

Photic Environment and Lightscapes Resource Summary Redwood National and State Park

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 **Redwood N&SP**, protecting photic resources, lightscapes and naturally dark skies are related to the following park priorities:

- enhance the sense of remoteness for all visitors
- nocturnal and crepuscular wildlife including but not limited to Northern spotted owl and Marbled Murrelet
- quality visitor experience
- interpretive programs related to nocturnal wildlife and night sky quality
- nighttime setting for front country and backcountry campers

Potential Threats

- artificial light from park facilities and operations
- artificial light from nearby development
- light domes from bright urban cities and metropolitan areas
- artificial light from visitors

Potential Opportunities

- park lighting plan
- retrofit park light sources in order to reduce glare, reduce overall light output, direct lights downward and install warmer color lamps
- coordinate with neighbors and partners to reduce human-caused light that could affect park resources and values
- night sky educational and recreational programming

Existing data/planning:

- baseline night time conditions from sampling in 2011
- predicted ALR conditions based on continental model

Future data/planning:

- re-measure conditions to describe trend
- develop a lighting plan
- pursue IDA International Dark Sky Park status
- develop night skies goals, indicators and standards in related park plans and strategies

Quality of the Resource at Redwood N&SP

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. Figure 3 is 360-degree panorama captured at the park that depicts total sky brightness in false colors, and is intended to provide information on nearby light domes and other sources of natural and anthropogenic light.

Ground based observations collected in 2011 on Schoolhouse Peak produced an ALR of 0.18. The modeled median ALR value is 0.12 (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. At these light levels, most observers feel they are in a natural environment. The Milky Way is visible from horizon to horizon and may show great detail, with fine details such as the Prancing Horse. Zodiacal light (or “false dawn” which is faint glow at the horizon just before dawn or just after dusk) can be seen under favorable conditions, and there is negligible impact to dark adaptation of eye sight looking in any direction.

Redwood N&SP provides important forest habitat for nocturnal wildlife and a unique opportunity for the public to enjoy night sky resources. 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.

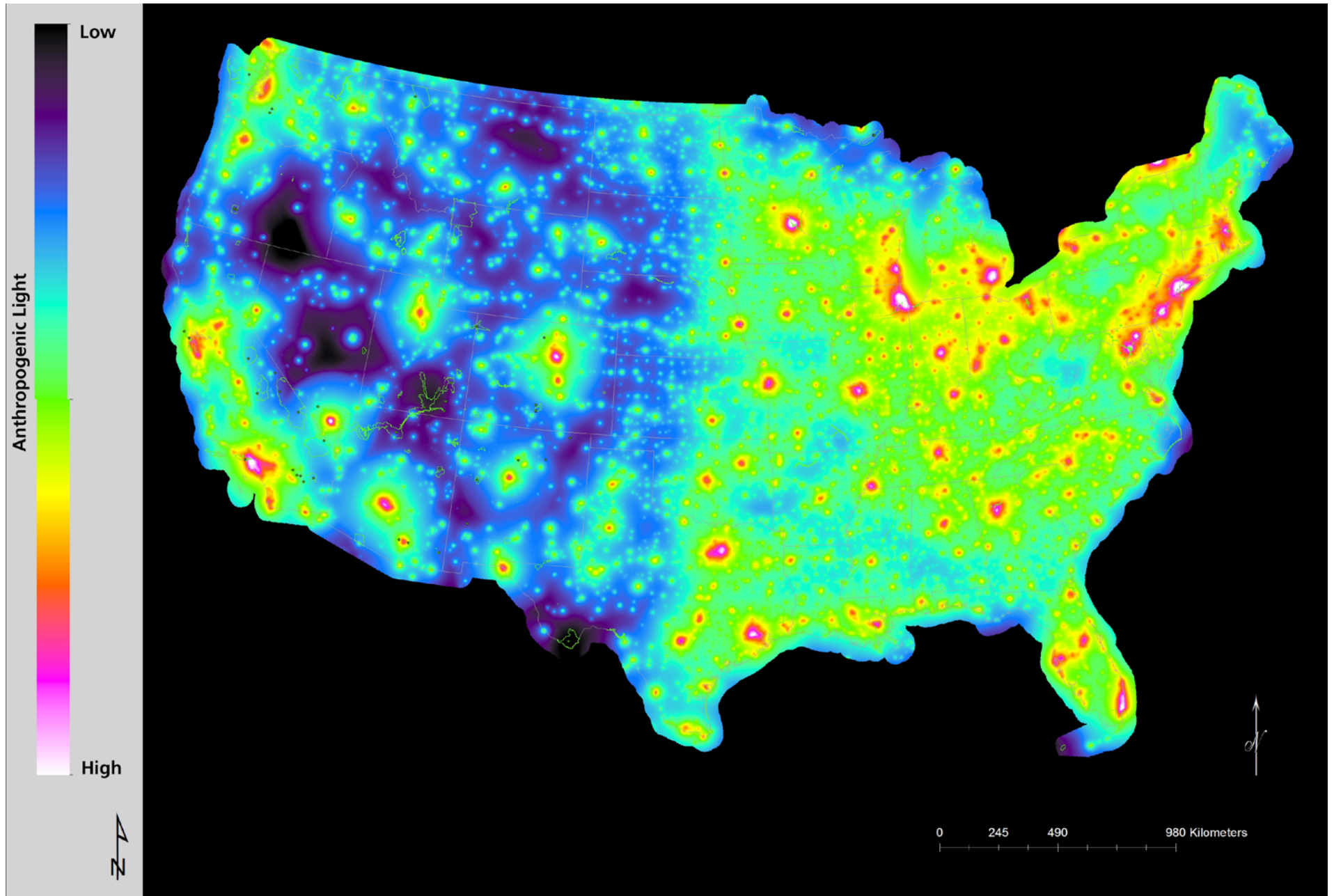
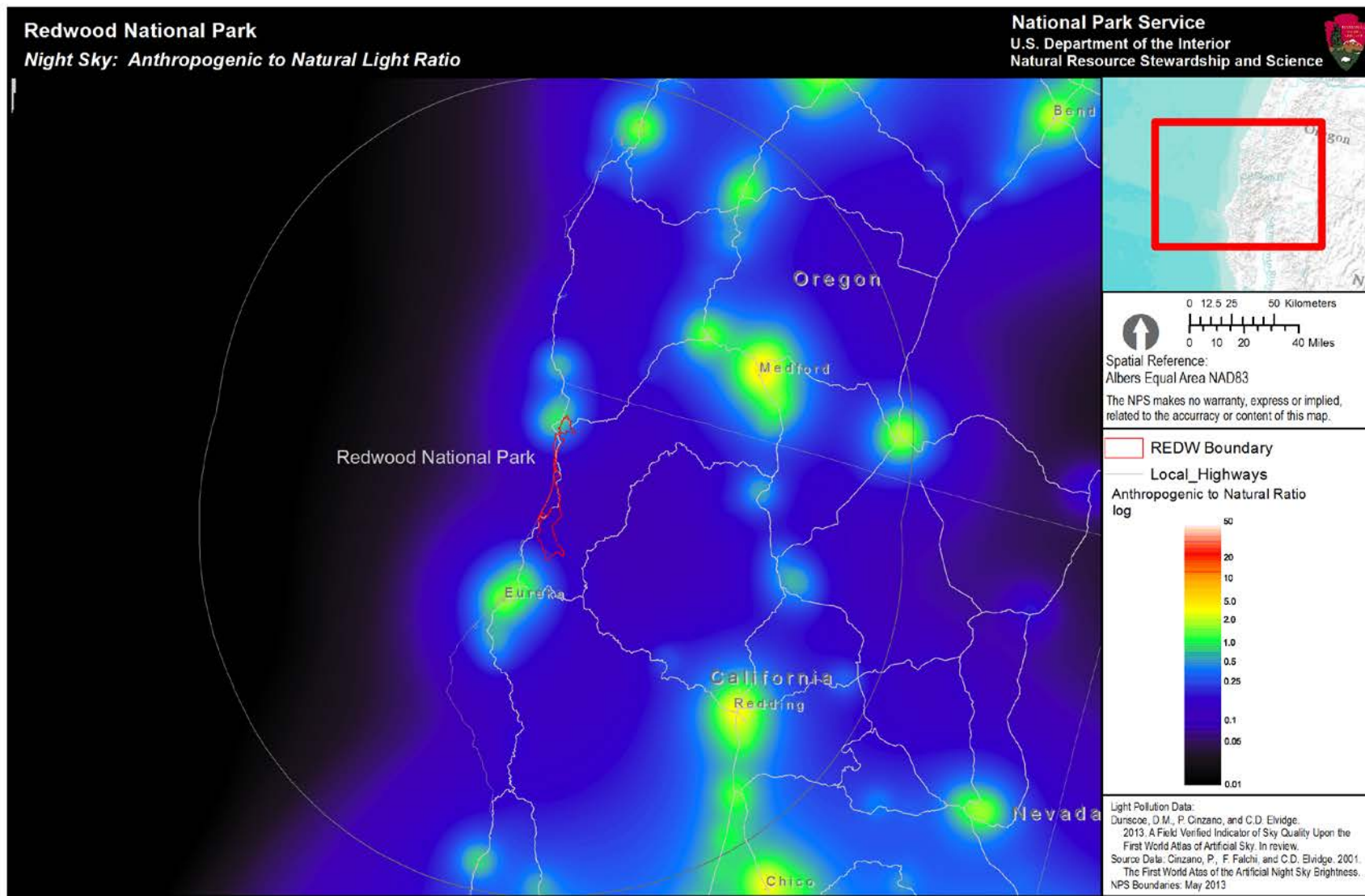


Figure 1. *Anthropogenic Light Ratios (ALRs) for the Contiguous US.* White and red represents more environmental influence from artificial lights while blues and black represent less artificial light.



Created by NPS Natural Sounds & Night Skies Division and NPS Inventory and Monitoring Program MAS Group on 20150220

Figure 2. *Regional view of anthropogenic light near Redwood N&SP.* Yellow and green represent more environmental influences from artificial lights, while blues and black represent less artificial light. The scale is small in order to show regional context and to show how far reaching the impacts of artificial lighting can be. While Redwood N&SP may be influenced by artificial light, it maintains more naturalness than surrounding areas and serves as a harbor of dark skies.

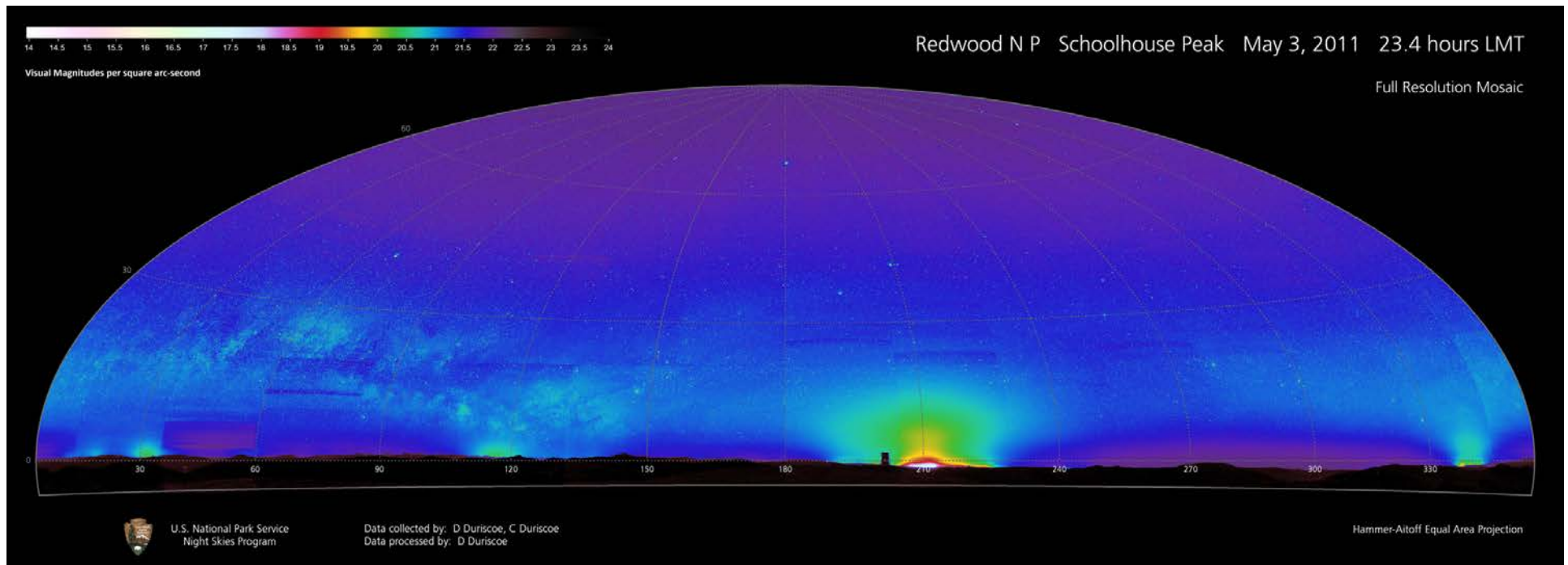


Figure 3. *Panoramic image of all (natural and anthropogenic) sources of light as observed from Schoolhouse Peak at Redwood N&SP in 2011.* This image was captured with highly sensitive photographic equipment in order to demonstrate the extent of sky glow from human light sources. White and red represent more environmental influences 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.