

# Project Completion Report

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

**Project Title:** AIRPACT Pollutant Deposition Maps and Analysis

**Project Codes:** WSU-05 J9088080024

**Type of Project (Research, Technical Assistance or Education):** Research

**Funding Agency:** National Park Service

**Partner University:** Washington State University

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**Start Date of Project:** Sept 1, 2008

**End Date of Project:** September 30, 2009

**Funding Amount:** \$12,000

**Project Summary, including descriptions of project deliverables, work accomplished and/or major results... Also add web sites where project-related information may be found.**

**Background:** The AIRPACT-3 numerical air quality forecast system (<http://lar.wsu.edu/airpact-3>) operates daily to provide quantitative estimates of air pollutant concentrations for a domain that encompasses all of Idaho, Oregon, Washington, and portions of bordering areas. This forecast system employs WRF meteorological forecasts from the University of Washington with emissions processing and CMAQ photochemical model simulations to account for the emission, transport, chemistry and fate of a wide range of pollutants. An important aspect of AIRPACT-3 is the fact that the modeling system explicitly treats the wet and dry deposition of a number of pollutants, including ozone, nitrogen species such as nitric acid, sulfur species such as sulfuric acid, and mercury species such as reactive gaseous mercury. At present, these results, although being produced, have not been shared via the AIRPACT-3 web site; and there has been only limited analysis of the AIRPACT-3 deposition estimates (Porter, 2007). For the project, we developed a series of deposition maps posted to the web on a monthly and annual basis

that show the total accumulated deposition for each selected species and for total N, total S, and total Hg. A second objective is to begin to compile deposition data from available sites within the AIRPACT-3 domain as a basis for preliminary evaluation of the deposition estimates at selected locations. This project overlaps with an allied project:

Atmospheric Modeling to Refine Lichen-based Critical Loads for the North American Marine West Coast Forests Ecological Region, performed under Task Agreement # J8W07090010, Cooperative Agreement # H8W07060001, with the Pacific Northwest Cooperative Ecosystem Studies Unit

**Approach:** The initial step required to achieve the first objective are to develop computer scripts to automatically accumulate deposition totals for each grid within the domain and for the selected list of pollutants, for each day. For each month and each year, these maps would become accessible via the web site. The second step is to develop the web page where the maps would be posted and to provide suitable background information for correct interpretation of the maps. An additional step would be to archive the deposition results for selected monitoring sites so that these estimates could later be paired with observed deposition results.

The list of species used in the deposition accumulations includes gaseous and aerosol N, S, and Hg species. In addition, it is desirable to show wet deposition totals separately and in sum with dry deposition totals.

To address the second objective, we have download available deposition monitoring data from the NDEP and CASTNET programs for sites within the AIRPACT-3 domain. These data are being paired with AIRPACT output for each selected site and the resulting database will be used for initial evaluation of the deposition estimates. Due to the limited scope of this project, we do not anticipate that this will be a comprehensive analysis, but we hope it will provide some initial insight into the level of model performance for a number of monitoring sites.

**Schedule:** Work began during September, 2008 and continued through the spring, 2009 and into 2010.

**Personnel:** Dr. Lamb and Dr. Vaughan shared responsibility for directing this project. A student assisted with the scripting and development of the deposition products.

**End Products:** The end products are accumulated deposition maps for variety of pollutants available via the AIRPACT-3 web site. Documentation is under preparation for addition to the web site, to provide a full description of the process for generating these deposition results. The monthly maps are posted for 2008 and 2009 within the AIRPACT-3 web site: [http://www.atmos.washington.edu/~empact/airpact\\_monthly\\_depo/AP\\_monthly\\_depo.php](http://www.atmos.washington.edu/~empact/airpact_monthly_depo/AP_monthly_depo.php)

**Number of students participating in this project: undergraduates, graduate students, degrees conferred.** One graduate student, 'Pierre' Wong, worked on this project and is expected to complete a Master of Science in Civil Engineering degree in December 2010.