Critical Loads of Atmospheric Deposition (CLAD) Science Committee

April 24-25, Spring 2012 NADP Meeting, Portland, OR

NOTES

1:30-1:45 PM Welcome (Jason Lynch, EPA)

Web logistics, introductions, agenda overview, update mailing list, approval of fall minutes.

The Participants introduced themselves: Jason Lynch (EPA), Claire O'Dea (USFS), Selma Isil (AMEC, Inc), Linda Geiser (USFS), Rick Graw (USFS), Lee Tarnay (NPS), Tamara Blett (NPS), Ann Mebane (USFS), Kathie Weathers (Cary Institute), Pierrette Blanchard (EC), Donna Schwede (EPA), John Sherwell (MD DNR), Bret Schichtel (NPS), Tonnie Cummings (NPS), Ellen Porter (NPS), Tim Sullivan (E&S), Steve Parakis (USGS), Todd McDonnell (E&S), Kristi Morris (NPS), Harold Sverdrup (ICP M&M), Jennifer Phelan (RTI), Salim Belyazid (BCC-AB), Tom Butler (Cornell-Cary Insitute), Greg Beachley (EPA), Gary Lear (EPA), Krish Vijayaraghavan (ENVIRON), Melissa Hovey (BLM), Jill Webster (USFWS), Cindy Huber (NADP), Sarah Jovan (USFS), Beth Schulz (USFS), Eladio Knipping (EPRI). On phone: Robin Dennis (EPA), Randy Waite (EPA), Kevin Civerolo (NY), Chris Clark (EPA).

1:45-3:15 PM Total Deposition Joint Session (Kristi Morris, Jason Lynch)

Gary Lear and Donna Schwede discussed the background and current status of the Total Deposition Science Committee (TDEP). The committee formed to discuss scientific issues related to estimating total deposition across North America. The first Total Deposition Science Committee meeting was at the 2011 NADP Fall Meeting. A needs assessment for what information is available and what information is still needed with respect to total deposition estimates was developed. The needs assessment table is intended to facilitate communication, allowing access to existing information on ongoing work and helping uncover gaps in research and modeling. The table categorizes work being done, describes projects and project status, outlines funding status, and lists partners organizations. The table is a work in progress, and comments/suggestions should be directed to Donna Schwede in text format (not inserted into the Excel spreadsheet). Donna will send the table to Jason Lynch and he will forward it to CLAD. The Total Deposition Science Committee is now beginning to prioritize research needs and gaps found within the needs assessment table. The Committee is hoping to hear from CLAD about whether this information is useful and whether this is the best way to make this information available.

Jason Lynch supported the tool as a great step for sharing information. He recommended including a point of contact for each project, and suggested making this table a "living" Google document. Donna Schwede explained that allowing others to edit the table would be logistically difficult, but that the goal is to eventually create a query-able database.

Robin Dennis requested more detail on the species (e.g., N species, gases, particles). Donna explained that there is a balancing act between providing information and making the table manageable, but that similar comments were given at the Total Deposition Committee meeting and are under consideration.

Gary Lear explained that the purpose of the table is to prioritize efforts in coming up with Total N and S deposition on a grid output scale. The purpose of the joint meeting with CLAD is to discuss desired deposition products.

Eladio Knipping stressed that there are ways of estimating air concentrations and deposition velocities besides CMAQ, and that any product should therefore allow for the use of alternate data sources.

Tamara Blett explained that it would be useful to have the best approximation of dry deposition that the Total Deposition Committee is comfortable with in order to add to PRISM-corrected NADP deposition to get total deposition.

Gary suggested focusing on existing low hanging fruit to provide a strawman for people to comment on and define bias among approaches. The inability to agree on one model has restricted progress, so the committee wants to move forward with an initial approach that can be revised and improved over time. Gary suggested that it is the role of the Total Deposition Committee to work through these issues, and invited CLAD members to participate in Total Deposition meetings, but wanted to focus the joint conversation on potential products and their ultimate utility. Donna asked if a gridded deposition product at a 12 km^2 grid scale would be useful.

Jason highlighted the need for good metadata and asked if the product will contain multi-year values.

The product will contain annual concentrations from NADP, CASTNET, and others, and there will be seasonal values for everything using a normalized deposition velocity. The product can go back through the period of record and give a longer record of deposition.

Jason stressed the need to backcast dry deposition, at least to 1990, and asked about base cation deposition maps. Gary said that the committee will work on these items, putting methods out for comment before starting work, and making substitutions for the data that is unavailable.

CLAD discussed the fact that species respond to different species of N and questioned which species are most important when examining ecological responses. EPA STAR is looking at solicitations to provide long term ecological information that would be spatially representative and effects modelers are projecting backwards and forwards. Total N is currently relied upon because we don't know about responses to different forms. As we learn more about responses to different forms of N deposition, we will make better use of that information. Lichens respond to all forms of N deposition; the sum total is more important than just ammonium.

CLAD also clarified that deposition information is used in calculating exceedances. Critical loads are a property of the ecosystem. The most important value other than the critical load is the deposition value. CLAD then discussed the tradeoff between larger grid cells (which minimize error) and small grid cells (which maximizes the ability to find hot spots). Harold Sverdrup explained that in Europe, a coarse model is used, followed by a more detailed national model if a country has a hotspot. Ann Mebane offered a management perspective, explaining that we need grid cells to be specific enough to deal with

individual states (or forests/parks); canceling out error with larger grid cell has some negatives. Tim Sullivan suggested that finer deposition will get us more bang for our buck than work on the effects side.

Rick Graw asked about a timeframe for source apportionment. Donna explained that there is work under way for that capability for some species (PM and associated species, followed by ozone). Eladio pointed out that Comprehensive Air Quality Model CAMX (http://www.camx.com/home.aspx) has this capability already. Rick also explained that we can currently get phosphorus estimates from lichen data. If we are interested in these elements, there is possible collaboration with NADP, looking at co-located sites (with NADP, lichens, IMPROVE, throughfall) to see how they compare.

Gary informed CLAD that there will be a Total Deposition meeting at the 2012 Fall NADP meeting (on Friday) and a session during the symposium. The Total Deposition Committee is considering a 2013 total nitrogen flux measurement workshop.

3:30-3:55 PM FS Pacific Northwest Strategy for developing CL for N in NW (Rick Graw, USFS)

Region 6 of the Forest Service is looking at where they want to be in 3-5 years in the calculation and application of critical loads. Strategic planning involves having purposeful answers to moving forward.

Region 6 is creating a region-specific document which summarizes applicable CLs and TLs in the Pacific Northwest. PNW has high ecosystem complexity and a variety of ecosystems. Strategies include: leveraging existing information and resources, consulting with technical experts to determine CLs (how to apply this information and include local information), reviewing agency policy to recommend TLs (how do you set those levels and what are the implications), and creating concise region-specific documents for communication with stakeholders.

Communication internally and externally is important. Moving forward, we must engage early and often and communicate in a concise focused way. We will develop briefings, presentations, GTRs, and a regional summary report (8-10 pages with graphics). Policy mechanisms will be utilized to implement CLs and TLs. We need to incorporate CLs into our planning process, new source review (AQRV analysis), and additional business requirements. We must also continue to refine CLs and TLs, allowing new research to be integrated into policy.

Comments:

- The first step should be deciding what you want to protect (biodiversity shifts of high elevation lakes, lichens, etc.), and CLs can be revised and TLs developed based on priorities.
- FOCUS is here to assist in joint CLs projects and hopes to offer the national CLs database as a place where information can be available.

3:55-4:45 PM FOCUS Update (Cindy Huber, NADP; Jason Lynch, EPA; and Tamara Blett, USPS)

A. Phase I (Cindy Huber, Jason Lynch)

In 2002 federal agencies and scientists began to convene workshops and conferences to develop CL science and modeling efforts in the US. CLAD meetings began in Virginia, and CLAD has facilitated multi-agency funded projects. In 2010 CLAD became an official NADP Science Committee.

In October 2010 the FOCUS project was introduced to organize existing US CL information into a database and share with international partners through unofficial submission to UNCEC CCE by March 2011. We learned what is required to maintain and update a national CL database and continued collaboration with international partners.

The goal of Phase 1 was to develop and implement a clear, consistent, repeatable process for creating standardized, mapable CLs within the US. Phase 1 is complete: compiling the database, completing the Phase 1 report to summarize the database project and include several map products, and providing detailed documentation of what was in the database. The documentation will be posted on the CLAD website.

B. Phase II (Cindy Huber)

Phase II began with a strategic vision and work plan in June 2011. Important points include improving modeled and empirical CLs, identifying data gaps, expanding and improving resolution, making the database more widely available, and identifying and defining database-related infrastructure needs. A survey was sent out highlighting the work plan and gathering interested parties to join work groups. Work group products will be presented at the October 2012 and Spring 2013 NADP meetings. Goals include improving the forest ecosystem critical load estimates (improvements to BCw and ANC leaching parameters in the SMB model); improving the nitrate leaching, N immobilization, and denitrification parameters of SMB; improving critical thresholds used to determine critical ANC leaching rate in SMB model; improving CLs of nutrient N for epiphytic lichens; improving empirical CLs of N; improving surface water CLs and uncertainty descriptions; and maintaining and expanding the US CL database.

A reminder to work groups: involve CLAD in selecting critical thresholds for CL calculations.

Phase II timeline:

- April 2012: work groups conduct reviews, create recommendations, and identify additional data sources. Database requires additional information and continues to document changes. Shared space acquired for work group documents.
- October 2012: work groups progress and present recommendations. Database resides in a publically available space. Decision regarding UNECE submission. Present needs for ongoing development and maintenance of the database. Secure funding to convene focused working meetings to accomplish specific goals.
- Spring 2013: new version of US CL database available, present work group results, and identify new issues to be addressed.

C. FOCUS next steps (Cindy Huber, Tamara Blett)

FOCUS is a project under CLAD. This is our opportunity to get feedback on where to go next.

- Database:
  - Determine criteria, format, and protocols for new data
  - Develop "call" for US CL data?
  - Comments: We need to report QA protocols/controls for all data. Look to existing examples for merging data sets (examples from Kathy Weathers). Metadata might be more appropriate. Provide enough information to pass judgment on the quality of the analysis used to calculate CLs (e.g., how did you get weathering rates). Include in database reference attributions (currently already being done).
- Reporting:
  - Use of FOCUS CL data (who and for what purpose)?
  - Comments: Tracking this is good feedback. Require a standard acknowledgement for people to use in published articles/reports.
- Coordination with International Partners:
  - Should FOCUS provide US CL data for the next UNECE Call for CL data (Spring 2013)?
  - Comments: talk tomorrow.
- Long term:
  - FOCUS as "ongoing process" with annual assessment
  - Workshop/working meeting
  - Comments: In Europe, by 2020 pollution will be brought to levels that do not harm biodiversity. The results of FOCUS can have other outlets and other funding sources. This group should be answering this question to the Biodiversity Convention (USFWS). Talk to Salim and Harold to find the appropriate POC. Optimize reductions. Does this group want to support broad assessments (similar to NAPAP)? Projecting CLs and using exceedance information to predict the landscape in the future and adjust policy accordingly. Are there efforts to link this to climate change?

D. Report on UNECE CCE Mapping and Modeling meeting (Jason Lynch)

The workshop focuses on scientific exchange, call for data results, and updates and future directions by country. Jason presented: "Modeling and Mapping Critical Loads in the US: Current Status and Future Directions," including time stamped maps showing surface water CL exceedances. There were discussions about biodiversity endpoints and biodiversity assessments. The US was encouraged to look at exceedances or areas at risk.

Questions arising from the meeting: What does CLAD want to get out of ICP Mapping and Modeling collaboration? How should CLAD respond to future calls for data? How should CLAD interact with ICP Forest, Vegetation, and Waters? Should CLAD include areas such as critical levels (ozone)?

4:45-5:30 PM FOCUS Work Group Reports (Work Group Leads)

A. Jason Lynch, Group G (Data Management)

FOCUS wants to house the database where it is accessible; we are talking with NADP about possibilities and are welcoming other suggestions. There is a standing call for data. Contact Jason if you have data to contribute. Eventually, we will create a standardized form for data to be submitted, but for the time being Jason will work with you to incorporate your data into the national database.

B. Jennifer Phelan, Group A

Group A is making recommendations on improvements to the base cation weathering rate and ANC leaching terms in SMB model. Group A met on March 8, 2012 with 12 members to discuss all SMB parameters to see if there are other important parameters. Information resulting from this discussion was passed along to other appropriate work groups and committees. This group wants to develop a stepwise chronology of methodologies that can be applied across the country. Summaries are being developed and will be sent out for review. Recommendations for how to move forward will be presented to CLAD in October.

C. Mark Fenn, Group B

This group is working on improving N parameters in the SMB model (N immobilization, nitrate leaching, denitrification). They have had one conference call and are meeting again May 1. The group will be searching for data and alternative approaches to the estimation of these parameters.

D. Cindy Huber, Group C

This group is working on gaining a better understanding of the link between soil chemistry and vegetation response with the intent to improve CL calculations (Richard Warby, Paul Schaberg, Linda Pardo). The two most important inputs to the CL calculations are the mineral weathering rate and the critical threshold (often the Al:BC ratio) used to determine the critical ANC leaching rate. This group is focusing on the critical threshold used to determine the critical ANC leaching rate. Objectives: recommend whether any change in the CL calculations are warranted, determine if the use of BC:Al ratio is warranted as a critical chemical criterion, determine evidence of vegetation response, and decide if a different criterion is better supported. One possible outcome or recommendation includes an RFP for additional analyses needed to identify relationships in specific regions. The approach is similar to Group A. The timeline starts in early June and the group will update CLAD at the Fall NADP meeting. A workgroup progress report will be given at the NADP 2013 Spring Meeting.

E. Linda Geiser, Group D

As CLs are exceeded, lichen communities shift to species adapted to high N concentrations. Lichens respond directly to atmospheric deposition (not soil chemistry). Diatoms, mycorrhiza, bryophytes, and lichens are very sensitive to acid deposition. CLs that protect lichens will likely protect other ecosystem components. We also have a lot of lichen data that we don't have for other components, making them a good research focal species. A model was built to relate N deposition and lichen response: 1) quantify lichen response to N deposition, 2) select threshold lichen response, and 3) calculate CL. Lichen response was related to precipitation and N deposition in PNW and this model was used to predict

lichen CLs in other regions. This group is trying to use the other existing lichen FIA data to build customized models for each ecoregion (not applying the same PNW model). They will build a model for each ecoregion. The team is assembled and the database almost completed. They hope to be done by March 2013.

F. Claire O'Dea, Group E: Refining empirical critical loads for nutrient nitrogen: Northeastern pilot study

Group E (led by Linda Pardo) is working on refining empirical critical loads for nutrient nitrogen, currently calculated at the ecoregion scale. They met with resource managers from the Green and White Mountain National Forests in March to gather site specific information and develop a concern list containing receptors and responses of concern to the land managers. They have developed a protocol for refining empirical critical loads of nutrient nitrogen to the 4km by 4km CMAQ grid scale, which involves examining the effects of biotic and abiotic modifying factors within each grid cell. They are starting by examining Class 1 Areas Lye Brook and Presidential Range-Dry River, but will eventually expand to the National Forest scale, and later hope to refine the empirical critical loads for nitrogen nationwide. They will be presenting to the White Mountain National Forest Leadership Team and the FS National Air Program in June, and hope to have products to share at the next CLAD meeting, depending on funding and intern availability. *Comments: Consider scale of N deposition – do we need a finer scale? Place monitors?

G. Jason Lynch, Group F

Jack Cosby is the co-lead and has been out of the country. This group will begin by reviewing methodologies and looking at exceedance maps. They want to have something complete (draft publication) by the fall NADP meeting. Broader conversations will start in May.

Adjourned for the day at 5:40 PM.

8:15-8:25 AM Day 2 Introductions and Agenda Review (Jason Lynch, EPA)

Introductions. Agenda review.

8:25-10:30 AM Critical Loads Projects: Status and Results

A. USFS Inventory, Monitoring, and Assessment Program (Claire O'Dea, USFS)

The USFS has drafted a strategy and implementation plan to streamline the way they conduct inventory, monitoring, and assessment (IM&A) across the agency; this draft strategy is currently being reviewed both within the FS and beyond. The goal of improving the IM&A system is to collect data once and use it many times, thus being able to respond to national issues (like climate change) in a coordinated fashion, and being more efficient during times of budget limitations. Critical loads of air pollution was selected as one of the five case studies associated with the IM&A System Improvement Strategy, selected because this work accommodates temporal scales and geographic diversity, integrates data across resources (air, water, soil, forest health), has implications at the local, regional, and national scales, and

involves collaboration with national and international partners. The case study work group examined 14 elements necessary for implementing an effective IM&A system, looking at the current situation and desired condition in order to identify short and long term improvements/implementation actions. Some of these improvements include: continuing contributions to existing work and collaborative efforts (CLAD, FOCUS), expanding partnerships, incorporating critical loads into the forest planning process, and developing a national FS strategy for the use of critical loads. Other improvements are available in the case study evaluation report. Claire is willing to share the draft national IM&A system improvement strategy as well as the draft critical loads of air pollution case study evaluation with interested parties. *Comments: Through WCF and TCF we have initiated efforts to improve air quality, but through IM&A we are working to improve and streamline the system. Consider incorporation of contaminants – assessing levels and performing remediation.

B. Forest Inventory Analysis (FIA) Forest Health Data (Sara Jovan, USFS)

FIA has a systematic, nationally consistent sampling effort across land ownerships. The phase 2 grid consists of one plot per 6000 acres, while the phase 3 grid consists of 1/16 of the phase 2 sampling locations. During budget shortfalls P3 sampling is frequently halted; this has led to the suggestion of permanently dropping some of these indicators, specifically vegetation and lichen sampling. The vegetation indicator examines plant cover, ground cover attributes, and species data. FIA is thinking of making the P3 vegetation indicator "optional" and focusing instead on P2 vegetation, which looks at growth habit and only the four most abundant species (losing community analysis possibilities). Lichens are excellent indicators for conservative critical load calculations. We currently have over 8000 lichen surveys across the US, which are used to refine empirical CLs for N (and possibly S). Making P3 data collection optional would mean that many regions would stop collecting lichen data (PNW would likely continue). The P3 soils indicator is undergoing a full review. The original intent was to reduce the indicator to P2+, dropping estimates but possibly performing analysis at more than 1/16 of sites. The FIA soil quality indicator currently samples minerals in the forest floor. The crown condition indicator uses crown health to estimate tree health. There is also a P3 down woody debris indicator, in which the P2+ version is being piloted. The EPA has been very vocal in support of the ozone indicator, which is currently at risk.

In the current proposal, ozone and lichens would lose status as national core indicators, P3 veg would become P2+ veg, and the soils indicator is being revamped. We are trying to support the forest health indicators at FIA meetings and write endorsement letters. FIA is crafting a new strategic plan for 2013-2017, so this is a good time to provide feedback. A webinar on P3 data is being planned for late summer.

*Comments: Given the difficulties accessing FIA data, it makes it difficult to expend energy supporting the program. The database is being updated and improved, and Beth and Sara are working to make the data more user-friendly. The database shows many fuzzed locations, but actual locations are available if you sign confidentiality agreements. The analysis band is helping to organize the data and the database. Getting the real locations for the full US can take several months; this process can move faster if you try to work through Sara or another indicator lead.

C. Nitrogen Deposition and Community Changes (Chris Clark, EPA)

Nitrogen Deposition has been occurring for decades and current CL calculations are calculated at the ecoregion scale. There are many ecosystem effects that can be linked to N deposition, but we need to know more about system response functions. Large transect studies on an ecosystem by ecosystem basis do not exist. We have CLs and experiments across the US where researchers have added N. Response functions have been generated using a combination of critical loads work and fertilization studies. Exceedance values were overlain on each grid scale to determine how much biodiversity was impacted within each grid cell for that year. Biodiversity status maps were generated to determine what we are observing now relative to a background level.

Which map is most representative of reality? The field study is currently in the planning stages, using impact maps with N deposition maps to estimate areas where there is a high probability of detecting a signal. Transects will be a few hundred kilometers long with 6-8 plots (measuring community concentration, soil variables, etc).

The analysis (modeling) study will use high resolution long term data from LTERs to get an adjacent vegetation model. Under what set of soil/plant community assumptions (weathering, etc) do we have to run the model to create empirical CLs (from Linda Pardo's GTR) and are those assumptions realistic? Using long term data and realistic model inputs, what CLs are predicted and how do they agree with Linda's findings?

*Comments: We might want to do more than foliar N – entropy might provide more information. Better to take more than just N. Plans include sampling to get N, P, and C to calculate ratios.

D. Soil Critical Loads (Jennifer Phelan, RTI)

This research uses PROFILE to develop a national coverage of base cation weathering rates (BCw) to support terrestrial critical loads of acidity. A pilot trial is being conducted in Pennsylvania. BCw is one of the most influential variables of the SMB model (49-90% of estimate variation), but it is very difficult to estimate. The clay-substrate model is the most commonly used, but the source is unknown, and clay is the main driver of the model which means it may not be suitable for older, more weathered soils. The objective of this research is to develop a nationwide coverage of BCw to estimate CLs of acidity for terrestrial systems using the PROFILE model. The pilot project is in PA because of high N and S deposition rates, diverse geology, and glaciated and non-glaciated areas (old and young soils). Many of the needed PROFILE parameters are available, but there is a wide range in the resolution of different parameters. Estimates were generated at the finest resolution and analysis was restricted to forested sites. The soil mineralogy data layer was extrapolated by soil taxonomy with 14 common mineralogy groups. Datasets not available include litterfall N and BC content, root distribution and depth, soil DOC, and soil solution CO2. BCw rates matched the current state effort.

PROFILE weathering rate estimates were compared to clay-substrate maps (2.54 to 0.92); CLs would be higher under PROFILE weathering rates. There is still missing data, room for data improvements (soil mineralogy is a priority), and resolution issues. Next steps include improving soil mineralogy using USGS

Geochemical Landscapes and National Geochemical Survey, extrapolating between data points based on common soil parent material, and comparing results of soil taxonomy versus parent material extrapolations.

*Comments: The USGS database still needs to go through QA/QC before being released to the public. Should we use an average or 95% threshold within a grid cell? There are plans to continue analysis by improving values, incorporating new data layers, and considering expanding across the US.

E. Mega Transect Study (Tim Sullivan, E&ES)

The project purpose is to assess deposition levels, impacts, and recovery capabilities, while extending the knowledge of baseline conditions and providing repeatable monitoring measures for climate change. The project spans the Appalachian Trail along ridge tops, spanning a wide range of climatic and elevation gradients, and a wide array of ecological diversity. Project components include: geological sensitivity maps, atmospheric deposition (throughfall collectors), soil surveys, water analyses, vegetation composition and stress, CL modeling, and extrapolation. Sites are classified as level 1 (most intensively sampled with soil pits), level 2 (missing in-depth vegetation, soil cores instead of pits), level 3 (no soils information). Forest types include oak, spruce-fir, and northern hardwood. Indicators species were examined and a wide range of water chemistry was found. Two field seasons have been completed and databases are being completed. Some streams are being resampled (beyond the standard two samples) where variation wasn't fully captured.

*Comments: Refining end points for CLs was another goal. This data allows for examination of available options for using soil condition rather than soil solution for CL modeling. Soil sampling techniques are more extensive than FIA (sampling many horizons).

F. Recent Advances in CL and TL Using Process Based Modeling (Tim Sullivan, E&ES Environmental Chemistry)

When modeling CLs using process models, the focus has been on weathering, critical limits, extrapolation from site specific studies to the full landscape, and biodiversity. ANC changes through time (overall and through episodic events). Tools includes steady state mass balance models (SMB, SSWC), process models (MAGIC, PnET-BGC, ForSAFE-VEG), and decision support (EMDS). Weathering drives steady state mass balance models. MAGIC is constrained by the amount of base cations in the soil and the stream, which improves weathering estimates. We need to extrapolate calculated weathering rates across the landscape.

In terms of critical limits, we have been using ANC=50 as a critical limit to protect surface water. For soil solution, Ca:Al = 1-10 and soil base saturation (BS) = 12% or 20% to protect terrestrial ecosystems. There is more confidence in the surface water critical limit than the terrestrial critical limit. For soil solution, using the Ca:Al ratio provides a totally different CL distribution moving from 1 to 10. We need to be careful with these thresholds because they can drastically effect CL calculations. Soil solution data yields much lower confidence because soil solution is not constrained within the model, but using soil BS yields higher confidence, at least at the low BS sites we are most concerned about. Numeric extrapolation only

explains so much across the landscape; we want to extrapolate spatially (predicting from water chemistry and landscape features). The Random Forest Model extrapolation of MAGIC BCw estimates uses many different landscape variables and provides a strong relationship with actual values, allowing us to map CLs across the landscape. Theoretically as CL increases, plant biodiversity decreases; the estimates support this theory. We have some flexibility in the setting of CL before diversity begins to change drastically.

*Comments: These results have been used in forest planning in VA.

G. New horizons and challenges in estimating effects – post "Gothenburg revision" (Salim Belyazid)

Because ecosystem effects are not monetized, they are frequently not a focus of research, which tends to focus more on health effects. In Europe sulfur emission have been reduced significantly, while nitrate emissions have been reduced a little, and NH3 has not been reduced. If legislation is followed, exceedances of acidification CLs in Europe should be reduced. Exceedances of eutrophication are not set to come down as much given current legislation, however, for target loads, recovery targets will likely be reached. Experiments substituting volume of N deposition for time show biodiversity losses and health effects. Changing land use and climate change might suggest a moving CL, the baseline is not fixed. We can use vegetation for modeling because vegetation integrates all drivers of change within an ecosystem. What is the indicator of ecosystem change that we want to examine? "No net loss of biodiversity" will allow for some change but the net will be just over a threshold. No net loss of biodiversity will occur at low N deposition, but at high N deposition we would have a high loss of biodiversity. We can decide our CL based on the loss we are willing to accept. How should we evaluate biodiversity: 1) no weighting, all species are equally important; 2) weighting by abundance; 3) weighting with intrinsic importance of plants; 4) weighting to desirability; 5) weighting to functional groups? There is a relationship between scientific basis, legislative application, and policy application. Communication is important. We must use things people understand to explain things they don't, and present a unified simple message.

H. NOx SOx Pilot Project (Jason Lynch, EPA)

Secondary standards for NOx and SOx were signed about a month ago (ambient standards), but the agency has decided not to proceed with a new standard base on the Aquatic Acidification Index (AAI), but instead to retain the current secondary standard. Instead they will continue to look at the proposed aquatic acidification index (AAI) in a field pilot project. The AAI relates aquatic effects to air concentrations. Within EPA, a white paper is being developed to lay out the pilot program. Program specifications are not finalized but include focusing on 3-5 ecoregions using existing CASTNET sites. There will be extensive collaboration with researchers and other agencies in moving the project forward. Site selection depends on infrastructure, geographic diversity, and partnership potential, while the number of sites depends on funding and partnerships. Schedule: draft white paper summer 2012, rolled out in fall 2012, and sampling collection in 2013.

*Comments: Pilot study is only looking at aquatic effects. How would states implement this? This is being considered in the pilot study, but is not decided.

11:15 AM – 12:00 PM CLAD Business (Jason Lynch, EPA)

What more do we (CLAD) want to focus on? Within FOCUS we are compiling CL data and mapping nationally. Are we ready and willing as a group to put forward national maps of exceedances? How do we want to use the information that this group has been collecting?

One of the roles for CLAD over the next year is going to be supporting recommendations of FOCUS work groups and prioritizing/discussing the information that we need and the associated costs. CLAD has funded multi-agency projects in the past by sending out an informal RFP. FOCUS will make research recommendations.

CLAD discussed the UNECE call for biodiversity data for 2013/2014. The supply of information into the center leaves freedom; we can supply what we have out of individual projects that a national map will eventually be built on. We need to find out who within the US is representing us on the biodiversity convention and pull in others beyond CLAD. We should be engaging the community and looking at biodiversity shifts. Is it better to work within a FOCUS biodiversity subgroup or start another subcommittee to work towards developing linkages? How do we want to proceed in biodiversity analysis and linking biodiversity with N and other drivers (climate change, fire, invasive species)? CLAD is very interested in how N affects biodiversity. Chris Clark (EPA ORD) should present more on his projects at the Fall NADP meeting because there seem to be some strong relationships. Chris might want to lead the effort if we decide to provide data to UNECE.

CLAD then discussed starting a webinar series to keep CLAD members informed throughout the year and ease pressure on meeting agendas. The Total Deposition Science Committee has discussed the use of webinars as well. Webinar information should be communicated to both Science Committees.

CLAD agreed that we want support a symposium during the fall NADP meeting. Eric Millar and Paul Miller (NESCOM) could present on the NE CL project. Given the fall meeting's focus on state involvement, we should consider Salim's idea about packaging our message and using it to encourage state participation at the Fall Meeting. We can use an intermediate webinar meeting to try to increase state involvement. The CL exceedance maps are not widely distributed but they would interest states.

CLAD discussed the potential to create official CLAD exceedance maps. There is a need to wait for the Total Deposition Committee to create a standardized deposition layer first, however there might be a product before the fall meeting. A CLAD subcommittee could move forward working with the Total Deposition Committee to create exceedance maps, but would ultimately need approval from the NADP Executive committee. Before that, we would need to have a process for CLAD approval since there are many methodologies. Alternatively, we could show many approaches instead of endorsing only one. Another option is to have CLAD pull together reports consisting of maps made by others, instead of creating new maps, which would reduce the need for approval from all levels. We should decide if we

want to select an endpoint to map nationally and make accessible and communicable. CLAD agreed to let FOCUS present a proposal at the Fall NADP meeting with a potential structure for proceeding with exceedance maps. Communicating current efforts in an annual summary could be a great way to get states and others involved. Having a more formalized process to report to CLAD stakeholders would be very useful. Ultimately, we would need volunteers to move forward and support this process.

The CL database was discussed, as well as the potential to house the database on the NADP website. This will be discussed at the Executive Committee meeting, which will fit with their theme of building bridges.

CLAD should also decide how to deal with ICP mapping and modeling. Jean-Paul discussed the training and support role that ICP is offering. If we need help or want training at the Fall Meeting we should let ICP know. There are models that they can help us use (VSD and supporting models). In Europe there is an annual coordination meeting followed by training sessions. This could be done with individual states in the US. We need to think about what we want to get out of this process. We don't want to burden ICP by providing data without a purpose. FOCUS will discuss this and bring it to CLAD in the proposal discussed above.

CLAD discussed work relating CLs to ecosystem services, which is an important discussion to have before deciding how to implement CLs. With ecosystem services, there are multiple stopping places: you can evaluate the environmental effects that people care about without associating a dollar value. A potential webinar focused on the role of atmospheric deposition on ecosystem services was suggested. The International Institute of Applied Systems Analysis (Luxembourg) is funded 30% by the US. CLAD should ask them to show what they can do. The Institute for Ecological Economics also does similar activities.

Adjourned at 12:00 PM. Information from this meeting was reported by Jason Lynch at the joint subcommittee meeting later in the day at 1:30 PM.

Notes recorded by Claire O'Dea, FY2012 CLAD Secretary. Send corrections to cbodea@fs.fed.us