

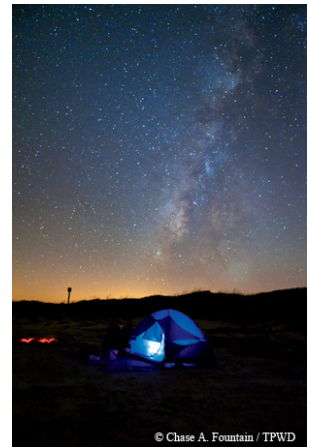
Photic Environment and Lightscapes Resource Summary Padre Island National Seashore

National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science
Natural Sounds & Night Skies Division



The quality of the nighttime environment is relevant to nearly every unit in the NPS System. The 2006 NPS Management Policies (section 4.10) speak of the importance of a natural photic environment to ecosystem function and the importance of the natural lightscape for aesthetics. Photic resources and lightscapes can be important as a natural feature, a cultural feature, or both. Natural lighting conditions are also important to wilderness character and have been identified under the Clean Air Act Amendments as an air quality related value. Therefore, the importance of lightscapes and photic environments is related to an array of park resources and values and has broad implications for park management. Park units should consider the photic environment and lightscapes as important factors that can have a profound effect on the quality of many other park resources and values such as wildlife, wilderness character, visitor experience, cultural landscapes and historic preservation. The topics in Attachment 1 discuss the importance of dark night skies in relation to park resources and values.



At **Padre Island National Seashore**, protecting photic resources, lightscapes and naturally dark skies are related to the following park priorities:

- enhancing visitor experience,
- conducting interpretive programs regarding night sky, wildlife habitat, and the natural costal environment
- interpreting sea turtle protection efforts
- nighttime setting in the park as it relates to the beach camping experience
- nocturnal wildlife such as sea turtles

Potential Threats

- Artificial light from park facilities and operations
- Artificial light from nearby costal development, light domes from bright towns/cities
- Artificial light from visitors

Existing data/planning:

- Baseline night time conditions from sampling in (2013)
- Predicted ALR conditions based on continental model

Future data/planning:

- Re-measure conditions to describe trend
- Develop a lighting plan with lighting zones
- Pursue IDA International Dark Sky Park status
- Develop night skies goals, indicators and standards in related park plans

Quality of the Resource at Padre Island National Seashore

One way the Natural Sounds & Night Sky Division (NSNSD) scientists measure the quality of the photic environment is by measuring total sky brightness averaged across the entire sky and comparing that value to natural nighttime light levels. This measure, called the Anthropogenic Light Ratio (ALR), can be directly measured or modeled when observational data are unavailable. Lower ALR levels reflect higher quality night sky conditions.

Figure 1 provides modeled ALR levels for the contiguous U.S. This figure illustrates the quality of the night skies found throughout the country and across the national park system. Figure 2 provides modeled night sky quality for the local area surrounding the park. These images provide an important landscape scale context for considering night sky quality at the park. Figures 3 and 4 are 360-degree panoramas captured at the park that depicts total sky brightness in false colors, and is intended provide information on nearby light domes and other sources of natural and anthropogenic light.

Although the park night sky quality is partially degraded due to the proximity of the multiple population centers, Padre Island National Seashore provides important coastal habitat for nocturnal wildlife and a unique opportunity for the public to enjoy night sky resources. The park unit demonstrates the best night sky quality in the region. By providing overnight camping, leading night sky programs, and conducting night sky quality monitoring, the park has demonstrated that it is dedicated to protecting night sky resources.

Ground based observations collected in 2013 at the northern edge of the park produced an ALR of 3.82 (Figure 3). At these light levels, the Milky Way may be visible when it is directly overhead, otherwise it is not apparent. The Andromeda Galaxy M31 may be barely visible. Little sense of naturalness remains in the night sky, and the landscape is clearly shadowed or illuminated. The horizon may appear aglow with anthropogenic light. Full dark adaptation of eye sight may not be possible, and substantial glare may be present. Circadian rhythms may be disrupted.

Ground based observations collected in 2009 at the southern end of the park produced an ALR of 0.78 (Figure 4). At these light levels, the Milky Way is more visible but has typically lost some of its detail and is not visible as a complete band. Zodiacal light (or “false dawn” which is faint glow at the horizon just before dawn or just after dusk) is rarely seen. Anthropogenic light likely dominates light from natural celestial features and shadows from distant lights may be seen.

The modeled median ALR value for the entire park is 0.5, but does not take into account recent developments over the last 10 years (Figure 2). An anthropogenic light ratio of 0.0 would indicate pristine natural conditions, while a ratio of 1.0 would indicate that anthropogenic light was 100% brighter than the average natural light from the night sky.

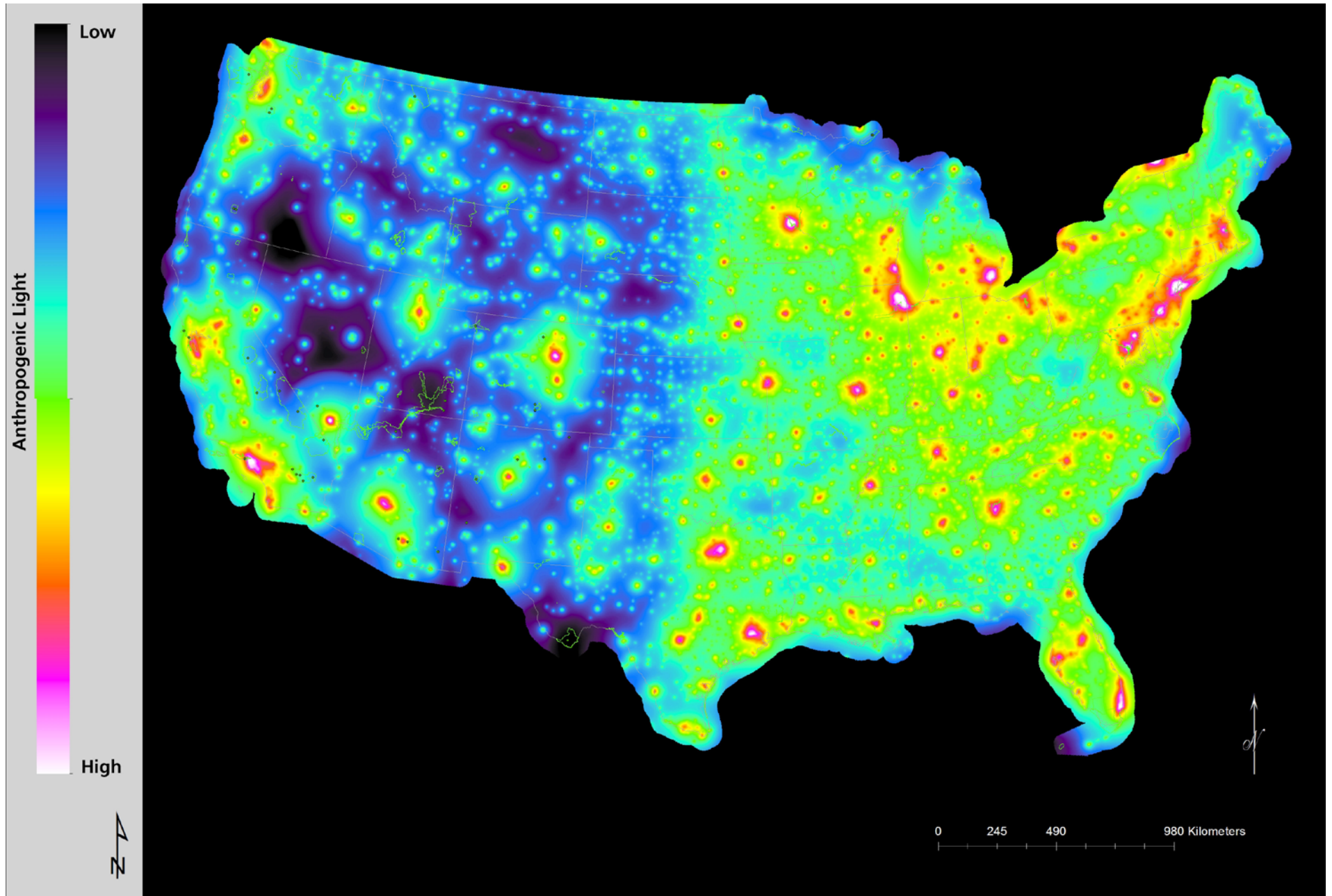


Figure 1. *Anthropogenic Light Ratios (ALRs) for the Contiguous US.* White and red represents more environmental influence from artificial lights while blues and black represent less artificial light.

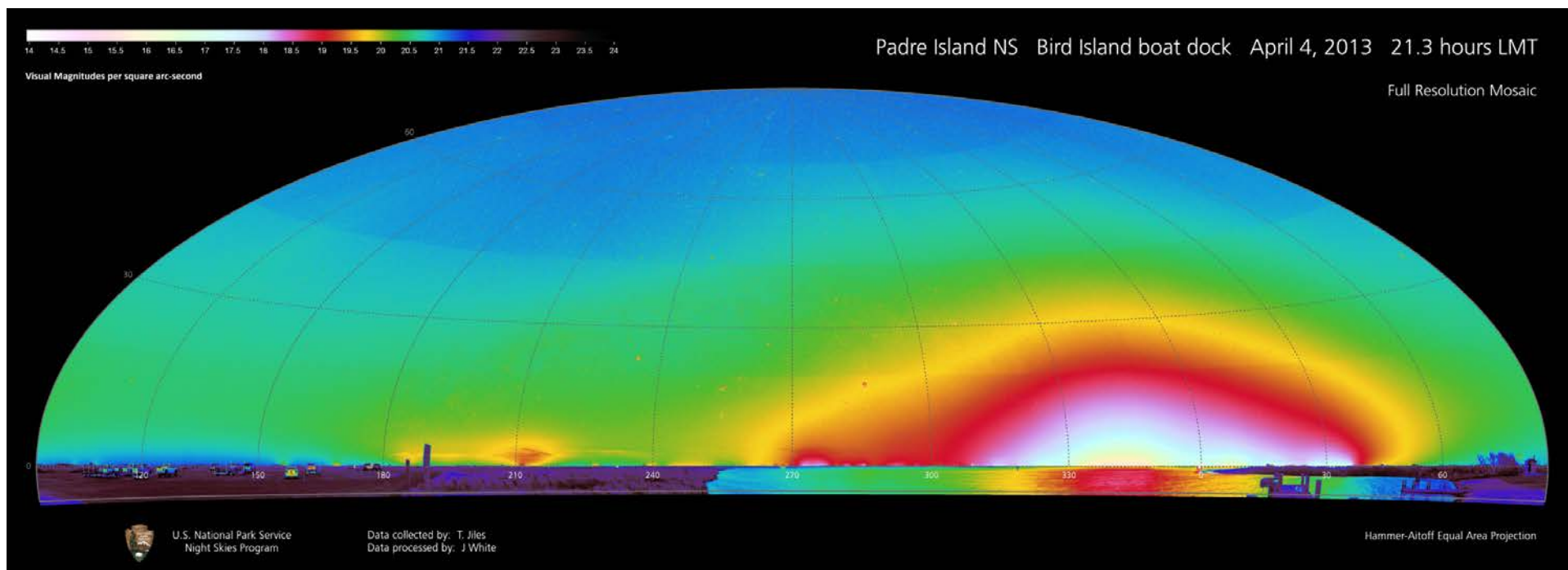


Figure 3. *Panoramic image of all (natural and anthropogenic) sources of light as observed from Bird Island Boat Dock at Padre Island National Seashore in 2013.* This image was captured with highly sensitive photographic equipment in order to demonstrate the extent of sky glow from human light sources. White and red represents more environmental influence from artificial lights while blues and black represent less influence. Images with less anthropogenic light may display celestial objects like stars or the span of the Milky Way.

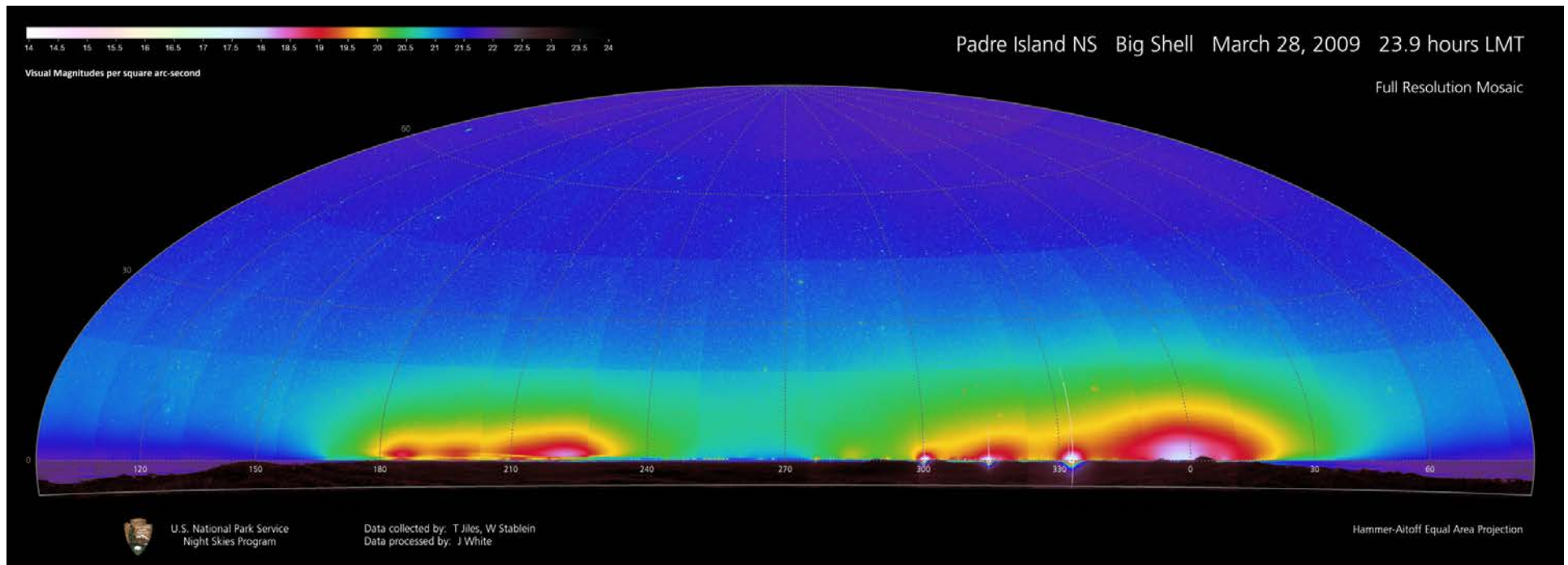


Figure 4. *Panoramic image of all (natural and anthropogenic) sources of light as observed from Big Shell at Padre Island National Seashore in 2009.* This image was captured with highly sensitive photographic equipment in order to demonstrate the extent of sky glow from human light sources. White and red represents more environmental influence from artificial lights while blues and black represent less influence. Images with less anthropogenic light may display celestial objects like stars or the span of the Milky Way.