearby Utah national parks
- Develop sea turtle-friendly lighting guidelines at Cape Hatteras
- Work with Arches to lay out a comprehensive plan for relighting the park and encouraging the gateway community to do the same
- Work with the community around Acadia to involve citizens in light pollution monitoring and lighting retrofits

Future Direction & Challenges

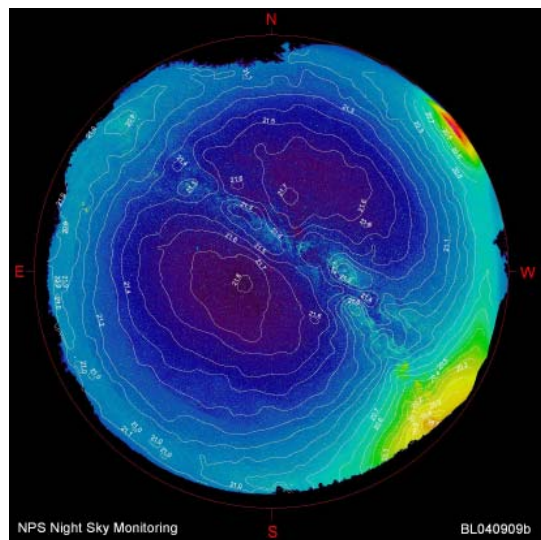
We must continue to meet the demand for direct assistance to parks, advance the study and mitigation of light pollution, integrate what we have learned into agency policies and procedures, and move toward regular monitoring of this important resource. Future milestones include:

- Continuing to provide science and solutions for decision-makers.
- Completing night sky quality inventories at all Class I airshed parks and Wilderness parks by 2012.
- Developing night sky friendly lighting specifications for the agency and integrating these into planning, compliance, and facility maintenance programs.
- Advancing the development of predictive computer models to aid in night sky impact assessment and link to changes in air quality
- Separating natural variations in night sky brightness from the artificial light pollution in our data.
- Developing low-cost instrumentation to enable long-term monitoring of park lightscapes and to track changes in artificial light and air quality, and provide feedback to community partners.
- Collaborating with scientists to develop a 1-100 numerical index of night sky quality to simplify communication of the scope and severity of light pollution.
- Harnessing the interest of amateur astronomers to enhance the experience of park visitors.

Currently 80% of the program’s funding is a blend of short-term allocations, small grants, and donations. Recent reductions by

some funding sources have handicapped progress and delayed fulfilling technical assistance requests. Long-term subsistence of the program and the unique skills developed within the agency relies on a pending base fund request.

The Night Sky Program is more than simply a technical group dedicated to a single park value. It has significant contributions to make in protecting nocturnal habitat given that roughly half of Earth’s creatures depend on some level of darkness. We are leading the way on illumination strategies in park/low-light environments, and we are showing the public that substantial energy savings (about 1.5% of U.S. electrical demand) can be realized by rethinking our illuminated environments. The Night Sky Program works with numerous park facility managers to reduce operational costs and meet safety concerns, and we are often asked to share these strategies with gateway communities. Moreover, the Night Sky Program plays an active role with park interpreters by encouraging stargazing in parks, providing training courses, lending telescopes, providing trained volunteers, and sharing our evocative images of the night sky. Dark night skies are rapidly being lost and are one of the most tangible environmental changes witnessed within a generation. Fortunately, opportunities to restore the night sky are within reach, and the National Park Service can play an important role in a future environmental success story.



All-sky image from Black Canyon of the Gunnison National Park, Colorado. The camera system developed by the NPS is able to measure precise brightness values and determine the deviation from natural conditions. In this image, the Milky Way is seen delicately arching across the sky. Light domes from distant cities are seen on the upper and lower right. Such dark skies are a source of inspirational scenery for visitors, but such relatively dark skies are clearly endangered.