Night Skies and Photic Environment Resource Summary
Palo Alto Battlefield National Historical 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. A lightscape can be important as a natural feature, a cultural feature, or both. Natural lightscapes 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.

When developing the foundation document, park staff should consider night skies as a resource with inherent value that may be recognized when appropriate in the Fundamental Resource and Value, Other Important Resource and Value, or another section of the document. In addition, parks 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. This approach provides parks with a degree of flexibility regarding when and how night skies can be addressed in the foundation document. The topics in Attachment 1 discuss the importance of night skies in relation to park resources and values. Please see Attachment 2 for an example of how Bryce Canyon National Park incorporated night skies into various sections of the foundation document.

Quality of the Resource at Palo Alto Battlefield National Historical Park

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 is 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 attachments provide an important landscape scale context for considering night sky quality at the park.

The modeled median ALR value is 5.96 (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 natural light from the night sky. Therefore, at Palo Alto Battlefield National Historic Park, the sky is predicted to be 596% brighter than a natural.

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 not possible and substantial glare may be present. Circadian rhythms may be disrupted.

Although the park night sky quality is partially degraded due to the proximity of the multiple population centers, 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.

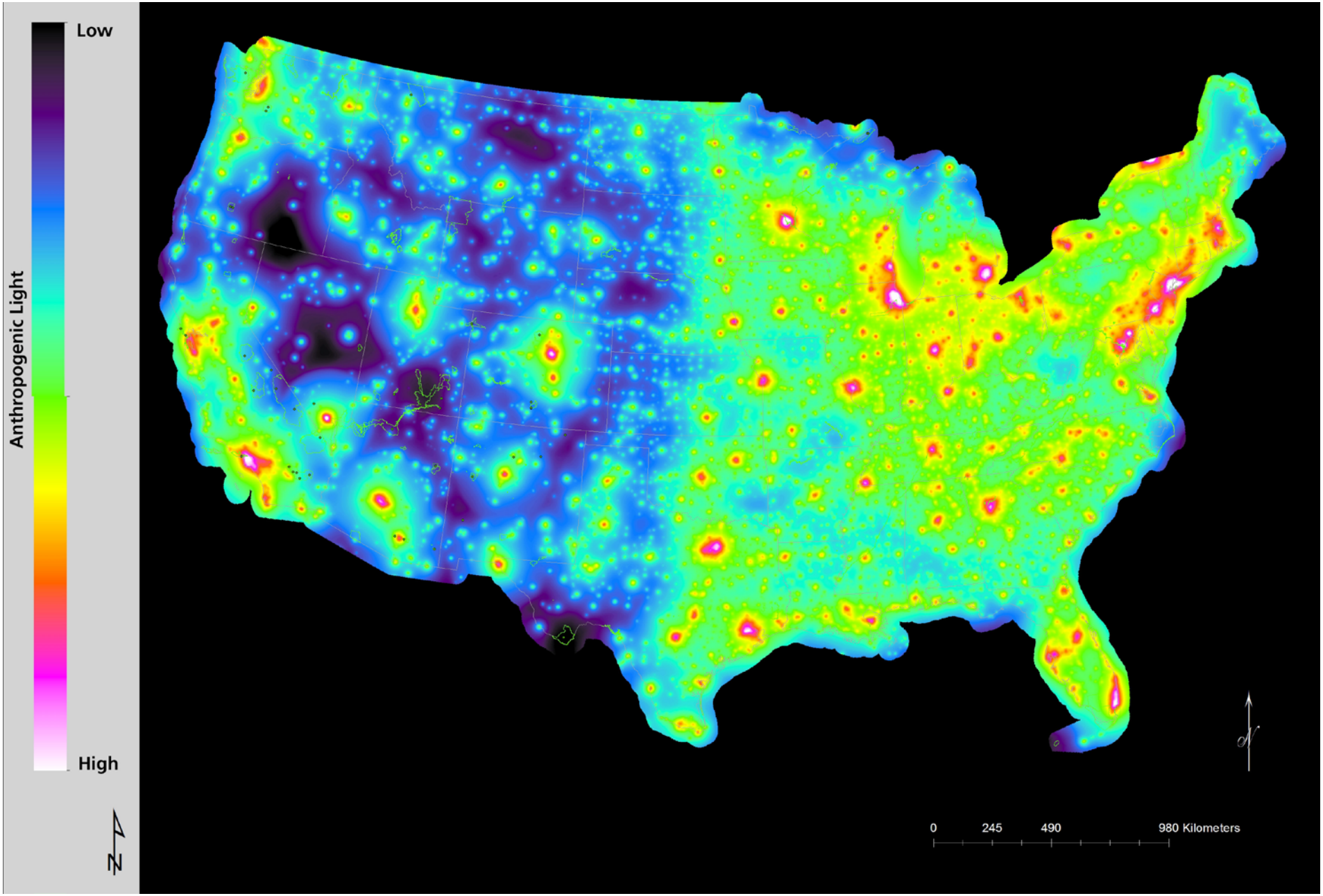

Figure 1 – Anthropogenic Light Ratios (ALRs) for the Contiguous US.

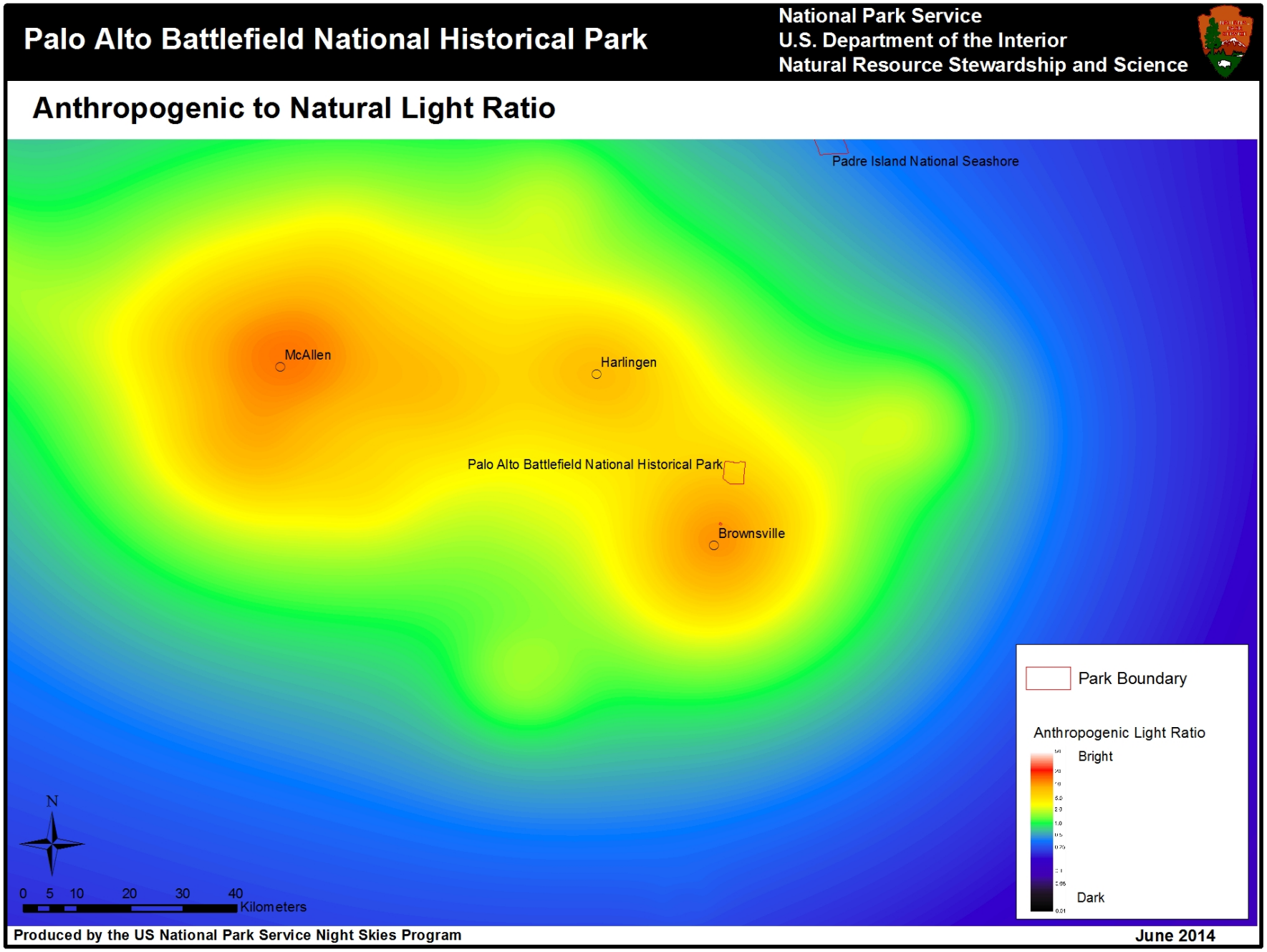

Figure 2 – Regional ALR near Palo Alto Battlefield National Historical Park