In A Changing Climate, How Do Projected Changes in Precipitation Affect Wet Deposition – A GIS Approach

Drew Bingham
National Park Service – Air Resources Division
PO Box 25287, Denver, CO 80209

As part of its efforts to make air quality data more accessible to policy and decision makers, the National Park Service Air Resources Division created a GIS based model designed to integrate several air quality parameters into a single aggregate score. This air quality score would convey the overall condition for each park unit, even those without on-site air quality monitoring.

In order to obtain condition scores for each national park unit, interpolations covering the entire continental US were created from monitored data. Along with ozone and visibility layers, total nitrogen and sulfur wet deposition (using NADP monitor data) were the primary inputs used to determine the overall condition score. The first step in creating the wet deposition layers needed for the model was to create interpolations of concentration using the most recent 5-year average of NADP monitored data. This interpolation was then multiplied by the normalized 30-year precipitation average from the PRISM Climate Group in order to minimize interannual variation in deposition caused by fluctuations in precipitation.

Recently the National Center for Atmospheric Research (NCAR) made available datasets of climate change projections in GIS format. These projections from the Climate Change System Model (CCSM-3, created for the 4th Assessment Report of the Intergovernmental Panel on Climate Change) included downscaled projections of not only monthly mean temperature but also total precipitation for the contiguous United States at a similar resolution to that of the PRISM data. It is now possible, using a process similar to the one used to determine present day deposition estimates, to estimate the effect of different precipitation scenarios on wet deposition of nitrogen and sulfur.

Wet deposition estimates for future climate conditions were created using different emissions scenarios and various future time frames. While there are issues with this approach (uncertainties inherent in the climate model as well as the assumption that concentrations will remain constant at today's levels) nevertheless, these deposition estimates are useful to park managers as they prepare for an uncertain future.

Corresponding author: Phone: 303.969.2341, Email:
Drew_Bingham@contractor.nps.gov