

# **Project Completion Report**

## **Rocky Mountains Cooperative Ecosystem Studies Unit (RM-CESU)**

**Project Title:** Investigation of Nitrogen Deposition into Loch Vale, Rocky Mountain National Park

**Project Code:** J1526095322, CSURM-156

**Type of Project:** Research

**Funding Agency:** National Park Service

**Partner University:** Colorado State University

**NPS Agreement Technical Representative:** Judy Visty and Jim Cheatham, Rocky Mountain National Park, 1000 Highway 36, Estes Park, Colorado 80517, (970) 586-1301; jim\_cheatham@nps.gov

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**Start Date of Project:** September 15, 2009

**End Date of Project:** January 31, 2012

**Funding Amount:** \$20,000

### **Project Summary, including descriptions of products, work accomplished and/or major results.**

Wet inorganic nitrogen deposition to Loch Vale (NADP site CO98) is estimated to be between 3.0 and 4.25 kg N/ha/yr. A concerted effort was made as part of this project to upgrade the NADP wet deposition collection capability. A replicate set of NADP equipment (NADP site CO89) was installed, the CO98 Belfort rain gage was replaced with a NOAA IV gage, and trees were trimmed near all collectors so that both CO98 and CO89 now meet NADP siting criteria. Data from both sites are now telemetered, and new no-glare solar panels have been installed on new scaffolding. Loch Vale now also maintains a passive ammonia monitor, installed in 2010. Loch Vale data contributed to a NPS Natural Resource Condition Assessment for Rocky Mountain National Park and the 2008 and 2009 NPS Natural Resource Reports: Monitoring and Tracking Wet Nitrogen Deposition in Rocky Mountain National Park.

Loch Vale stream discharge, weather, and water quality data are now available both in text file and real time from NWIS, the USGS National Water Information Source. A quality assurance report for all Loch Vale water quality data was published as a USGS Open-File report and is available on the web page. The Loch Vale website and methods manual were updated:

<http://www.nrel.colostate.edu/projects/lvws>. Glacier, waters, and soils were sampled for microbial activity and will be the subject of a thesis, now in draft. LiDAR data were obtained and used to support another thesis and a current study of topographic flowpaths.

Field trips were provided for summer students from high schools and universities and state and federal air quality officials.

Publications:

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**Number of students participating in this project: 5 undergraduates, 4 graduate students, degrees conferred.** Graduate students Cara Moore (M.Sc. defended Feb 27 2012), Katie Williams (M.Sc. defended in 2010), Blaine Hastings (M.Sc. in progress) and Brooke Osborne (M.Sc. defense April 2 2012) benefited from this project. Undergraduates Shenavia Balcom, Matt Schoonmeester, William Magee, Michelle Bahnick, and Julie Spencer either did summer internships or worked in the laboratory.

**Lessons Learned from this project.** Longer is better! Loch Vale is entering its 30<sup>th</sup> year of continuous measurements, and the results of the monitoring reveal unexpected climate changes with unexpected ecological responses that we are now trying to understand.