# TDep at NADP Spring 5/1/23

Monday, May 1, 2023 2:30 PM

Introduction

- Hybrid meeting
- Fall Meeting minutes will be up on website soon
- Agenda overview
- Website status: Total deposition maps available for 2000-2021
    - Gif trend movies added for v2022.01
    - Summary updated, fact sheet to be updated soon
- Annual report still a work in progress
    - Project tracker could be updated, take a look
- Fall 2023 will be in Madison, WI 10/23-27
    - Please contribute potential topics

Workgroup updates

- Bret Schichtel - Measurement and Monitor WG
    - Mission and objectives - support NADP by assessing and advancing air quality monitoring
    - What pollutants for focus? Depends on NADP and TDep goals
        - Total N dep rates and budgets
        - Total phosphorus deposition
            - Dust
        - Priorities expected to evolve and change as issues/champions rise
    - Activity focus/priorities
        - Routine monitoring
        - Network resilience/optimization
    - Alternative activity
        - Advancing techniques/science for monitoring
            - NPS special studies
            - EPA Duke Forest special studies
            - COTAG
            - SNiPiT development
        - WG about fun, new projects and things that promote engagement
        - Broader TDep and MMF should focus on data products and network preservation
            - Their needs can guide advancement of science/techniques/technology for measurements
    - Potential projects
        - Create a live catalog of routine ambient and deposition monitoring programs of reactive N, S, P
        - Identify current monitoring gaps in routine networks
            - For example, no organic N dep monitoring and limited NH3
        - Identify alternative, underutilized datasets
            - Satellites
        - Identify and support new monitoring initiatives:
            - Total phosphorus
            - PFAS, microplastics, black carbon
    - Current committee roster
        - How would attendees connect with this group?
            - Email Bret or Kristi Morris
            - Bret.schichtel@colostate.edu, kristi_morris@nps.gov

- Greg Wetherbee - CityDep
    - CityDep needs a project to coordinate around, keep in mind the article that identified science needs
    - Low bandwidth for CityDep, proposed to fold in CityDep WG into the Measurement and Monitoring WG
        - Bret confirms
    - Greg Wetherbee suggests coordinating deadlines around identified needs
    - Greg Wetherbee motions to fold CityDep into Measurement and Monitoring WG
        - Kristi seconds
        - Floor open for discussion
            - No discussion
        - 61: 42 + 19 online
        - Motion passes

- Mike Bell - Deposition uncertainty
    - How certain measurements and models are, applied toward confidence in critical load exceedance interpretation, for optimizing monitoring networks
    - Had the impact of improving communication between TDep and CLAD
    - Mike Bell - Motion to move this WG under TDep MMFWG
        - Discussion
            - Greg Beachley supports this idea, there is bandwidth in MMFWG
            - Kris - Do we need a formal motion from CLAD?
                - Mike - we probably should have…
        - Kris seconds the motion
        - 18 + 14 = 32 in person (some didn't vote), + 10 yes online = 42 yes total
    - AQMEII4 - evaluating 8 different chemical transport models with same emissions and meteorology simulate deposition between 2010-2016
        - Led by Paul Makar (ECCC), participating to calculate CL exceedances
        - Initial ensemble analysis - most models show broad exceedances in EUS, much of WUS for 2010 and 2016 (slightly lower in 2016)
        - One example analysis done so far - how many Class I Areas in exceedance in 2010 and 2016?
        - Let them know if there are endpoints/areas of interest - plan to continue this effort
        - Some slides with a focus on aquatic acidification - maps across models
            - Models vary in number of Class I areas in exceedance
        - Bret asks about one model that simulated very different magnitude of exceedance
            - Mike is not sure which model is which at this stage, but one of them doesn't have bidirectional flux
        - Greg W asks about bar charts - are they for different models, or years?
            - Each bar is a different model.

- Greg Beachley - TDep MMFWG
    - Outline
        - New TDep version on website
        - Discussion of planned work
        - Trends, highlights from Acid Rain 2020 (2023?)
        - Improvements
    - Version 2022.02 published
        - CMAQ DEPV filter to correct error in EQUATES
        - NADP NTN error in NH4 MDL
        - Improved grid statistics routine
        - Extends grid coverage for extraction

        - Includes adjustment of dry unidirectional "NH3D" with AMoN concentrations
    - Version 2022.02 extended grids for coastal sites
        - Extended the PRISM raster to recover data at coastal sites
    - TDep MMF: Timeline of upcoming publications, projects
        - May
            - CASTNet SAB review in late May
            - Manuscript on script modernization
            - TDep SOP, DOI, scripts (Riley)
            - Characterization of impacts of measurements of TDep
                - IDW measurement jack-knife and site ranking
                - Extraction of input CMAQ data at site locations
                - Rewrite bias correction and assess (May-June)
        - Summer
            - TDep presentation for IRL141 and National Estuary Programs
            - Outreach: Update EnviroAtlas, CMAQ
            - Prepare manuscript on TDep versions and trends
            - Begin NH3 research
                - Fused CrIS NH3 concentration map
                - AMoN-adjusted unidirectional EQUATES
                - Update CMAQ variograms - extrapolated distance based on EcoDep, needs to be updated
        - Fall
            - Publish version 2023.01
                - Urban deposition - IDW radius for urban wet observations
                - Begin to incorporate CMAQ wet deposition
    - From Acid Rain: Comparison of N and S deposition trends from 1989 to 2021 using 3 different methods
        - Large difference between TDep and MLM for total N
        - Input measurements same; CMAQ timeseries may differ
    - Total N trend is neutral (-3%) across the US for past 2 decades
    - Dry HNO3 has decreased substantially from 2000-2002 to 2019-2021
        - Dry N from NH3 has increased from 3 to 25%
    - TDep 2023
        - Fall 2023 release - many missing sites
    - Urban deposition with TDep MMF
        - Fu group
    - Apply bias adjustment to modeled NH3 concentrations
        - [NH3] increases
            - Even with the adjustment, CMAQ is still underestimating NH3
    - Greg W - NTN NH3 correction, Mark Kuether email on database correction -- is this related? Was the correction to TDep or NTN database?
    - Greg W - Looking at trends, always focus on N central - not sure how much is due to adding sites. We often assume due to agriculture. Seeing turndown of oxidized N but increase in reduced N--how much is due to fleet turnover? Asking what is the source of this reduced N? Will discuss in NOS using nitrogen isotope measurements--could that help us to get at source terms?
        - Greg B - Definitely should look into vehicle source.
        - Chris Clark - Putting on my biofuels hat, we've put a lot of work into fertilizer application. Activity related to fertilizer (eg acreage) is up.
    - John Offenburg - I believe I heard you say "under shrinking network…" - black carbon, microplastics, PFAS are on the other side -- what does a growth path look like? Do you give that some thought--what's a sufficient approach?
        - Greg B - From NADP/CASTNet side, no I haven't really.

        - John O - If we were to approach it fresh, what are the important levers to balance?
        - Greg B - Bias adjustment - relatively coarse, to 1000 km (?). But fusion - relatively fine. We could look at it that way, what is an acceptable number of sites?
    - Linda Geiser - What do we really need to understand these measurements? How to optimize the beneficiaries of these networks? One of the priorities of Exec this year is how to expand sites in urban areas -- urban residents could benefit from more air quality measurements. We have started to look at what an urban package could look like.
        - Will be reaching out to cities, would be helpful to know which cities to include
        - Greg B - for ozone or PM? Both

John Walker - Stakeholder WG

- Ian Rumsey will pick up leadership of this group to return to ag-stakeholder workshop building on 2019 workshop.

Kristi Morris - EOS

- May is social media month - does anyone have suggestions for posts we can submit this month?
    - Will need to follow up
    - Suggestion for CASTNet public comment for Science Advisory Board
    - Stakeholders of NADP would be great
- Need to create a new fact sheet for the updates to the TDep model
    - Greg confirms to be done… Kristi to follow up, EOS to provide support for updating the fact sheet
- Reach out if you'd be interested to join

3:55pm break

Jeremy Schroeder - EnviroAtlas

- Online resource providing geospatial data, tools and resources related to ecosystem services, stressors, human health, equity
    - Includes over 500 map layers
    - Interactive mapping
    - Ecohealth relationship browser
    - Analytical and interpretive tools
    - GIS toolboxes
- EnviroAtlas Objectives
    - Produce data linking ecosystems and human impacts
- Ecosystem services in EnviroAtlas
    - Services important to human well-being but often overlooked
    - EnviroAtlas seeks to fill the info gap by providing services data in one accessible place
- National (30 m) and community-level (1 m) data
- Also provides educational materials
    - Use cases and featured collections, Fact sheets, Tutorials, Guides
- Demonstration of EnviroAtlas
    - Dynamic data matrix is available
        - 18 layers related to deposition
        - More info available as to how the data was developed, etc
    - Interactive map
        - Data tabs
            - Organized by topic
            - Many layers available; Can also search for other data or add your own
        - Analytical tools
        - Example of deposition in Dane County, WI
            - For example, total N deposition at 30 m

        - CAFO data available
            - 2002-2017 at 5-year increment
        - HUC12 Navigator - can aggregate across watersheds, eg contribution of N deposition upstream or downstream
        - "Compare My Area" tool
            - Aggregate up from local to county, state
            - Census tract offers demographic information
        - "Summarize my area" tool
            - Can choose various boundaries of interest (eg congressional district)
            - Produces a report that shows, for example, changes to landcover types
    - EnviroAtlas could be used for outreach for NADP
    - Questions
        - Mike: How big of a team works on EnviroAtlas?
            - Two to three dozen people.
        - Data on how many people access it?
            - Thousands per month
        - Bret: A lot of this data has temporal component--is there a way to plot it on a timeline?
            - We have time series functions related to climate scenarios
            - This is an option under summarize my area
                - Clicking within the selected boundary gives annualized activity data, as available
            - Some data only based on 1 year, for example fertilizer application
            - Suggestion to make a timeline/timeseries available to visualize this, for example with respect to TDep data
        - John O: Is there any cross-talk to the CompTox dashboard and/or can you describe the relative spaces?
            - Do you mean speciation? They are at ~million chemicals mark.
            - Working with CCTE on CompTox at 3M sites, but could be expanded.
    - Feel free to reach out: Schroeder.Jeremy@epa.gov

TDep Network Optimization

- Facilitators: Melissa Puchalski and Amanda Cole
- Creating a forum for cross-agency discussion of priorities, methods, best practices etc
- Topic leads from various agencies
    - Melissa CASTNet
        - CASTNet budget has declined through 2022. Currently undergoing scientific review for holistic look at program under resource constraints.
        - Coordination with federal partners
        - Recommendations from SAB and partners will be used to develop a draft plan for network sustainability
            - Trying to maintain a large network with stakeholders across federal partners
        - Supporting OAR's needs
        - What data products are unique to CASTNet?
        - Which sites are most critical?
            - Will sites be needed to address emerging pollutants of concern or fill spatial gaps?
            - Is the site co-located with other networks where resources are already leveraged?
        - Engagement and communication
        - Scientific Advisory Board public comment
            - As many stakeholders to request a time to speak before May 24-26
                - Email Bryan Bloomer to request a time (bloomer.bryan@epa.gov)

- Tony Prenni
  - NPS network optimization - budget has decreased over last 20 years
  - This is not for IMPROVE. IMPROVE is separate.
  - We expect that there will be more cuts; look toward partnerships and new technology for new savings.
  - Our priorities are to protect resources in national parks. Visibility, etc.
    - Quantitatively: Sites scored based on relevant considerations developed in ARD monitoring strategy. Primary vs secondary vs logistical considerations (see table)
    - Qualitatively: Scores from quantitative assessment used to guide more in-depth discussion/data analysis
  - Question (Doug USGS): Do you make the argument that we can't look only at one agency's priorities because we're part of a larger network?
    - That's where qualitative priorities come in. Ultimately if we're choosing between network or park priority, park priority will win.
    - Bret clarifies that spatial representativity consideration leads to implicit consideration of network
    - Melissa: That's where federal partner meetings come in.
    - Tony: We're hoping to have more specific numbers in next few months, but cut of 10-20% is likely.
    - Michelle - Difficult to cut funding. Statistical/power analysis, regional comparisons, etc would be beneficial. I haven't heard anyone mention that, but it would provide justification and offer evidence/support for why funding is needed.
    - Greg - We're looking at that with TDep, will discuss it soon.
    - Melissa - It gets hard for us because we have TDep and air quality priorities; mixing those together is a challenge.

- John Walker (EPA)
  - Another thing we're up against time constraint.
  - We point to need for development of a quantitative approach
  - Several weeks ago, ahead of the announcement of the SAB review of CASTNet, a director of the ACE program asked us to put together a list of the most critical sites
    - We had to identify publications, tools, datasets etc that are part of our research plan for the next few years. What you see if you compile that is that ORD uses CASTNet extensively as a primary dataset
      - Integrated Science Assessment for NOx primary and secondary standards
    - Development and evaluation of tools (eg CMAQ)
    - Ecosystem assessments
    - Nutrient inventory assessments
    - Investigation of contaminants of emerging concern (e.g. PFAS)
  - Within these priorities, which sites are the most critical?
    - Developed a survey of questions with a score of 1 for "yes" or 0 for "no" for each site
    - Includes questions of co-location, method technology, length of data record, vulnerability (e.g. wilderness area), extreme air pollution (e.g. high ozone, PM), part of a special study, environmental justice considerations
    - Can sum and use to rank each site
  - Questions
    - Selma - Have you conducted this analysis yet? Yes but won't be discussed here.
      - Even for low priority sites still highlight the context under which they are influential
    - Chris (Neon) - Open to discussing how to collaborate, where can provide support
    - Trent - was USFS part of discussion?
      - No, only included funders of CASTNet. Would love to have stakeholders from

NADP like USFS (fund NTN sites) for public comment

        - Greg W in Zoom chat, for wider discussion: To expand on what Doug Burns said - All of these efforts to prioritize sites objectively in line with agency goals and objectives is all fine and good. But, this parochial approach is incomplete and requires the agencies to come together and determine where some sites will be mothballed/closed, and where they are desperately needed to contribute to a meaningful, useful set of annual deposition maps, upon which so many efforts depend. Collaboration has always been the saving force for NADP. For example, USGS supports some NPS sites by funding the NADP costs, but NPS supports the operation costs. This has to happen with all sites that are being evaluated for abandonment. So, the network has to be evaluated as a whole, not by agency support. We have to think about each agency's contribution to the national maps. This precludes the long-held desire to keep sites with long periods of record because we have a "National Trends Network." I think that we need to sacrifice some sites with important trends."
- David Gay and Richard Tanabe (NADP Program Office)
    - Will not answer which sites are funded (can help inform strategy, though)
    - Try to make networks cheaper and more efficient, reducing costs
    - Optimization means doing more with the same funding
        - Upcoming
            - Robotic sample filtration
            - AMoN - Using alphas vs radiellos
            - MDN Bag sampling
            - Total N and P in NTN samples (will be more expensive but may draw stakeholder support)
            - Black carbon in precipitation
            - Two-week MDN samples
            - Passive sampling for NH3, Hg (cheaper for Hg)
            - PollenSense and more AQ monitoring
        - Previous
            - Bags in NTN buckets
            - Digital gages vs belforts
            - Scanning bars on all samples
    - This won't solve all financial problems, but we can assuage them
- Amanda Cole (CAPMoN)
    - Monitors wet deposition, acidifying gases and particles (filter pack), other air pollutants
    - Periodic network review
        - What are science and policy drivers?
        - What are emerging needs and is CAPMoN ready to meet those emerging priorities?
        - Is the network well integrated with other networks?
        - Is the network well optimized?
    - Highlights
        - Prioritization of existing sites for multiple applications
        - Considerations of monitoring frequency for precipitation and filter pack samples
        - Identifying gaps: Emerging pollutants, new emitters and sensitive regions
    - Analysis of existing sites
        - After colocation tests, have transitioned some sites from daily to weekly
        - Using Fast Fourier Transform and concentration gradients to identify clusters of similar sites
        - W/in site clusters, prioritize sites with largest GEM-MACH model bias
        - Assess impact of individual sites on interpolated US/Canada maps (ADAGIO, similar to TDep), in light of changing gradients
    - Questions
        - Michele - hope that no sites are lost--one thing in particular, CAPMoN measures in

non-urban areas. Also support prioritizing co-location with climate-focused network.
        - Amanda - We're not in the same boat as CASTNet where we need to make a cut soon, just trying to stay on top of things to be sure that we're using our resources to be most effective. We don't know what the future holds and don't want to be caught on the back foot. Your comments are really helpful because one of the things we're considering is how people are using the data.
        - Melissa - this points to how to we improve stakeholder communication/outreach/engagement?
- Greg B (EPA, TDep)
    - Framing existing data and options
        - Conducted two scenarios - 50 vs 39 sites
        - Taking S out entirely had very different results
        - This takes a lot of effort--vs leave-one-out could do a modified version where we leave few out
        - Looking at each site difference between CMAQ and TDep
    - Options to improve understanding of deposition uncertainty and site prioritization
        - Breaking down sources of uncertainty in fusion step:
            - TDep = Measured dry dep * weight raster + Adjusted CMAQ dry dep * inverse weight raster
            - Existing jack-knife analysis tests individual sites; could be propagated through model
        - Building off of the qualitative uncertainty metric
            - Leave one out and/or Monte Carlo analyses (proposed by Sonoma Tech)
    - Questions:
        - Amanda: Seems like there are a lot of things in the works--what's the timeline? Could it be shared with sponsors?
            - Easier things 2-3 weeks and could be shared
            - Amanda: Would be worthwhile to follow-up because part of the objective of this discussion was to get back to sponsors w/ what's needed for TDep
        - Greg W: There might be conflicts between sites w/ long-term data vs constraints on the map. Parochial/ w/in agency discussion needs to involve collaboration
            - Mention that for some sites, can cut one site and pay NADP costs for 3 sites. Could collaborate w/ other agencies if they can cover the operational costs.
            - Need to collaborate to identify which sites most important for maps
        - Amanda: Yes that's where Greg Beachley's work would be really informative.
        - Bret: I agree w/ Greg W in a general sense, though the maps aren't necessarily everyone's priority. This is more difficult than that b/c competing priorities. Suggesting as a next step - Tony is writing a report. We can share that w/ anybody and everybody - which sites are up for closing & why? Can others do this as well?
        - Michele - Can other agencies pick up sites that might be closed? What about airsheds--which sites have similar variations?
        - Melissa moving to close, we are at time. Thanks from facilitators to the contributors. It's helpful to know what's going on and who to contact.
        - Ryan - Thanks to the facilitators for managing this discussion. As we'd anticipated, 1 hr is not enough time for this conversation but hopefully this can be a springboard for the meeting.

Attendees
In-person

- Ryan Fulgham - EPA ORD
- John Offenberg - EPA ORD

- Ryan EPA-ORD
- Vick Grandie - Retired, independent
- David Schmeltz EPA-OAR Exec
- John Walker EPA-OAR Past chair of Exec
- Katherine Benedict - LANL, EOS
- Chery Sue ECCC
- Catherine Collins - USFWS
- Rick Haeuber - EPA OAP
- David Gay - NADP
- Jim Hermanson - State lab of Wisc
- Jeff Herrick - EPA ORD
- Kris Novak - EPA
- Chris Florian - NEON
- Doug Burns - USGS
- Jeremy Schroeder - EPA ORD
- Frank Weber - RTI
- Tracy Dombek - RTI
- Greg Beachley - EPA OAP
- Colleen Baublitz EPA OAR
- Alexia Prosperi USFS Eastern
- Trent Wickman USFS Eastern
- Selma Isil - WSP
- Kevin Mishoe - WSP
- Melissa Puchalski - EPA OAP, NADP Exec Secretary
- Tim Sharac - EPA NOS
- Rodolfo Sosa Echeverria - U Mexico
- Amelia Jimenez - U Mexico
- Beck Dalton - US EPA
- Mike Bell - NPS, NADP Exec Vice Chair
- Kristi Morris - NPS Air and Resources Division
- Chris Clark US EPA ORD
- Jason Lynch - EPA OAR
- Richard Tanabe - NADP
- Todd McDonnell - E&S Environmental Chemistry
- (?) USFS

Online

- Amanda Cole - ECCC, TDep Co-Chair
- Anne Marie Macdonald - ECCC
- Alexander Nyhus - Wisc Dept Natural Resources
- Bret Schictel - NPS Air Resource Division
- Chris Rogers - WSP
- Greg Wetherbee - USGS
- Ian Rumsey - EPA ORD
- Irene Cheng - ECCC
- Jayde Alderman - WSP
- Jason O'Brien - ECCC
- Katie Blaydes - Wisc state lab NADP
- Ken Bryce - ECC
- Leiming Zhang - ECCC
- Michelle Williamson - Ontario Ministry of Environment, Conservation and Parks (provincial government)
- Marcus Steward - WSP

- Nathan Pavlovic - Sonoma Tech
- Ralph Herron - USFS Eastern
- Shaun Watmough - Trent University
- Tom Butler - Institute for Ecosystem Studies, Cornell
- Emmi Felker-Quinn - NPS
- Ashley Cohen - S Florida Water Management District
- Paige Dugan - Florida
- Lourdes Pineda - U Mexico
- Damani Eubanks - USFS
- Colin Kelly - Wisc State Lab
- Ashley Colon - SFWMD
- Lorena Roxana Cortes Ruiz
- Kulbir Banwait - ECCC
- Kenneth Brice - ECCC
- Yuan You - ECCC
- John Jansen
- Ralph Perron - USDA

J. David Felix - TAMU
K. Daimy Avila
L. John Walker - EPA ORD
M. Orren Russell Bullock - EPA
N. Linda Geiser - USFS
O. Yayne-abeba Aklilu - Alberta, CA
P. Zhiyong Wu - RTI
Q. Jian Feng - ECCC
R. Martin Shafer - Wisc state lab
S. Charles Driscoll - Syracuse U
T. Naomi Tan - Alberta, CA
U. Tony Prenni - NPS
V. Justin Coughlin - Sonoma Tech
W. Laura DeCicco - USGS