

Project Summary
Rocky Mountains Cooperative Ecosystem Studies Unit

Project Title: Nitrogen Deposition in the Rocky Mountain Region

Discipline: Natural
Type of Project: Research
Funding Agency: National Park Service
Other Partners/Cooperators: Colorado State University
Effective Dates: 9/1/2010 - 8/31/2011
Funding Amount: \$679,629

Investigators and Agency Representative:

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Project Abstract: During this project, CSU investigators propose to continue analyses of data from recent intensive field campaigns in RMNP, to continue baseline monitoring of key gas phase and particulate nitrogen species at the RMNP RoMANS core study site during key spring and summer deposition seasons, to continue support for the new IMPROVE pilot-scale NH_x monitoring effort, and to initiate new efforts to characterize reactive nitrogen deposition budgets and pathways in Grand Teton N.P. Planned efforts are summarized below:

1. Analysis of RMNP nitrogen deposition data sets
 - a. Utilize recently collected year-round measurements of airborne concentrations and wet deposition of key nitrogen species to construct seasonal and annual budgets of reactive nitrogen deposition in RMNP. These will include new, full-year budgets for organic nitrogen wet deposition and gaseous ammonia dry deposition.
 - b. Analyze continuous measurements of gaseous NO_y, NO_x, and NH₃ to determine conditions when elevated concentrations of these species are observed in RMNP. Compare with continuous particle composition measurements (measured by the Particle Into Liquid Sampler (PILS)). Work with NPS/Cooperative Institute for Research in the Atmosphere (CIRA) researchers using modeled transport pathways to assess important sources of these species.
 - c. Analyze available data, including paired ammonia measurements on the east and west slopes of RMNP and measured soil emissions of ammonia, to determine the importance of local vs. transported sources of ammonia at the RMNP RoMANS core measurement site.
 - d. Determine the abundance (and, if possible, composition) of organic nitrogen in RMNP particles and gases. Determine RMNP organic nitrogen dry deposition budgets.
 - e. Determine impacts of prescribed and wild fires on aerosol concentrations in RMNP from real-time and filter-based smoke marker measurements during summers 2009 and 2010. Determine whether periods of smoke impact are associated with elevated nitrogen species concentrations and deposition.

2. Continue baseline monitoring of key gas and particle phase species contributing to RMNP nitrogen (N) deposition. During spring and summer 2011, measure weekly average concentrations of gaseous ammonia, gaseous nitric acid, and particulate ammonium, nitrate, and sulfate to extend the data record begun during the 2006 RoMANS study.
3. Continue the IMPROVE NH_x study. CSU will continue to prepare and deploy filters for, and analyze measurements from, the pilot-scale, 9-site IMPROVE NH_x study initiated begun in spring 2010.
4. Initiate a new investigation of airborne nitrogen species concentrations and deposition in Grand Teton N.P (GTNP)
 - a. Collect, in collaboration with GTNP staff, year-round, weekly integrated samples of gaseous ammonia, gaseous nitric acid, and particulate nitrate, ammonium, and sulfate in GTNP. Collect year-round weekly samples of wet deposition in GTNP. Analyze collected samples at CSU to provide information about the concentrations and deposition fluxes of key nitrogen species in GTNP throughout all seasons.
 - b. Conduct a 3-month intensive study in GTNP during spring and summer 2011 of reactive nitrogen species concentrations and deposition fluxes.

Outcomes with Completion Dates: August 31, 2011

Keywords: Colorado State University, NPS-Air Resources Division, Rocky Mountain National Park, RoMANS, nitrogen deposition, air quality