

# Joint Subcommittee Meeting Minutes

2019 NADP Spring Business Meeting

Madison, WI  
May 14<sup>th</sup>, 2019

Chair: Richard Tanabe (WSLH/Environment & Climate Change Canada)

Vice-Chair: Melissa Puchalski (US EPA)

Secretary: Winston Luke (NOAA)

## Welcome, Logistics & Introductions – Richard Tanabe

- Richard started meeting at 8:30 AM and provided an overview of the meeting and logistics for the week.

## WSLH Welcome Address – Jamie Schauer

- Jamie introduced himself as the director of the WSLH and welcomed everyone to Madison.
- A small group met on Monday (May 13<sup>th</sup>) afternoon to begin a strategic planning process for NADP. He stressed the importance of thinking about the future of the program. The second strategic planning meeting is being held on Friday morning.
- He encouraged participants to engage with students at poster session being held that evening.
- The theme for the Fall meeting “Expanding the Boundaries” fits well with the strategic planning efforts.

## Approval of Fall 2018 Minutes – Richard Tanabe

- **Motion:** Greg Wetherbee; second: Pam Padgett. Joint minutes from Fall 2018 were unanimously approved.

## State of NADP – Michael Olson

- Mike also reiterated that Jamie was leading a strategic planning effort at this meeting. Phase I occurred Monday (yesterday). There were very similar ideas and messages shared across all breakout groups. Phase II will be held on Friday morning to develop a draft document. The document will be distributed to stakeholders for review and comments.
- Mike also noted that there would be a proposed Mercury (Hg) Science Committee Meeting during lunch to discuss better integrating Hg science into NADP.
- This evening there will be a Poster session. This is an opportunity to engage with researchers using NADP data and discuss the future of NADP. Researchers have been looking at deposition science and improvements to measurement methods and deposition models.
- Mike also noted there would be WSLH tours on Friday (one also occurred Monday).
- NADP was highlighted on [reddit](#). It was noted the way the data displayed shows the growth of the networks, but poorly shows wet Hg deposition. The authors assigned an average Hg deposition value to a state based on one monitor where there is only one monitoring site. The program should be aware of these data “users”. Mike provided a comment to Reddit.

## Transition

- The Program Office (PO) and laboratory (CAL) are fully staffed. The 2019-2020 projected budgets are balanced but moving forward the budget (site costs) will be adjusted to reflect the true cost of the program. The PO and CAL are looking for feedback from stakeholders on operations at WSLH.
- WSLH will take over the Hg Analytical Laboratory (HAL) from Eurofins Frontier Global Sciences in June 2019 which is sooner than initially anticipated.
- The monitoring site at the University of Wisconsin Arboretum (WI06) began sampling in February 2019. The site includes NTN, MDN, and AMoN. Arboretum staff have been engaging on outreach and have an interest in understanding the methods and science. They can now act as spokespeople for the public.
- The Eagle Heights Supersite is measuring black carbon (BC) in precipitation to evaluate the method. The goal is to find a method that could be used to measure BC using existing NADP infrastructure (see poster tonight). Researchers are working with Madison Water Utility which has caused the project to move very slowly.
- There are opportunities to link NADP wet deposition data to ecological/biological data being collected at both supersites.
- The PO has developed a formal evaluation procedure to assess sample archive requests to ensure that each request and evaluation criteria is transparent, meets the NADP mission, PO/CAL has the resources, and the scientific approach is feasible.
- The historical sample archive will be organized and documented by the end of the summer. No archive samples will be transferred to researchers until that is complete. The archive samples received from the University of Illinois were poorly documented and disorganized. The CAL has spent substantial resources on sample archive organization and documentation.
- The long-term sample archive from IL11 was not transferred from the University of Illinois to the CAL.

## Site Status

- Overall networks are stable with exception of AIRMoN. AIRMoN will no longer be a subnetwork under NADP. This change will be discussed at the Executive Committee Meeting.
- Sites in jeopardy due to funding and/or operational support:
  - NC17 (NTN/MDN) is supported by NC A&T and operated by student and faculty. The site lost external funding.
  - PA37 (MDN) has equipment and is willing to support site operations, but there is no funding for sample analysis.
  - AK98 (MDN) satisfied the environmental monitoring requirement. Mike has initiated contact with local university. This is the only MDN site left in AK.
  - WA18 and WA03 (MDN) has been supported by Eurofins/HAL and will continue through Sept. 2019. The PO will assess cost of analysis. The site operators are willing to continue sampling.
  - FL32 (NTN) is experiencing staffing issues.
  - MI98 (NTN) the Sault Ste Marie Tribe of Chippewa has expressed interest in operating site. The equipment is available.

- Potential new sites:
  - OH32 (AMoN) Kenyon College secured funding with new faculty member.
  - AB34 (NTN) Stony Mountain began sampling 4/23/2019. Group may add an additional site in the future.
  - The Eastern Cherokee in NC have submitted a proposal to fund NADP site.
  - The Grand Portage Band of Lake Superior Chippewa are working with MPCA to secure funding for an MDN site.

## Outreach

- Several researchers from South Korea have contacted the PO about joining AMoN. They are attempting to get sites established. South Korea already has an IMPROVE site so there is an agreement in place, but it is difficult to move funding for the new sites.
- During the 5-week government shutdown the PO and CAL contacted sites and suggested methods to prepare equipment and store samples properly until shipping could resume, however many sites continued sampling despite the lapse in funding. EPA sites were less impacted because of the funding mechanism in place through Wood. The shutdown occurred across the 2018/2019 calendar year so completeness criteria for the year will be less impacted.
- Jamie has focused his efforts on international outreach including visits to EANET and NIES in Japan; MDN – NEIS, NIER, Taiwan.
- Mike attended the National Monitoring conference, as well as a water conference. The interest was focused on using isotopes to trace sources and phosphorous. Participants had heard of NADP but didn't know what was measured. NADP needs better communication tools.
- NOAA's Boulder Global Monitoring Division and Chemical Sciences Division has interest in mobile NADP sites – aircraft and ground collection coordination. Also, potential collaboration for PM and NADP measurements under a large multi-million dollar grant proposal in a few years. The PO will pursue how to create mobile sites for stakeholders.
- NEON plans to attend fall meeting. Discussions between NEON and NADP continue to focus on collaboration, but NEON is still management heavy.
- Large Lake Observatory at the University of MN Duluth would like to put a NTN site on a research vessel (mobile site). They have an interest in microplastics in sensitive ecosystems.
- Water@UW seminar series drew 200 people from campus to hear about NADP. There was interest in PFAS quantification. The CAL has made PFAS measurements in rainwater.
- There is potential for collaboration on water quality in Guadalajara, Mexico at an existing site.
- Sponsored seminar speaker – Dr Eve-Lyn Hinkley (University of Colorado) spoke at UW. She uses sulfur biogeochemistry to understand S impact on California wine country. Post doc will fund Kenyon College site.
- Science on Tap discussion included 1.5 hours of questions. Not necessarily funding for new sites but communicated what NADP measures. USGS and NPS researchers are trying to establish a lake monitoring site in Chequamegon Bay to understand extreme weather events. They had never heard of NADP.

## PO and CAL initiatives

- There is now an NADP Foundation which allows donations to support program operation, site support or external research.

- Equipment can be leased from the PO temporarily for research and/or normal site support (potential for mobile site for lease). Researchers with small grants may not want to spend \$10,000 on equipment that can just be loaned from WSLH/PO. Greg W asked about equipment at sites that have shutdown. It's not the PO's equipment to take, but Richard has been contacting sites to try to retrieve equipment that is no longer being utilized. However, if a site is newly shuttered and the PO takes the equipment they lose leverage to find funding to support the site in the future.
- The WSLH has a discounted rate for shipping labels. They may start providing return labels for shipments as option for sites. They estimate the cost would be about 20% lower than public cost and CAL can then track sample shipments.
- The PO is looking at the inclusion of passive samplers in AMNet which would expand network and validate the Tekran.
- A call for abstracts was sent out for fall meeting being held in Boulder, CO 11/4-11/8 2019. There will be an agricultural workshop on Monday hosted by TDEP.
- Linda Geiser thanked Mike for all the work he is doing on outreach and will bring this message back to the communication team at USFS. Agencies appreciate outreach.
- Chris C invited Mike to present on multi-agency group calls that happen routinely. Everyone should be highlighting NADP capabilities when talking to stakeholders.

## HAL Transition – Mark Olson

- Mark will become the Program Office and HAL Lab Manager on May 20<sup>th</sup>.
- Frontier Global Sciences has been the contract laboratory for MDN since the network was established in 1996. Eurofins LLC has been integral part of developing the network and supporting program since its acquisition of Frontier Global Sciences.
- The transition began with a motion from the budget meeting in 2018. Initially, the HAL transition to WSLH would be effective 9/30/2019. In January 2019, WSLH was notified that the Eurofins lab would be moving and needed the transition to happen more quickly (by 6/1/2019).
- Martin, Amy, Richard, and Mark met with Bob Brunette and Michael Flournoy of Eurofins in Seattle in February 2019. There were limited staff available due to snow. Mark noted that Eurofins has been extremely helpful through transition. WSLH has had 15 weekly HAL transition meetings to date.
- Martin wrote a lab validation plan for WSLH. The plan was to split 100 samples but the samples contain the BrCl oxidant, which prevented shipping samples. Therefore, USGS will provide audit samples instead. Both laboratories will analyze samples from dual chimney NCON collectors during the verification period. Each lab will clean the sample train for their samples. There are 4 sites: WA18, WI06, WI31, IL11 participating. There will be about 13 samples from each of the co-located sites. WA18 is no longer included because of communication issues.
- WSLH had capability to analyze MDN samples manually, but they have purchased automated systems including a Tekran 2600 total Hg analyzer and a Tekran 2700 MeHg analyzer. The Tekran 2600 is operational and the Tekran 2700 has arrived but is not set up yet. There are currently 9 MeHg sites that want to continue.
- WSLH has also purchased Nippon MA 3000 direct Hg analyzer to accommodate the Hg litterfall initiative, which will transition from USGS to WSLH.

- There has been a challenge collecting all of the MDN equipment/supplies (coolers, thistle tubes, etc.). WSLH purchased everything that was available from Eurofins. The coolers were loaded and shipped 5/1/2019. WSLH had to purchase glass equipment because of breakage during shipping to be ready with enough sample equipment to support sites after transition. WSLH contracted with local glass blower for NCON and ACM thistle tubes and funnels.
- The clean Hg laboratory is located at Ag Drive. All other MDN operations will be located at Henry Mall including NADP shipping and receiving. A few of the lab spaces are being renovated to address security issues (first floor).
- WSLH is also moving NTN processing for bucket sampling (5/24) to Henry Mall. They are adding new bench hoods for the Hg laboratory for MDN which will be for sample processing.
- The assistant data manager position is closing next week; interviews are being conducted for the associate chemist. The associate chemist will not be 100% allocated to MDN. The LIMs support position will be fulltime and the lab will use trace clean room staff.
- Other changes that will happen after transitions include:
  - Acid labels will be combined with bottle ID;
  - HAL SOP states bottles are washed with acid, but the HAL was using a dishwasher with hot tap water and Cascade. The WSLH will follow SOP and soak in acid overnight;
  - The coolers will be shipped in boxes to save money. Shipping non-cardboard packages is more expensive. WSLH hopes to see cost savings for both NADP and site operators that pay for return shipping.
  - There will be one NED 800 number for all of NADP networks.
- Next steps include:
  - Evaluating the acidification concentration/volume. There is concern that the volume isn't sufficient to retain the Hg. Some studies have been performed on loss of Hg in samples. During testing Mark will increase volume in one sample and compare to current volume to assess Hg loss.
  - WSLH will evaluate sample trains but invested in new glassware so changes are unlikely
- Mark thanked HAL staff at Eurofins for ensuring a smooth transition.
- Greg questioned the timing of the change in protocol for washing supplies at the HAL. He noted that the last time he was at HAL they were soaking supplies in 409. Greg noted that if there might be a noticeable shift in the QA data when the protocols changed, but also noted he hasn't noticed a shift in system blanks.
- Greg W noted that MDN would not exist if not for Eurofins. One person that has been there throughout the life of the program is Bob Brunette and Eurofins has been gracious during the transition. **Motion: to present the Elis Cowling lifetime achievement award to Bob Brunette and explicitly list Eurofins Frontier Global Sciences on the award. Second: Pam Padgett; motion passed.**
- Eric asked about site operator reactions to the transition. Richard sent a survey to operators (60% response) and Richard will follow up to discuss changes during transition. Overall no anxiety from operators or sponsors. The next communication will include information about billing not changing.
- There are large spatial gaps in the MDN in the west. NADP needs to find some funding to support WA18. Eurofins will continue to provide site support (probably). The HAL has funded the analysis for WA03 and that's unlikely to continue. Greg recommended talking to Dan Jaffe.

- Mike O noted PO's renewal charge to reach out to keep MDN sites funded.

## CAL Report – Chris Worley

- Chris shared the CAL organizational chart. He noted that Maisie (sample receipt) will be leaving in the fall.
- The CAL sample receiving is moving over to Henry Mall. Supply preparation, shipping, sample receipt and preparation will be at the same location which will improve efficiency. Several notifications have been sent to site operators to inform them about shipping changes. June 4<sup>th</sup> should mark the first sample received at Henry Mall.
- Annual rotation for chemists happened in mid-March to allow chemists to be trained on multiple instruments for backup capabilities, new opportunities for chemists, and provide new ideas/suggestions for improvements to methodologies and processes. Chemists are required to demonstrate capability prior to rotation including preparation of blanks, analysis, etc.
- Both ICs had noisy baselines a few months ago. The CAL noticed there was fine black powder in the pump head in both instruments. The Thermo-Fisher tech had never seen that happen before. The ICs were still under warranty, so they received two new ICs. The ICs have passed QC criteria.
- Titrec pH analyzer has been problematic but going through final validation.
- Agilent ICP now has a maintenance contract. It is difficult to perform maintenance on this instrument.
- WSLH purchased a 3<sup>rd</sup> IC unit to assist with special projects and overflow periods after both ICs went down and samples were unable to be analyzed quickly.
- The CAL experienced relatively high hood and room blanks in December for AMoN. They replaced the hood with an Air Science Hood and saw blanks drop quickly. The old hood will be used in the Hg lab. The CAL added another sonicator for AMoN extractions and cleaning.

## MDLs/QA

- The lab MDLs were calculated from 20 direct analyses of MDL solution containing all NADP analytes.
- The Network MDL is 20 discreet MDL solutions that were processed as simulated rainwater, poured in buckets and into bottles, then analyzed over days to months.
- AMoN lab MDL is calculated from core blanks
- The CAL uses EPA's method for calculating MDLs.  $MDL = \text{mean blank} * \text{sd} * t \text{ value (99\% confidence interval)}$ . Some values were slightly higher in 2019 than 2018 but it's unclear how long solutions sat in buckets, etc at the previous CAL (University of Illinois).
- Chris provided a table showing the status of SOPs and QA documentation. Completing all documentation is a high priority but it's taking more time to complete with WSLH processes.
- The CAL is using Occurrence management software to track incidents that do not conform with established processes. There were 17 incidents listed for NADP where they have discovered issues. The CAL uses this as a learning tool by going over issues at quarterly meetings.
- CAL participated in 3 external QA programs.

- ECCC – June 2018, 10 samples rated very good. There was a low bias for nitrate. In November 2018 the lab was rated very good; no exceedances.
- WMO – June 2018, 22 analytes rated good, 5 were satisfactory, and 3 did not meet data quality objectives. In November 2018 – 26 were rated good, 3 satisfactory, and 1 low (pH). The CAL is continuing to watch issues.
- The CAL is publishing NTN results in 90 days, AMoN and AIRMoN in 90 days from sample receipt.
- 13.9% of NTN samples are invalid (of which 63% from gross contamination, then insufficient volume). There may be a spike in invalid samples due to the government shutdown.
- CAL is using FreezerPro software to track the sample archive
- They are expanding ICP-OES element menu to look at other analytes (Zn, Mn, Cu, Fe, Al, etc.)
- CAL is testing a method for quantifying amines in extraction from AMoN. They have seen ethylamine on a small number of samples tested. A lot of development work would need to be done but they are looking at capabilities.
- Martin is looking at PFAS in 7 NTN samples. Results will be presented at the poster session.

#### AMoN QA

- The CAL is looking at the impact of ambient temperature on the established AMoN flow rate. Radiello says the effect of temperature is negligible >36 deg F.
- CAL is also analyzing data to look at reusing sample bodies but are there embedded particles in sample bodies that may affect flow rate. Radiello says after 4-5 washings bodies should be replaced. The CAL will use triplicates to see if there are changes in one sample used over and over. They could also block part of the AMoN body. The CAL will limit body re-use to 5-times and then throw out per Radiello manual recommendation.
- Anne Marie noted that the ECCC lab looked at temperature impacts on AMoN sample flow rate and she will share results. ECCC corrects their AMoN sample data for temperature.

## QAAG Report – Camille Danielson

- Camille and Martin are the new co-chairs of QAAG. The first meeting was held on 3/4/2019.

#### Approvals/Summary of Call

- The CAL readiness verification plan report was approved and is now available on the website
- The MDN/HAL 2017 QA Report was approved.
- The OTT Pluvio2-S gage was not approved in 2017 due to transition, but was approved by QAAG and will be discussed during NOS.
- A motion to remove Br data from the NADP website and discontinue analysis in June 2019 was passed by QAAG and will be discussed further in Joint.
- The HAL lab verification plan was approved by QAAG and implemented.
- The transition from bucket to bag sampling for NTN was approved.
- It was noted that the FIA procedure for AMoN was updated to acid-match samples in November 2018.
- Data Management Advisory Group (DMAG) was re-established.

- Dirt/soot is not coded as contamination to be consistent with former protocols. Samples were incorrectly coded as invalid. Historical data were corrected due to coding error – these samples should not be invalidated. Revised reports were issued to site operators.
- A database editing protocol is needed and DMAG will work on this to track changes to the database.
- QAAG finalized the long-term NTN sample archive plan.
- Greg will compile data from the IL11 precipitation sensor study so it can be published on the NADP website as a data release.
- PTGE bottle was approved by NADP in 2018, but no study results are published. Greg will compile the data so it can be released.
- There are currently no suggestions for MDN sample evaporation, but the HAL will look into issue going forward.
- MeHg subsampling method needs improvement. Sites wish to continue analysis for MeHg.

### CAL QA

- The CAL QAP was sent to QAAG for review and should be finalized June 2019.
- There are 13 SOPs complete. SOPs now include a tracking table with version control.
- IDOCS and annual DOCS were documented to show demonstration of capabilities to show analyst proficiencies.
  - The CAL staff must review SOPs, chemical hygiene, QAP, data integrity documentation annually to keep up on changes.
- Camille will perform internal systems audits annually and methods audits every other year

### New/Ongoing supply assessment:

- CAL performs blank testing on new 60 mL bottles, 250 mL bottles, sampling bags, test tubes for FIA/ICP, NTN sample filters. There have been a few failures including NTN filters which failed for Na<sup>+</sup>. The CAL tried to use new filters as a cost savings with Millipore filters. They have returned the filters because they failed acceptance testing.
- CAL performs acceptance testing on polisher water, buckets and lids, bottles, bags, and AMoN cores and jars. 20% of the CAL workload is QC sampling. Less than 10% QC samples > criteria – mostly less than 2%. Lids caused the most failures.

### Archive

- WSLH will freeze all samples. Former CAL (Univ. of IL) froze long-term archive, but not active archive.
- The “forever” long-term sites now include WI06 (NH02, NE15, WI06, IL11). All residual samples are saved from these sites.
- Fixed long-term sites include 10 sites – one sample saved each month.
- The CAL is starting an archive preservation study which will be completed in 2024 to identify any issues with freezing archive samples. 40 states/provinces are included in preservation study.

### AMoN QC

- Several AMoN blanks are run routinely. Preparation blank is the best measure of AMoN QC as it goes through full preparation and analysis.
- No travel blanks have failed with no concentrations > 0.2 mg L<sup>-1</sup>



- Core blanks and preparation blanks were displayed by lot. Higher blanks in core lots resulted in higher preparation blanks.

## A Reassessment of Bromide Levels in NADP/NTN Precipitation Samples – Martin Schafer

- Soon after transition to WSLH, observed a significant number of bromide concentration levels that were hard to reconcile geochemically or geographically (some over 100 ppb). This suggested an interference in the analytical protocol. Hypothesis was this was actually oxalate. Oxalate is formed from photochemical reactions from biogenic precursors.
- In standard method there is only a 1-2 second difference between oxalate and Br on IC
- WSLH confirmed the oxalate interference with oxalate spiking experiments. They developed a new method to separate oxalate and Br. They confirmed bromide levels with the new method and re-ran 1000s of samples with both methods. The CAL is continuing to quantify bromide with valid method through 2019.
- WSLH method uses a magnetic sector ICP-MS with much lower detection limit. This is not a method you would want to perform routinely on precipitation samples.
- Overall mean of 0.0027 ppm of bromide which is below the former CAL (Univ. of IL) method for analyzing Br
- New method doesn't compromise quantification of other NADP IC analytes
- New method averages are order of magnitude lower in concentrations of Br
- These results could have significant implications for pre-June 2018 Br database. Methods were poorly documented. Other issues were uncovered including errors in database editing. Manual editing was performed which was subject to errors. A lengthy report documenting WSLH findings was prepared and an abridged version of that report was submitted to QAAG for review.
- WSLH feels there were substantive errors in pre-2018 bromide database and only a much larger and detailed investigation would be able to definitively define the scope of these problems. Resources are not available to perform study.
- Only about 10% of the samples analyzed with the new method were above the method detection limit. Only 53 samples out of 8190 had bromide levels 3x's greater than the MDL (0.65% of valid samples).
- To continue method development and evaluation of the existing database would require major investment in the pre-2018 dataset. Is there are user base to support continuing to analyze for Br? There have only been a few published articles using NADP Br data.

### Recommendation:

- *With appropriate due-diligence, notification, and per SOP (in development) remove the bromide data from the NADP website. Prepare an internal NADP report detailing the timeline of this issue and action.*
- *Continue quantification of bromide at WSLH/CAL with the new method until June 2019 (i.e. obtain a full calendar year of bromide data). At that point discontinue routine quantification of bromide in NTN and AIRMoN samples. Prepare a short report detailing the outcomes of that 1-year study.*

- *Entertain special requests or special studies to quantify bromide in non-archived NTN samples. The stability of bromide in archival samples has not been experimentally verified and we can't devote NADP resources to establish stability metrics. Requests will be handled on a case-by-case basis via the special study review process at WSLH/CAL/PO.*
- *Make the new IC method available on the NADP website.*
  - Noted that the IC method is available but not directly able to download. Users would need to contact the lab to start discussion.

#### Discussion:

- Rich Grant suggested NADP should highlight that they do have the capability to analyze for Br using the new method in case Agricultural community has interest.
- Greg asked to describe the scope of the report. Response: Overall statics and a spatial analysis. Martin would write this report and it would take about a week to summarize the data for the report. Greg noted that if it shows a similar distribution as shown in published papers that would be useful.
  - Greg noted that before January 2017 the former CAL (Univ. of IL) was using a different instrument. Integrion was what they moved to and that is what WSLH adopted. The former CAL had poor documentation, data errors, etc. prior to 2017, but data may be okay. These errors persist in all of our datasets and may not be a unique problem with Br. He agrees that NADP should take bromide data off the website but noted that it's not definitive that the pre-2017 data are inaccurate. USGS will have to submit an erratum about published data.
- **Motion:** to accept Martin's recommendation (*italics above*). Greg moved. Mark O second. Motion passed.

#### Discussion:

- Jamie noted that they might need further discussion on point 2 (report). He is uncomfortable saying we don't know the quality of the data, but it is available if you want to use it. Greg thought this was like providing C coded data, but Jamie disagreed. Jamie thought this was a different level of uncertainty than C coded data.

## Joint Subcommittee

May 15<sup>th</sup> 2019

### Subcommittee Reports

- See individual subcommittee reports

### Using Critical Loads to Assess Risk to Ecosystems from N and S

#### Deposition – Mike Bell

- CLAD has put together a presentation for communicating critical loads (levels of protection) to resource managers
- Describe how N deposition harms ecosystems

- Changes in tissues chemistry
  - Increases in herbivory
- Declines in growth and survival
- Increased susceptibility to secondary stresses
- Shifts in community composition
  - disruption of food chain
  - loss of sensitive/rare/endangered species
- How are CL and exceedance used in federal land management?
  - Resource management and planning
  - Resource stewardship and conservation
  - Reporting on status and trends
  - Air quality permitting
- Use a “rainbow” image to show how critical loads are used to assess ecosystem susceptibility to N and S deposition.
  - If the critical load of a system is below the amount of deposition there is a detrimental effect to ecosystem.
  - Also calculate the percent of area (i.e. National Park) in exceedance (above the critical load).
- Using Bridger-Teton National Forest to answer management question examples:
  - Which lifeform critical load should I use?
  - Are all exceedances the same?
  - Showing lichen species detectability as an example, 38-68% of species are at risk of decline based on TDEP estimates of N deposition to the area
  - Showing tree species survival as an example – only 15 species in the forest and only 8 species abundant enough to calculate CL – 1 to 2 species exceed the CL for survival
  - Showing tree species growth as an example, only 13% of the 15 species exceed the CL for tree growth reduction
- Simplifying mapping by using 3 reference points – above critical loads, below critical load and at critical load. At critical load is +/- some value and is sensitive to deposition accuracy.
- Ecosystem response to deposition are complex, but overlaying responses and generalize to lifeform helps managers understand current conditions and long-term reduction goals.
- Communicate the intensity of risk based on TDep (actual measurements).

## Hg Litterfall Update – Doug Burns

- The Hg litterfall initiative is being managed out of the USGS office in Albany. Samples are being analyzed by the USGS laboratory in Middleton WI. The laboratory will transition to WSLH initially with the program management function moving to WSLH afterwards. Martin and others visited the USGS laboratory recently.
- WSLH purchased an analyzer for the litterfall analysis, but it has yet to arrive. The intercomparison will be between the two laboratories with split samples in July 2019. Litterfall samples aren't shipped to the lab until ~December. WSLH will take over the program fully in 2020. Samples will be shipped to WSLH at the end of 2019.

- Data have been posted on the USGS Sciencebase website. Doug has offered to post the dataset to the USGS Sciencebase website, but it will be a different link. Should data be brought together into one dataset/website?
- Costs for analysis and program management have not been determined.
- In 2018 there were 27 sites – the site number has remained stable, but Beth Boyer (PSU) funds 9-10 sites so her participation is critical for the network to be successful. She relies on grant funding that is usually last minute/uncertain.
- Mike Olson wants to look at grassland litterfall but would need a new method. Current sites are hardwood deciduous forests. Kristi is interested in joining with an updated method for western sites (conifers).
- Discussion followed about when the transition is happening – should USGS lab analyze 2019 samples because of HAL transition also happening this summer? The CAL/PO will talk through what is required for a successful transition. They will reassess feasibility after July/August to let USGS know. Need a motion in Executive Committee to change to 2020 sampling period if WSLH doesn't feel comfortable analyzing the 2019 samples.

## Government Shutdown – Mike Olson

- The lapse in federal funding occurred December 22, 2018 – January 25, 2019
- Richard Tanabe contacted the site operators to prepare for shutdown. Operators were asked to add anti-freeze to raingages to prevent damage. The PO and CAL focused on notifying operators what a valid sample duration would be (194 hours is still valid).
- The PO sent communication to all operators across all networks.
- Memo to operators described how they should collect their samples as the shutdown was about to occur and how to collect their sample once the government opened. Everyone's first mistake was assuming the shutdown would be a few days. The PO assumed government sites would not collect samples but that was not the case. There was a lot of uncertainty on who was able to do what. Operators also couldn't ship samples because they couldn't get into their accounts.
- Eurofins – supplies are turning around quicker to operators – had no way of knowing who wasn't visiting their site so supplies piled up at some sites. Eurofins is under contract to continue shipping samples until notified otherwise.
- A second memo was sent to operators once the government reopened. The note requested that site operators clearly document the sample metadata, supply needs and requested that operators don't discard samples. Operators could finally call the PO with issues once they were back to work.
- Mike showed a table of sites impacted by agency. USGS and NPS experienced the greatest impact from operators not sampling (50 sites total with 5-6 weeks of data lost). We still don't know the full impact to completeness criteria.
- On February 4<sup>th</sup> the PO scheduled a briefing with federal agencies but everyone was still trying to dig out from the shutdown. PO sent summaries to agencies. AMoN and NTN summaries were created but MDN was difficult to assess.
- There was a significant impact to the PO and CAL. They shifted priorities and tasks to reduce the level of effort. There wasn't an observed impact on funding as most sites were funded through the NIFA agreement.

- EPA sites funded through the Wood contractor were not highly impacted. Sites were funded, but quickly reached a point where they would not be able to continue sampling because the Wood contract is incrementally funded and EPA wasn't paying invoices.
- NADP is encouraging sites to request that they be able to continue sampling during the next government shutdown. NPS has sent notification to sites and recommend doing this. USFS did the same.
- Greg noted this is going to happen again and feds need to not be reactionary but to have a plan that includes back up operators, back up shipping addresses, extra return shipping labels. Greg will set up a call with federal agencies.
- Greg and Doug noted that it would be easier if USGS used a centralized contractor for paying operators (similar to EPA). USGS has several contracts with operators who are paid individually.
- Mike O noted that having the NIFA agreement in place was really helpful to keep operations funded. The agreement binds NADP.
- Camille requested alternative email/phone numbers for federal agency contacts when shutdown occurs.
- Greg reminded everyone that they are legally allowed to protect government equipment (i.e. raingage is \$10k). Kristi will send bullet points from NPS communication to Greg.
- Amy noted validation criteria is only on collection. If a site needs to hold samples in a fridge on site that doesn't invalidate samples.

## A proposal to leverage the NADP to fill critical dust deposition data and knowledge gaps – Janice Brahney

- Dust is not measured by any U.S. network but has increased over the last several decades. As a starting point, researchers used  $\text{Ca}^{2+}$  concentrations in precipitation as an indicator of dust. The western US has experienced an increase in dust deposition (using  $\text{Ca}^{2+}$  as a surrogate).
- $\text{Ca}^{2+}$  in precipitation is not a true 1:1 correlation with dust.
- Visibility metrics or satellite radiometry can also be used as a surrogate for dust.
- Dust impacts water quality and chemistry. Janice has made high resolution measurements at 1 WY site. They have found that phosphorous concentrations are much higher in dust impacted lakes. Dust picks up heavy metals (i.e. lead, cadmium).
- There are several methods that can be used for dust collection
  - Cake pan filled with marbles is not great. It is difficult to deal with in the field and difficult to get sample off the marbles so there tends to be low recovery.
  - Dust on snow is only seasonal sampling. Snowmelt and blowing can cause samples to be highly variable across a landscape.
  - Bulk sampling collects wet and dry sample.
  - Fine aerosols are good surrogates (IMPROVE) but samplers measure < 10 um particles. Dust tends to be larger so not a true measure of dust. The fine aerosols show a decreasing trend (opposite of dust).
- Janice is leveraging existing NADP dry bucket. She is using a series of filters to keep out contamination and act as a wind blocker. She designed a sampler made of glass, nylon, and polycarbonate to fit into the dry bucket. Phosphorous transported as a particulate contributes to the total phosphorous budget.

- The pilot study began in November 2017 at 15 sites in the west. Sites collect monthly samples. They recover the dust sample by scraping the final plate in the stack of filters with a razor blade, then weigh the sample and archive before analysis.
- Janice is testing the prototype sampler.
  - Janice added different masses to sampler and performed recovery analyses. She found they were recovering > 97% for a range of masses (10mg – 120mg). Compared to marble samples where there was no recovery of sample with mass < 10mg, the prototype is working well.
  - They are also performing wind experiments where they are exposing material on glass plate in 30 mph winds. They also found good recovery using filter/screen.
  - During the pilot study they have had good correlation with dust on snow method. Average dry dust is 67% of total dust deposition.
- During the pilot they noticed the glues failed and samplers fell apart. They are no longer using glue. The samples are sometimes wet, so they must be dried before recovery, but there is no phosphorous lost. Solution might be to use the MDN side dry buckets.
- Janice is working on a publication describing the efficiency of the sampler. This will be completed before publishing on deposition rates of nutrients.
- Her vision is to expand the network in the future.
- She also wants to look at carbon, nitrogen, alkalinity, and microplastics in the samples, possibly metals (depending on funding).
- About half of the sites in winter months had low recovery rates – low sample mass, spring/summer/fall is good. Could combine sample into one sample to do an annual value.

## Spring Meeting (Melissa Puchalski)

- The Spring 2020 NADP Business Meeting will be held in Madison, WI week of May 11<sup>th</sup> or 18<sup>th</sup>

## Fall meeting (David Schmeltz)

- The Fall Meeting is being held in Boulder, CO Nov. 4<sup>th</sup> – 5<sup>th</sup>. The technical committees and Exec as well as the Ag workshop will be at the Embassy Suites in downtown Boulder. The Science Symposium will be held Nov 6-7<sup>th</sup> at the UC Boulder conference center. Transportation will be provided.
- The theme is “Expanding the Boundaries of NADP”.
- There will be a keynote plenary panel with 4 panelists that will give short presentations and a discussion around the theme. Panel will be moderated by Jamie.
  - New monitoring frontiers
  - Partnerships with other programs and networks
  - New applications of data
- Field trip will be at Betasso Preserve Boulder Creek Critical Zone Observatory lead by USGS and University of CO.
- Abstracts are due July 12<sup>th</sup>.