



NEON Technical Working Groups

2024 Biannual Report Quarter 1-Quarter 2



1685 38th St., Suite 100 | Boulder, CO 80301 | 720.746.4844 | www.neonscience.org

The National Ecological Observatory Network (NEON) is a major facility fully funded by the U.S. National Science Foundation and operated by Battelle.

Table of Contents

Introduction.....	3
Airborne Remote Sensing TWG.....	4
Aquatic Biogeochemistry TWG.....	5
Aquatic Biology TWG.....	6
Atmospheric Deposition TWG.....	8
Atmospheric Stable Isotope TWG.....	9
Biorepository TWG.....	10
Breeding Landbird TWG.....	11
Data Standards TWG.....	12
Ecological Forecasting TWG.....	13
Foliar Sampling TWG.....	14
Ground Beetle TWG.....	15
Microbial TWG.....	16
Mosquito TWG.....	17
Re-aeration TWG.....	18
Site Management and Disturbance TWG.....	19
Small Mammals TWG.....	20
Soil Sensor TWG.....	22
Surface Atmosphere Exchange TWG.....	23
Terrestrial Biogeochemistry TWG.....	25
Terrestrial Plant Diversity and Phenology TWG.....	27
Terrestrial Plant Productivity and Biomass TWG.....	28
Tick Sampling TWG.....	29

Introduction

Since its inception, NEON has relied on expertise within the science, education, and engineering communities to advise on key areas impacting the design, construction, and maintenance of the Observatory with the goal of optimizing its operation. Currently, two types of external advisory bodies support staff and leadership in making key decisions that guide all of NEON's activities: The Science, Technology & Education Advisory Committee (STEAC) and Technical Working Groups (TWG). Both bodies are comprised of experts nominated to serve in these roles who are selected by NEON staff following a rigorous selection process.

NEON currently relies upon input from 22 TWGs. These groups play an important role by providing input to NEON's data collection and processing methods and ensuring that NEON infrastructure, data, and programs are a valuable community resource. Working groups are participatory and advisory; they are often tasked with providing input on issues that have scientific, educational, engineering, or operational implications. This document includes a summary of activities, recommendations, and NEON's response to those recommendations for each TWG during the first half of the 2024 funding year (November 2023-April 2024).

Airborne Remote Sensing TWG

The Airborne Remote Sensing Data Quality Technical Working Group provides expert input and advice regarding NEON's airborne sampling design, data collection requirements and constraints, campaign scheduling, data products and algorithms, and reported quality metrics.

Summary of Activities

Q1: No meetings were held.

Q2: No meetings were held.

TWG Recommendations

Q1: N/A

Q2: N/A

NEON Response

Q1: N/A

Q2: N/A

Aquatic Biogeochemistry TWG

The Aquatic Biogeochemistry Technical Working Group (ABTWG) provides experience and expert knowledge across the fields of Aquatic Biogeochemistry, including water chemistry, solute and sediment transport, nutrient cycling and metabolism. The scope of the NEON ABTWG includes both the Aquatic Observation System (AOS) and the Aquatic Instrument System (AIS). The expertise of this group is intentionally broad and is intended to represent the diverse set of data users interested in utilizing NEON data to address research questions within the various subfields of aquatic biogeochemistry.

Summary of Activities

Q1: Held online kickoff meeting February 1, 2024. Reviewed new membership and elected chair.
Q2: No meetings were held.

TWG Recommendations

Q1: N/A
Q2: TWG made several minor suggestions.

NEON Response

Q1: N/A
Q2: Suggestions were incorporated into RFP.

Aquatic Biology TWG

The Aquatic Biology Technical Working Group provides expert knowledge across the fields of organismal sampling in aquatic systems. The scope of the NEON Aquatic Biology Technical Working Group includes data products generated by the Aquatic Observation System (AOS). The expertise on this group is intentionally broad within the field of aquatic biology and ecology. The group is intended to represent a broad set of NEON data users and experts in various subfields of aquatic biology and ecology, who can:

- 1) take a broad and complete view of the aquatic program, and
- 2) provide scientific guidance on design, prioritization, and value of the components of the Project.

Summary of Activities

Q1: Held online kickoff meeting in January with TWG members to go over new membership, elect new chair Jennifer Edmonds, and introduce Ryan McClure. Most of the presentation related to the fish data product. We also communicated via email to get names of additional invertebrate and zooplankton contracting labs.

Q2: Ryan McClure and Stephanie Parker met with new TWG chair Jennifer Edmonds to talk about improvements, communication, and any outstanding issues for the upcoming year, there were no new recommendations that came from this discussion. We asked for TWG volunteers to review the Macroalgae statement of work (SOW). Ryan McClure had separate meetings with some TWG members regarding optimization analyses.

TWG Recommendations

Q1: A portion of the TWG volunteered to break into a smaller group led by Ryan McClure for TWG fish discussions. Ryan McClure met with smaller TWG groups to discuss optimization strategies for 30 to 50 LW regression data, changes to the number of fixed reaches at the NEON sites, and discussions around updates to user guides for the fish data. The TWG discussed a few different models that could be applied to evaluating the changes to the number of fixed reaches and some ideas to increase the user breadth of the fish data. No official recommendations for fish resulted yet from the discussions, but a few lab recommendations for potential service providers for macroinvertebrate and zooplankton taxonomy were received and incorporated into the Battelle procurement effort.

Q2: Marco Cantonati volunteered to review the Macroalgae SOW; he provided minor recommendations on document formatting and recommended that NEON concentrate phytoplankton prior to archiving a subsample at ASU. Dr. McClure's meetings with the TWG members resulted in continued analyses on the 30 v 50 LW regressions and the fixed reach changes for fish sampling, begun in Q1. NEON staff are actively working to update the fish data product, so the TWG opted to hold off on any specific recommendations for user guide updates until after this effort is completed.

NEON Response

Q1: NEON's sample analysis team used the TWG lab suggestions for the second round of the procurement effort for macroinvertebrates and zooplankton service providers. Dr. McClure continued working on the fish analyses based on the meetings with the TWG members.

Q2: The Macroalgae SOW was updated based on Dr. Cantonati's recommendation to concentrate phytoplankton prior to archiving.

Atmospheric Deposition TWG

The NEON Atmospheric Deposition Technical Working Group TWG focuses on the sampling of precipitation for chemical analysis and isotope concentrations as well as particulate size distribution. Input from the TWG will be requested, as needed, on the refinement of current procedures, algorithms, sensor obsolescence and replacement or the elimination, modification, or addition of data products, and infrastructure issues related to deposition.

Summary of Activities

Q1: Held kick-off meeting and requested feedback on the following questions: sample train supply issues for wet deposition, moving wet deposition collectors to the ground, whether a tipping bucket (NEON secondary precipitation) is a reasonable measurement of precipitation to complement wet deposition collection, biweekly vs weekly sampling and tradeoffs between sampling weekly at fewer sites or biweekly at more sites.

Q2: No meetings were held.

TWG Recommendations

Q1: The TWG strongly supported moving the wet deposition collectors off the tower top to the ground at all core sites (where we have a suitable location and precipitation gauge). No consensus was reached regarding the other topics, so additional discussions are planned. There was agreement and understanding that compromises had to be made to improve the data quality, but more discussion is needed to make those choices.

Q2: N/A

NEON Response

Q1: NEON moved the wet deposition collector at WREF to the ground as a pilot of this proposed change. Relocations at other sites are planned for 2024-2025 pending NSF approval. Current data availability is being assessed for continued feasibility of difficult sites.

Q2: NEON staff are drafting a memo to the NSF to request approval for moving the wet deposition collectors to the ground.

Atmospheric Stable Isotope TWG

This group provides guidance regarding sensor designs and assemblies, data products, and field and lab procedures and protocols to measure atmospheric stable isotopes of ^{13}C in CO_2 and ^{18}O and 2H in water vapor and precipitation water.

Summary of Activities

Q1: Sent an email request for feedback regarding frequency and need for low humidity dependence characterization (LHD) on Picarro instruments at sites where annual humidity is high, e.g. above the 5000 ppmv threshold where the instrument correction should function.

Q2: No meetings were held.

TWG Recommendations

Q1: The TWG wanted to better understand the extent to which the low humidity dependence of each of the NEON instruments has been stable versus variable through time within the existing record of LHD characterizations, and how the magnitude of the temporal stability/instability compares to the magnitude of the instrument-to-instrument variation in the effect. The group discussed whether data below 5000 ppmv should be flagged or not. The argument for flagging was that the Picarro applies an empirical correction during data processing that accounts for concentration dependence down to ~5000 ppm. The argument against flagging is that the effect is continuous and that it would be more effective to make users aware by providing documentation that clearly lays out the whole processing chain, and transparently describe the known strengths and weaknesses. More TWG members were in favor of flagging known issues.

Q2: N/A

NEON Response

Q1: NEON provided a summary of all previous LHD characterization plots so that the TWG could assess year to year patterns in LHD characterization across sites and instruments.

Q2: N/A

Biorepository TWG

The Biorepository Technical Working Group is comprised of curation, archival and museum collections experts as well as ecologists and others who would make use of the NEON Biorepository. The group advises NEON on curation best practices, and discoverability of and ready access to biological samples and specimens for future scientific research. A particular focus is to broaden the availability and use of museum assets for regional to continental-scale ecological research.

Summary of Activities

Q1: No activities to report, as no issues or large sample requests that required input arose.

Q2: No activities to report, as no issues or large sample requests that required input arose.

TWG Recommendations

Q1: N/A

Q2: N/A

NEON Response

Q1: N/A

Q2: N/A

Breeding Landbird TWG

The Breeding Landbird Technical Working Group provides expert input and advice regarding the science design and protocols related to NEON breeding landbirds sampling.

Summary of Activities

Q1: No meetings were held.

Q2: No meetings were held.

TWG Recommendations

Q1: N/A

Q2: N/A

NEON Response

Q1: N/A.

Q2: N/A

Data Standards TWG

The Data Standards Technical Working Group is tasked with making recommendations about effective ways to provide NEON's data products to the broader scientific, educational, and policy communities. Topics may include 1) principles, standards, and policies for open data and software; 2) data discovery, exploration, and delivery mechanisms; 3) improvement of data products to increase utility; and 4) monitoring impact of NEON data use on research.

Summary of Activities

Q1: No meetings were held.

Q2: No meetings were held.

TWG Recommendations

Q1: N/A

Q2: N/A

NEON Response

Q1: N/A

Q2: N/A

Ecological Forecasting TWG

The Ecological Forecasting TWG provides recommendations to NEON on how to best support ecological forecasting. This may include facilitating community discussions around forecasting needs, providing guidance for data product development, and identifying opportunities for NEON to engage with the forecasting community through workshops, educational materials, and code/data product development.

Summary of Activities

Q1: No meetings were held.

Q2: We had a virtual meeting in March where we welcomed new TWG members (Freya Olsson and Kari Norman). Quinn Thomas provided highlights from the NEON Ecological Forecasting Challenge, which is run by the Ecological Forecasting Initiative Research Coordination Network (EFI RCN), from the past year. The TWG discussed how NEON should support future activities related to the challenge, including a NEON beetle forecasting workshop at ESA 2024 and the EFI RCN 2025 meeting. The TWG also discussed how ecological forecasting might be used to inform NEON operations, such as planning and prioritizing field work.

TWG Recommendations

Q1: N/A

Q2: The TWG recommended NEON seek input from NEON science staff, including both HQ and Field Science staff, for ideas about use cases where forecasting might be informative.

NEON Response

Q1: N/A

Q2: NEON staff are currently collecting use case ideas to bring to the TWG for discussion.

Foliar Sampling TWG

The Foliar Sampling Technical Working Group provides expert input and advice related to sampling sunlit plant foliage, with a key goal of linking field measurements to remotely-sensed observations of vegetation chemical and physical properties.

Summary of Activities

Q1: Over email, the TWG was asked to weigh in on the process for creating foliar trait maps using NEON airborne remote sensing and ground-based data. A presentation was shared that contained an overview of work to date, then specific questions were posed surrounding data selection, outlier filtering, model structure and approach, and other topics.

Q2: The TWG was asked to weigh in with their experiences and lab practices regarding independent verification standards for foliar chlorophyll measurements. NEON transitioned analysis labs for this service for FY24 and was interested to get community feedback on best practices prior to firming up the new lab's NEON analysis protocol.

TWG Recommendations

Q1: Several TWG members shared very helpful feedback. This included how to prepare remote sensing data for the trait modeling effort, deciding which pixels to include/exclude from the crowns, things to consider when pairing with foliar measurements, and different approaches for modeling in terms of one model or several and which type to use.

Q2: One member of the TWG shared their lab's practices for assessing consistency and accuracy across sample runs when measuring foliar chlorophyll.

NEON Response

Q1: These suggestions have been carefully considered as foliar trait modeling efforts continue. Many suggestions have been incorporated into the workflow. The TWG will continue to be advised and asked for feedback as the work matures toward a first trait map data release.

Q2: This response was helpful and assisted NEON establish a standard analytical protocol with the new laboratory including two types of quality assurance materials.

Ground Beetle TWG

NEON collects ground beetle observations and archival samples at all terrestrial field sites to capture how ground beetles (*Carabidae*) communities change in different habitats and ecosystems over time. This TWG determines targets for sampling that generate data that can reveal significant changes in beetle abundance, diversity, and community composition.

Summary of Activities

Q1: No activities to report, as no beetle sampling issues arose.

Q2: No activities to report, as no beetle sampling issues arose.

TWG Recommendations

Q1: N/A

Q2: N/A

NEON Response

Q1: N/A

Q2: N/A

Microbial TWG

The Microbial Ecology Sampling Program encompasses measurements of soil and aquatic microbial diversity, composition, and abundances that are deemed critical for understanding long-term changes in biodiversity and ecosystem function. The tools used for measuring microbial diversity in the environment develop and change rapidly. NEON relies on input and guidance from the Microbial Technical Working Group to advise on questions related to methods and analyses, as well as best practices for ensuring data quality, accessibility, and usability.

Summary of Activities

Q1: TWG lead met separately with individual members of the TWG with specific expertise. Met with Jeff Blanchard and Dawson Fairbanks to go over changes to the metagenomic and community composition data products.

Q2: Some members of the small mammal TWG participated in a cross-TWG meeting to discuss the standards that are used for documenting the contents of genetic extract samples that are stored at institutions.

TWG Recommendations

Q1: The individual meetings were very informative. For the community composition, Dr. Fairbanks provided feedback on NEON's plan to update the fungal ITS data analysis protocol. For the metagenomics data products, both Dr. Blanchard and Dr. Fairbanks provided helpful advice.

Q2: For the soil reference standard protocol, the TWG members recommended to freeze-dry the soil samples to avoid artifacts from continued freezing/thawing of the samples, and so all samples were preserved the same way. Jeff Blanchard suggested a strategy for obtaining funding to carry out experiments on the viability of tissues in the Biorepository.

NEON Response

Q1: The community composition protocol is being updated based on feedback. For metagenomics, a workflow has been developed for getting metadata relevant to those data products.

Q2: The soil reference standard protocol has been revised and organized technicians to carry out the protocol in the Boulder HQ lab. A small grant application has been drafted for internal funds to test the viability of soil samples in the Biorepository.

Mosquito TWG

The Mosquito Technical Working Group is comprised of researchers focused on topics including mosquito surveillance, public health, disease ecology, and phenology. The group advises NEON on sampling approaches that will generate data that reveal significant changes in mosquito abundance, diversity, and community composition. A focus of this group is to ensure compatibility of the mosquito dataset with other surveillance infrastructure used to monitor arboviruses in mosquito populations.

Summary of Activities

Q1: No activities to report, as no mosquito sampling issues arose.

Q2: Requests to provide feedback on their setting of traps within 5 m of water, reporting tank weights for the new use of CO₂ canisters in trapping, and capping the number of archived mosquitoes were sent over email. Additionally, a survey to provide feedback on plans for the future of the mosquito pathogen data product was also sent. See also the Small Mammals TWG summary for details about genetic extract meeting in which some Mosquito TWG members also participated.

TWG Recommendations

Q1: N/A

Q2: The TWG recommended 1) to remove the language requiring that traps be set >5m from standing or flowing water to ensure that traps continue to be set in wet/rainy conditions, 2) that it wouldn't be critical to report canister weights but may be relevant/of interest 3) that it would be sufficient to store ~200 individuals of a given species from a given bout of sampling and 'extra' individuals beyond that could be discarded rather than archived. This would ensure that the mosquitoes can be stored in vials that are more easily accessible and stored in liquid nitrogen.

NEON Response

Q1: N/A

Q2: A protocol update removing the requirement to place traps >5m from water was approved and the protocol change has been communicated to all field staff. The feasibility of reporting canister weights is being assessed with the field teams. Approval to cap the number of archived individuals will be sought in coming weeks.

Re-aeration TWG

The Re-aeration Technical Working Group provides feedback on NEON re-aeration sampling protocols. The TWG is helping to evaluate previously collected data and develop plans to reduce the frequency of re-aeration experiments by strategically targeting certain discharge ranges to complete k-Q rating curves which can be used by data users to estimate re-aeration. The goal is to phase out the use of sulfur-hexafluoride as tracer gas.

Summary of Activities

Q1: No meetings held, as further potential modifications to sampling are awaiting additional data collection.

Q2: No meetings held, as further potential modifications to sampling are awaiting additional data collection.

TWG Recommendations

Q1: N/A

Q2: N/A

NEON Response

Q1: N/A

Q2: N/A

Site Management and Disturbance TWG

The Site Management and Disturbance Technical Working Group (SIM TWG) provides experience and expert knowledge related to Disturbance Ecology, particularly in reporting disturbance events and metadata. The scope of the NEON SIM TWG includes capturing disturbance events for all NEON Science subsystems (AIS, AOP, AOS, TOS, TIS). The group advises NEON on SIM data accessibility, quality, and usability as well as identifying areas of improvement within our budget. This group is also tasked with providing guidance on disturbance monitoring methods and best practices for reporting impacts to other ongoing data collection at our sites.

Summary of Activities

Q1: Continued discussion on possible protocol updates.

Q2: Discussed the TWG's final out of scope recommendations to present to one of the internal NEON change management groups, the OS IPT. We introduced the next TWG objective to identify an appropriate and efficient method for determining NEON monitoring disturbance.

TWG Recommendations

Q1: The discussion focused on when spatial data would be most useful and event type standardization with other groups that do repeated sampling (FIA, LTAR).

Q2: The TWG recommended:

- 1) add spatial data collection,
- 2) create AGOL layers of managed units,
- 3) backfill events that were missed from 2012: present,
- 4) refine/standardize eventTypes,
- 5) add/publish photos,
- 6) create a SIM R package.

The initial response to the impacts of sampling on data were that it was an interesting question that is difficult to quantify and the "elephant in the room" at other research institutions.

NEON Response

Q1: The goal is to summarize and rank all protocol recommendations before the next meeting through a google form. TWG members will add a rank of benefit to the community to each recommendation and NEON staff will add information about cost and feasibility. The recommendations will then be presented to the OS IPT.

Q2: OS-IPT ticket submitted to discuss the TWG recommendations with NEON leadership.

Small Mammals TWG

The Small Mammal Technical Working Group provides expert input and advice regarding the science design and protocols related to NEON small mammal abundance, diversity, and pathogen sampling.

Summary of Activities

Q1: Requested feedback related to mitigating plot damage due to site trampling at woody wetlands as well as how to respond to persistent bear disturbances at the Great Smoky Mountains (GRSM) site.

Q2: Some members of the small mammal TWG participated in a cross-TWG meeting to discuss the standards that are used for documenting the contents of genetic extract samples that are stored at institutions.

TWG Recommendations

Q1: Mitigating plot trampling damage: It is OK to shift the plots; however, this needs to be recorded both in the data as well as user guides. Some care should be taken to maintain a similar breakdown of landcover classes. All grids (even those only at risk of deterioration in the future) should be changed at the same time to avoid user confusion. There was also a suggestion to analyze the data for diversity and captures across different land types to better understand and document the impacts of the shifts.

Bear Disturbance Recommendations: The recommendation was not to reduce the number of nights sampled on pathogen grids to reduce bear habituation since the recapture data are very useful. Sampling fewer plots was considered a viable option as was bringing back some plots that were closed in previous years to see if the bears have moved on.

Q2: The group seemed to converge on the idea that providing information on the extract volume and the TNA quantity (using a qubit / fluorometric measurement) is the bare minimum for samples to be used for most purposes. Additional information about the extraction methodology should be readily available to researchers as well (e.g., in the collection description). We would also need to be clear about what the qubit is measuring (usually total DNA?). While a more 'gold standard' approach might be found by organizations like JGI, these tend to be expensive and mostly necessarily for things like whole genome sequencing, which these samples would be unlikely to be used for (since most doing that kind of work would just go to the original tissue/sample, not something already extracted). Another great suggestion was to develop an Assignable Asset pathway for researchers to build the cost of sample analysis into a grant so that the Biorepository could sort out which samples would work before sending them out. Pathogen sample quantities would need to be specifically noted that the qubit is measuring mostly host TNA in the collection description.

NEON Response

Q1: Mitigating plot trampling damage: An analysis of captures between wet and dry areas at UNDE plots indicate a complex relationship between species composition and moisture such that we recommended that shifting of plots should be minimized and pavers should be attempted to reduce trampling damage at the sites. Additional budget is being sought to maximize the use of pavers at these plots to reduce the amount of plot shifting. Bear Disturbance: we will continue to sample 3 nights at the pathogen grids. The plan is to bring restart sampling at the grids that were closed for bears 1 and 2 years ago to see if that was enough of a closure to avoid additional bear disturbance. We will also establish an extra contingency grid or two, as feasible, that is in relatively bear-free area of GRSM but may not be co-located with other NEON plots since there are not many more remaining from which to choose.

Q2: CLA is considering the budget and feasibility of reporting a qubit analysis and total volume for genetic archive samples.

Soil Sensor TWG

The Soil Sensor Technical Working Group, provides feedback on all aspects of sensor measurements made in the TIS soil plots, including soil temperature, soil moisture and salinity, soil CO₂ concentration, soil heat flux, throughfall, soil surface photosynthetically active radiation (PAR), net longwave radiation, and soil surface/litter/vegetation infrared temperature measurements. In addition, the Soil Sensor TWG provides recommendations on approving or disapproving requests for large amounts of soil from the NEON Megapit Soil Archive.

Summary of Activities

Q1: Held an online kickoff meeting (28 Nov 2023), which included discussion of the TWG charter, status of the Megapit Soil Archive and soil sensor data products, roll-out plans for the new combined soil temperature, moisture, and electrical conductivity sensor, and improvements made over the last year. Sean Schaeffer was elected TWG Chair.

Q2: Two discussions occurred this quarter via Teams chat. The first sought TWG input on the optimal sensor to measure soil temperature at 2 cm deep (16 Feb 2024). The second sought TWG input on whether NEON should continue to implement soil-specific calibrations for the soil moisture data product and the type of pre-deployment measurements needed for the new combined soil temperature, moisture, and electrical conductivity sensor (10 Apr 2024).

TWG Recommendations

Q1: N/A

Q2: The TWG recommended to continue using the existing soil temperature sensor to measure temperature at 2 cm deep after switching to a new combined soil temperature, moisture, electrical conductivity sensor for the other measurement depths. They also recommended continuing to implement soil-specific calibrations in the soil moisture data product and performing a temperature calibration as well as a validation in a few different dielectric fluids.

NEON Response

Q1: N/A

Q2: NEON will continue using the existing soil temperature sensor at the 2 cm depth. NEON is exploring ways to implement soil-specific calibrations as the Observatory switches to a new combined soil temperature, moisture, and electrical conductivity sensor. A temperature calibration will be performed prior to deployment of the new sensor and internal discussions are ongoing about implementing a validation with different dielectric fluid.

Surface Atmosphere Exchange TWG

NEON measures the surface-atmosphere exchange of momentum, heat, and several climate-relevant trace gases. This Technical Working Group advises on the operation of NEON's surface-atmosphere exchange assets, development of novel, scale-aware data products, adaptive algorithms, and usability tools, and active contribution to network science. The Technical Working Group accomplishes these tasks by working closely with NEON's Surface-Atmosphere Exchange Group. This includes prioritizing quarterly developments, pre-reviewing new resources, and bringing forward community input.

Summary of Activities

Q1: N/A

Q2: Emails were sent out in January 2024 to begin process of revamping SAE TWG which had little activity the prior year. Two meetings were set up to meet with the whole TWG which included introductions and updates regarding ongoing questions. Both these meetings took place in February 2024. Issues discussed with TWG via these meetings and separately by email include:

- 1) BLAN canopy height issue (get feedback on how to quantify canopy height, how to include this in data, what to do about growing canopy, and are data quality still acceptable).
- 2) Selection of new soil moisture and temperature sensor. Email was sent out to help choose among different options.
- 3) Methods for high frequency correction of turbulent flux data. Email was sent out to help decide what is the best method to employ.

TWG Recommendations

Q1: N/A

Q2: Responses from the TWG for each issue include:

- 1) BLAN canopy height: Provide both AOP-derived canopy height model estimates as well as wind-profile estimate for end user's observatory wide; data quality look good for now but continue monitoring; should consider something like an extendable pole or telescoping tower to move/adjust up with the canopy as it grows over time so it is consistent height above top of the canopy. Otherwise, it is difficult to merge records.
- 2) Soil sensor question: Maintain the existing soil temperature sensor for the 2 cm measurement depth and only install the HydraProbe at deeper measurement levels.
- 3) High-freq correction methods: do an intercomparison with other networks/observatories (e.g., with ICOS) to better understand the impact that different methods may have on flux data.

NEON Response

Q1: N/A

Q2: Emailed SAE TWG back regarding each issue to confirm recommendation and how SAE team is progressing forward.

Terrestrial Biogeochemistry TWG

The Terrestrial Biogeochemistry Technical Working Group provides expert input and advice regarding the science design and protocols related to measurements of plant and soil biogeochemistry within the NEON Observational System (e.g., not sensors).

Summary of Activities

Q1: Over email, the TWG was asked for input on whether it was important to switch the ground plant tissue archive from plastic to glass containers, a step that was suggested by one member of the group when reviewing NEON documentation.

Q2: Over email, the TWG was asked to weigh in on two items. First, members were asked what the consequences of using a different pore size filter for soil inorganic nitrogen extracts might be. This was accidentally done in one of the domains. Next, the group was asked how they interpret the analysis results from the same set of samples, comparing ground vegetation analyzed by NEON's former carbon/nitrogen/stable isotope lab compared to a new lab that NEON is moving the contract to. The labs had significantly different values for some analytes, but the differences were within the long-term reported uncertainty ranges for those labs.

TWG Recommendations

Q1: Glass containers were deemed a better option for long-term storage. The disadvantage of glass in terms of slightly higher costs and higher potential for damage during shipping is outweighed by the durability and non-reactive nature of the material. One TWG member has seen plastic scintillation vials become brittle and crack/disintegrate over longer periods of storage, which is not ideal given the 30 year lifetime of NEON.

Q2: Regarding the use of a different kind of filter, the group did not think this was very concerning. Members cited varied practices in terms of types and sizes of filters using in their own research and thought that while it is important to document any deviation from NEON's standard protocols, this was not one with a large data quality impact. Regarding the inter-lab comparison of ground plant samples, the group felt that NEON should not take a lab change lightly and consistency is best for the time series. However, if there are compelling reasons to change labs, then it is important to document the change and its potential impacts, and to ensure all labs that work with NEON are using appropriate internal and external standards to document their precision and accuracy.

NEON Response

Q1: Starting in 2024, all ground plant tissue samples for archive in the NEON Biorepository will be stored in glass scintillation vials instead of plastic. In addition, the Biorepository will rehouse all existing samples, transferring them from plastic to glass vials over the next few years.

Q2: An Issue Log Entry was created for DP1.10086.001 noting which sites used a non-standard filter type for their soil extractions and for what period.

A similar issue log entry will be created for DP1.10026.001, DP1.10033.001, and DP1.10067.001 documenting the change in analysis lab for ground plant tissue samples for carbon, nitrogen, and stable isotopes. This documentation will include which analytes seem most sensitive to lab, what are the estimated differences, how this compares to long-term lab precision, and what time periods are affected.

Terrestrial Plant Diversity and Phenology TWG

Membership of the Terrestrial Plant Diversity and Phenology Technical Working Group includes researchers and practitioners from universities, federal and regional government agencies, and coordinated research networks. This group represents the community of plant diversity and phenology data users that NEON aims to serve; members provide expert input and advice regarding the science design, protocols, and data quality issues related to NEON plant diversity and phenology sampling.

Summary of Activities

Q1: No meetings were held, as no sampling issues arose.

Q2: No meetings were held, as no sampling issues arose.

TWG Recommendations

Q1: None to report.

Q2: None to report.

NEON Response

Q1: N/A

Q2: N/A

Terrestrial Plant Productivity and Biomass TWG

The Terrestrial Plant Productivity Technical Working Group advises which methods, protocols, and equipment are employed to create robust ground-based estimates of live and dead woody biomass, woody and herbaceous productivity, coarse downed wood volume and density, fine and coarse litterfall, belowground plant biomass, and leaf area index across a suite of different vegetation types. The TWG also considers optimal spatial and temporal integration of ground-based measurements with remote-sensing hyperspectral and LiDAR datasets (i.e., the NEON AOP system), and with data streams generated by the NEON Terrestrial Instrument System. Finally, the TWG is also deeply invested in determining how NEON Plant Biomass and Productivity data products can be optimized to enhance usability and value for the NEON end-user community.

Summary of Activities

Q1: No meetings were held.

Q2: TWG completed review of the Litterfall and Fine Woody Debris protocol.

TWG Recommendations

Q1: N/A

Q2: Recommended one minor clarification around how larger material captured by litter traps but hanging over the edge is processed.

NEON Response

Q1: N/A

Q2: Will add clarification to next protocol revision.

Tick Sampling TWG

The Tick Technical Working Group provides expert input and advice regarding the science design and protocols related to NEON tick abundance, diversity, and pathogen sampling.

Summary of Activities

Q1: No activities to report, as no tick sampling issues arose.

Q2: No activities to report, as no tick sampling issues arose. See Small Mammals TWG summary for details about genetic extract meeting in which some TWG members participated.

TWG Recommendations

Q1: N/A

Q2: N/A

NEON Response

Q1: N/A

Q2: N/A