

HYBRID APPROACH TO MAPPING TOTAL DEPOSITION

Total Deposition Science Committee

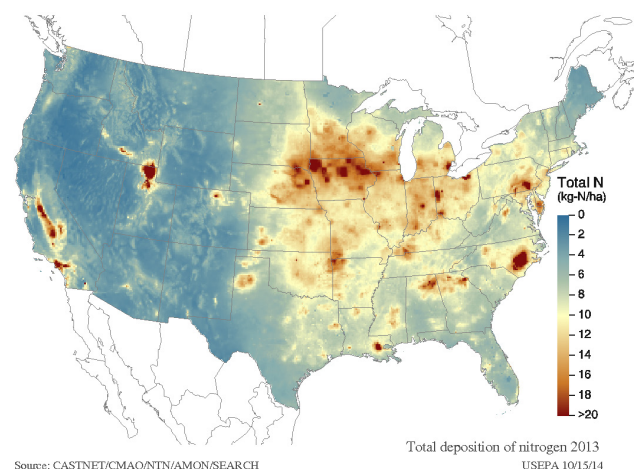


Total deposition estimates are derived from summing wet and dry deposition. Members of a multi-agency committee worked to develop a “hybrid approach” to mapping total deposition that combines measured and modeled values. This Total Deposition Science Committee (TDEP) was formed within the National Atmospheric Deposition Program (NADP) in 2011 with a mission to improve estimates of atmospheric deposition by advancing the science of measuring and modeling atmospheric wet, dry, and total deposition of species such as sulfur, nitrogen, and mercury. TDEP provides a forum for the exchange of information on current and emerging issues within a broad multi-organizational context including atmospheric scientists, ecosystem scientists, resource managers, and policy makers. The TDEP Committee is open to anyone who wants to participate. More information can be found on the NADP website at <http://nadp.slh.wisc.edu/committees/tdep>.

One of the initial goals of TDEP is to provide estimates of *total* sulfur and nitrogen deposition (Figure 1) across the U.S. for use in critical loads and other assessments, where loading results in the acidification and eutrophication of ecosystems. Measured values are given

more weight at the monitor locations, while modeled data are used to fill in spatial gaps and provide information on chemical species that are not measured by routine monitoring networks. One of the main advantages to this approach is that it will provide continuous spatial and temporal coverage of total deposition estimates in the U.S. (beginning in 2000), which until this point, has been unavailable.

Figure 1. Map of Total Nitrogen Deposition 2013



Methodology

(Details are provided in Schwede and Lear, 2014)

- Wet deposition values are obtained from combining NADP/National Trends Network (NADP/NTN) measured values of precipitation chemistry with precipitation estimates from the Parameter-elevation Regression on Independent Slopes Model (PRISM). The PRISM model estimates precipitation across the U.S. based on elevation and slope.
- Dry deposition values are obtained by combining air concentration data with modeled deposition velocities. Air concentration data are from the Clean Air Status and Trends Network (CASTNET), the NADP/Ammonia Monitoring Network (NADP/AMoN), and the Southeastern Aerosol Research and Characterization (SEARCH) network, while deposition velocities are estimated from the Community Multiscale Air Quality (CMAQ) model 4.7 (for 2002-2006, 36km resolution) and 4.7.1 (for 2007-2009, 12km resolution). These point values for deposition are merged spatially with modeled dry deposition values from the CMAQ model.

- Dry deposition values for unmeasured species (PAN, N_2O_5 , NO, NO_2 , HONO and organic nitrate) are estimated from the CMAQ model.
- Dry deposition values are combined with the wet deposition values to produce the final estimates of total deposition.

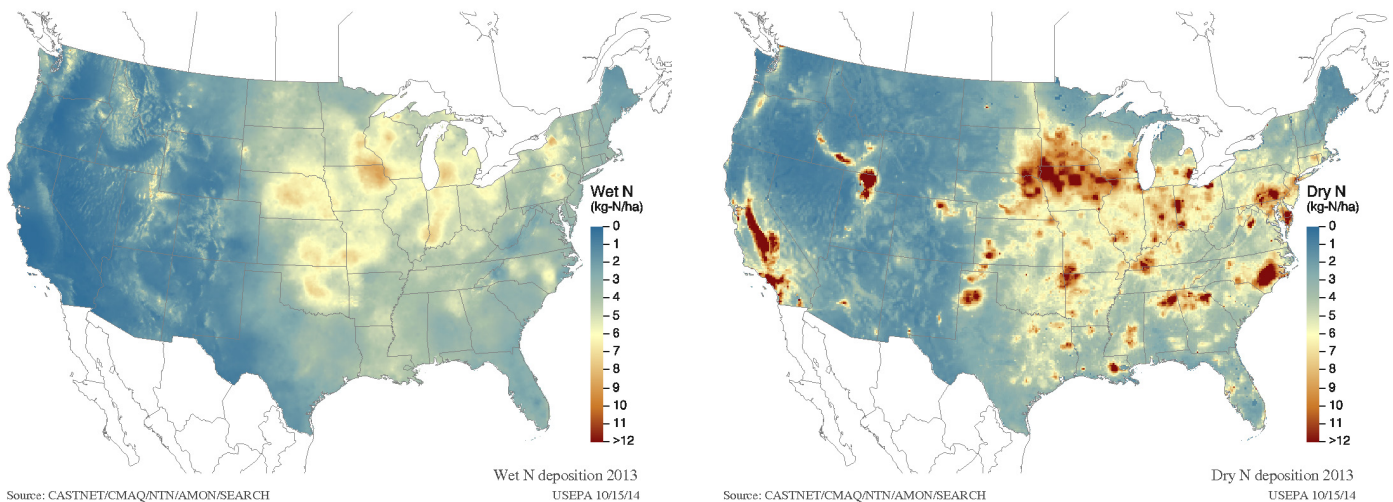
Availability of Maps and Data

The hybrid maps are available for years 2000-2013 and some 3-year averages for all components of total sulfur and nitrogen deposition. For example, there are maps of wet and dry deposition (Figure 2), oxidized and reduced nitrogen, and the individual species that make up total sulfur and nitrogen deposition. The most recent version is available as ESRI ArcGrid™ files and maps which can be downloaded from the NADP website at <http://nadp.slh.wisc.edu/tdepmaps>. This data set will be updated each year as new data, both modeled and measured, become available and as the methodology evolves.

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Figure 2. Hybrid Maps of Wet Nitrogen Deposition and Dry Nitrogen Deposition 2013



Reference: Schwede, D.B. and G.G. Lear, 2014. A novel hybrid approach for estimating total deposition in the United States, *Atmospheric Environment*, **92**, 207-220.



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