

**Project Summary**  
**Rocky Mountains Cooperative Ecosystem Studies Unit**

**Project Title:** Assistance for Night Sky Visibility Data Collection, Analysis, and Presentation

**Discipline:** Natural Resources  
**Type of Project:** Technical Assistance  
**Funding Agency:** National Park Service  
**Other Partners/Cooperators:** Colorado State University  
**Effective Dates:** 9/1/2010 - 5/31/2014  
**Funding Amount:** \$380,490 (FY13: \$17,000; FY12: \$23,500; FY11: \$39,950; FY10: \$300,040)

**Investigators and Agency Representative:**

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**Project Abstract:**

Night Sky Visibility Data Collection, Analysis, and Presentation: The public visits national parks and wilderness areas to enjoy nature in an unblemished setting. These areas have been set aside for their scenic qualities and for the inspiration they provide to the American people. Daytime visibility as seen from park vistas has been well studied and is protected by various regulations such as the Clean Air Act. However, visibility at night has been less well studied. Views of the stars, other celestial phenomena, and simply the natural view of a nighttime scene unencumbered by artificial lights is a wildland value of increasing significance.

Threatened by light pollution, the upward emission from outdoor lights that brightens the sky and drowns out the view of the cosmos is diminishing nighttime visibility. Atmospheric pollution such as aerosols also diminishes the nighttime scenery, as it does the daytime scenery, and interacts with artificial light in complex ways. The NPS and CSU scientists are working together to better understand the scientific basis of these issues, share knowledge and data with the public, and make that information available other agencies and collaborators.

Effective management of nighttime visibility is being catalyzed by instrumentation developed by the NPS that measures night sky brightness. Demand for baseline inventories of night sky conditions has increased sharply from within the NPS and from other agencies. The NPS Night Sky Program joined with CSU two years ago to assist with the collection, analysis, and presentation of data and to help push the state of the art to the next level. The field of study will be further enhanced by collaboration with CSU atmospheric scientists, integrating into the strong sustainability focus that CSU has seized upon, and enticing more students into putting academic effort into this topic.

Effort for the period September 1, 2010, through August 31, 2013, will encompass the following:

- Conduct field visits to national park sites for inventory and quantification of night sky visibility. Provide other technical assistance as needed to agency on topics such as light pollution physics, outdoor lighting mitigation, ecological impacts of artificial light, and outreach strategies.
- Test, deploy, and critique new instrumentation, including recently acquired Night Sky Brightness Meters (NSBMs). Deploy for one year alongside air quality instrumentation. Analyze and report on the ability of the instrument to track sky brightness accurately and resolve the relationship between atmospheric extinction and artificial night sky brightness.
- Process and manage field data, and assist with improving reliability, accuracy, and speed of processing algorithms. Assist with publication of methods and results.
- Promote education and understanding of light pollution, and promote an appreciation for natural night skies.
- Collect references and research papers on night sky visibility and compile into an electronic library to be made available to collaborators and academics.
- Prepare existing data for inclusion into the Federal Land Manager's Environmental Database, in order to display imagery, descriptive statistics, metrics, and metadata.

Web-based Environment Database Supporting Air Resource Management in National Park and Forest Service Lands: The objective of this project is to develop a web-based integrated environmental database and data delivery and visualization tools to support and facilitate environmental data assessments and reports by the National Park Service and Forest Service. To meet this objective there are four tasks that need to be completed. First, a project website and integrated database need to be created. Second, the datasets from multiple providers need to be incorporated into the database and tools for maintaining these data generated. Third, tools to calculate and archive common summary statistics and derived values from the raw data need to be developed. Last, tools to access and deliver the data to users in tabular and graphical forms need to be developed.

**Outcomes with Completion Dates:**

**Final Report** - March 31, 2014

**Keywords:** NPS Night Sky Program, Visibility Data, light pollution, web-based integrated environmental database, Air Resource Management, Colorado State University, Cooperative Institute for Research in the Atmosphere (CIARA), National Park Service