

Photic Environment and Lightscapes Resource Summary Overmountain Victory National Historic Trail

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 **Overmountain Victory National Historic Trail**, protecting photic resources, lightscapes and naturally dark skies are related to the following park priorities:

- ability to enhance visitor experience and conduct interpretive programs
- historic, commemorative, and rural setting in the park
- nocturnal wildlife such as bats, predators, migratory birds, and small mammals

Potential Threats

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

Potential Opportunities

- Reduce artificial lighting effects from park facilities
- Educate visitors about glare and light pollution

Existing data/planning:

- Predicted ALR conditions based on continental model

Future data/planning:

- Collect baseline data
- Develop a lighting plan
- Develop night skies goals, indicators and standards in park plans

Quality of the Resource at Overmountain Victory National Historic Trail

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 demonstrate 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. For OVVI, a 500m buffer was added to each side of the trail creating a 1km area along the entire length of the trail, from which the model sampled ALR. These images provide an important landscape scale context for considering night sky quality at the park.

The modeled median ALR value is 2.73 (Figure 2). Due to the linear nature of OVVI, ALR varies along the trail. The minimum ALR value along the trail is 1.81, and the darkest 10% of trail area was 1.93. These conditions are moderately degraded. The maximum ALR is 6.36, and 90% of the trail area was 4.86. 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.

For 50% of the park, the median level, 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; however dense forest may block light domes. The horizon may appear aglow with anthropogenic light. Full dark adaptation may not be possible, and substantial glare may be present when horizons are relatively clear. Circadian rhythms may be disrupted.

Although the park night sky quality is degraded due to the proximity of the multiple population centers, the conditions may be better than surrounding areas and represent an important yet threatened resource. The area provides habitat for nocturnal animals and offers recreation opportunities after dark. Further, national parks are tasked with preserving night sky quality and can serve as an example to surrounding communities and agencies by taking steps to mitigate anthropogenic light internally, providing the best opportunity for visitors to enjoy the night sky.

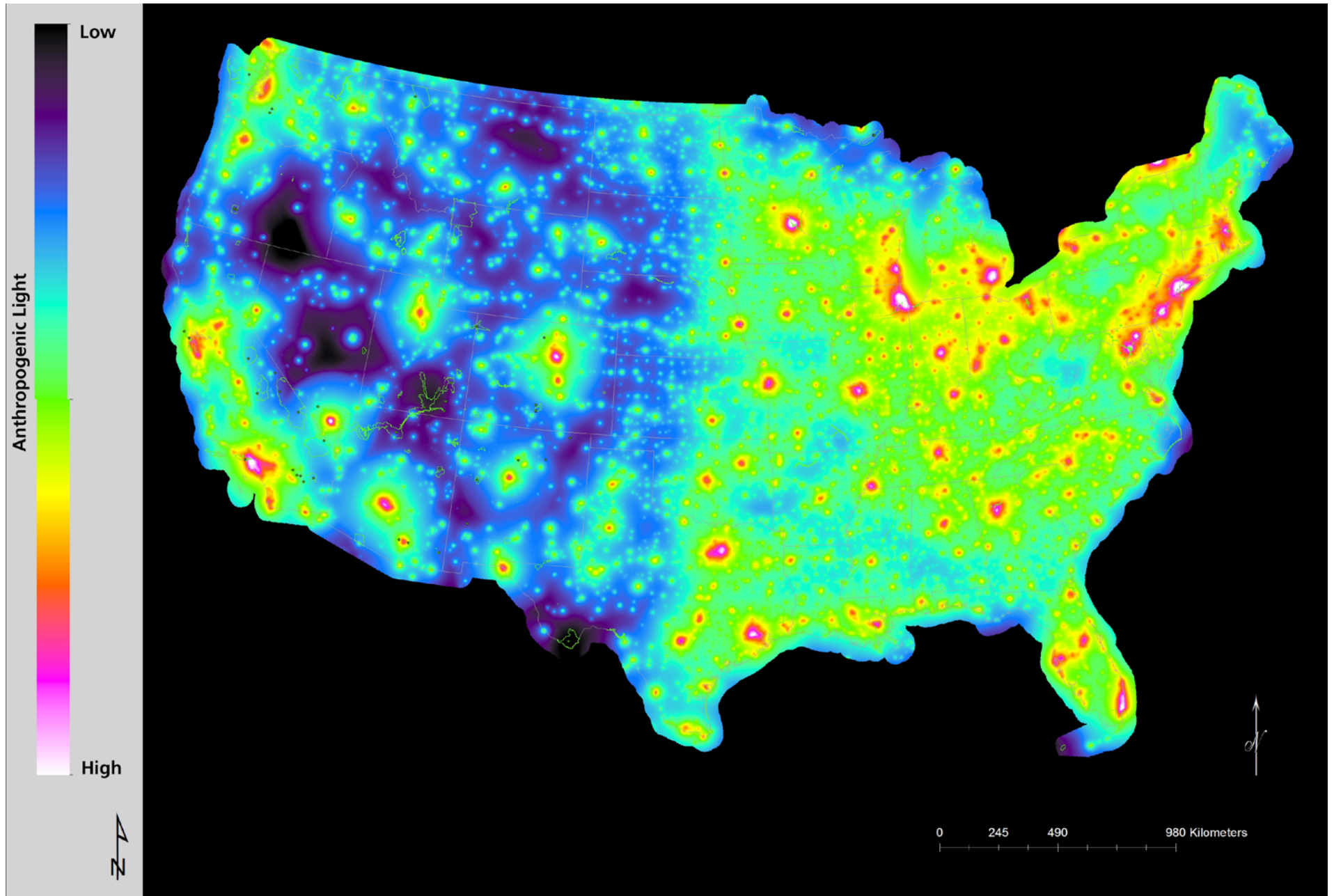
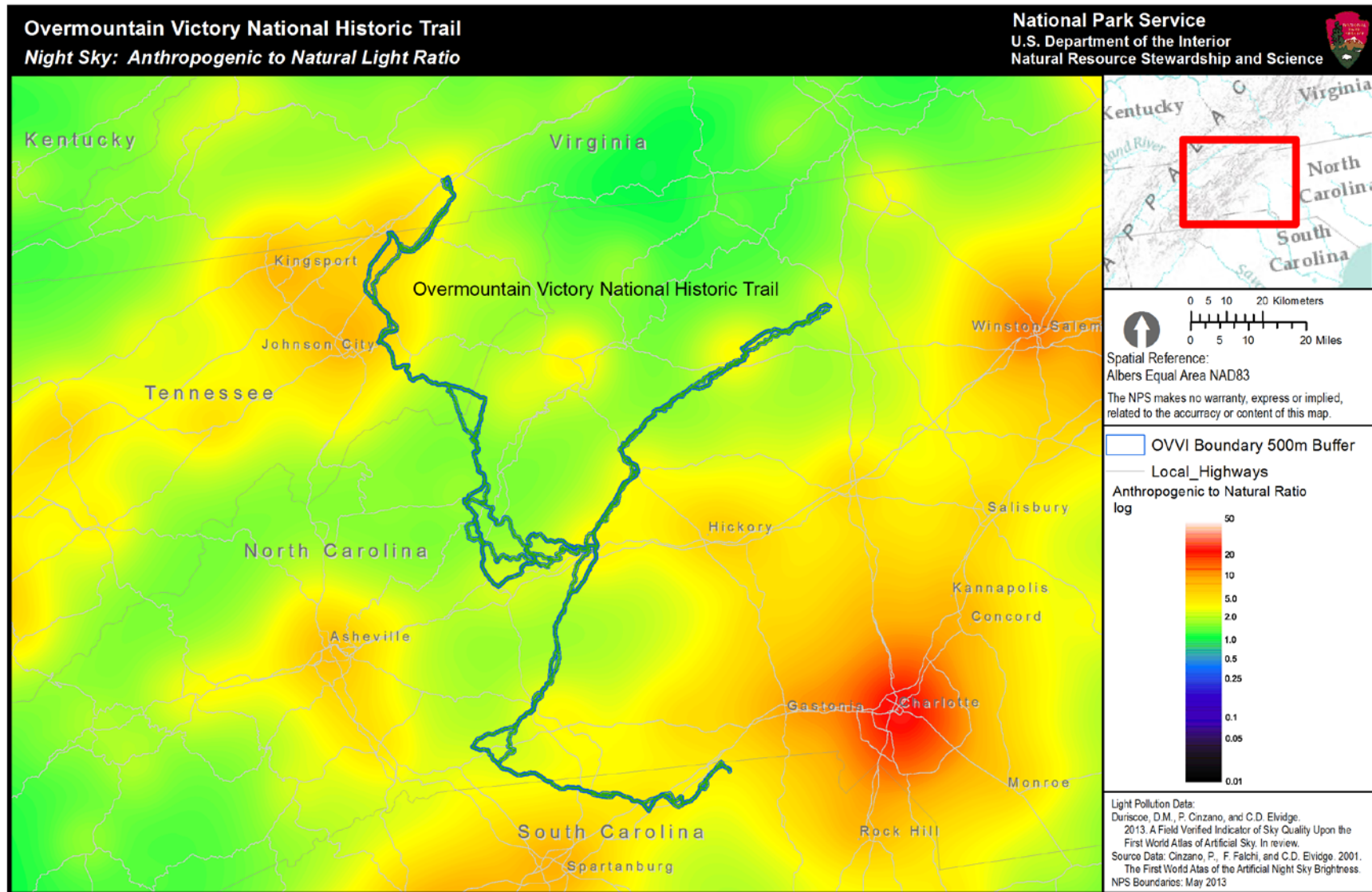


Figure 1. *Anthropogenic Light Ratios (ALRs) for the Contiguous US.* White and red represents more environmental influence from artificial lights while blues and black represent less artificial light.



NPS Natural Sounds & Night Skies Division and NPS Inventory and Monitoring Program MAS Group 20150126

Figure 2. *Regional view of anthropogenic light near Overmountain Victory National Historic Trail.* White and red represents more environmental influence 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 Overmountain Victory National Historic Trail may be influenced by artificial light it still maintains more naturalness than surrounding areas and serves as a harbor of dark skies.