



NEON Technical Working Groups

2022 Second Quarter Report



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

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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 (TWGs). 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 23 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 second quarter of the 2022 funding year (February 2022-April 2022).

Airborne Remote Sensing Data Quality 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

No meetings were held.

TWG Recommendations

N/A

NEON Response

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

No meetings were held.

TWG Recommendations

N/A

NEON Response

N/A

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

Summary of Activities

Algal taxonomy meeting: We met to review past algal taxonomy TWG decisions and optimization, and presented the results of the algal taxonomy pilot study done by CU to determine whether a 600 valve count or an alternative is best for analysis, with guest speaker Pat Kociolek from CU.

TWG Recommendations

Algal taxonomy: The TWG suggested that we stay with 600 valve count based on the results of the pilot study, although further analysis is needed for the number of field samples collected.

Fish: The TWG was consulted about lowering the amount of fish per species/transect needed to measure before bulk count from 50 individuals to 30. The TWG overwhelmingly approved of the change

NEON Response

Algal taxonomy: Stephanie presented TWG recommendations to the OS-IPT. Field optimization analysis is ongoing.

Fish: The change was implemented at this springs fish bout at BLUE with positive outcome. A bout was fished for the first time in years (though not a full bout). Depletion was reached and a successful methodology has been adopted.

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

No meetings were held.

TWG Recommendations

N/A

NEON Response

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

No meetings were held.

TWG Recommendations

N/A

NEON Response

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

No meetings were held.

TWG Recommendations

N/A

NEON Response

N/A

Community Engagement TWG

The Community Engagement Technical Working Group (TWG) provides guidance on the ways in which NEON engages with its existing and potential user community. This includes scientists, educators, and students as well as organizations, agencies, institutions, and companies whose activities align with the mission and goals of the NEON program. Members serve as liaisons to the NEON user community while providing input on the program's strategic engagement plan and the activities and outcomes identified in that plan.

Summary of Activities

Community Engagement TWG met on March 23, 2022. Bonnie Meinke, the new NEON Engagement Team lead introduced herself. The group discussed upcoming conferences and meetings, and a new Regional User Group in Domain 05. The group focused on brainstorming possible activities for members to advise NEON on, such as "incentivizing staff to conduct outreach" and "following up/keeping momentum after NEON workshops." Following the meeting, the TWG members down-selected their activity groups and volunteered for leadership and membership of each.

TWG Recommendations

N/A

NEON Response

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

Kickoff meeting on March 2, 2022. Reviewed recommendations from previous years and the charter, which was then successfully voted on. Discussed quick start guides and the movement of data to Google Cloud Platform.

TWG Recommendations

The quick start guides should be available in a screen-reader friendly format such as HTML or plain text. PDF only is not user friendly for the blind.

NEON Response

This response has been passed along to the data portal team, which feels that it should be simple to provide HTML and/or plain text in addition to the PDF, which is far harder to develop. This should be available when the quick start guides are released or shortly thereafter.

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

The group met three times during Q2: March 4, 2022, March 25, 2022, and April 22, 2022. Meetings have focused on (1) updates on the availability of low-latency data for forecasting and how to best communicate its availability to participants in the EFI NEON forecasting challenge, (2) discussions about how to better provide resources those interested in becoming involved in the eco-forecasting community, (3) planning a coordinated presence at relevant meetings including the EFI virtual meeting and the LTER All Scientists Meeting, and (4) coordinating blog posts with NEON communications staff to highlight successes in the EFI NEON forecasting challenge.

TWG Recommendations

The group has been interested in coordinating an effort between EFI and NEON to create more incentive to boost participation in the EFI RCN NEON forecasting challenge. The TWG has suggested that NEON and EFI work together to recognize successful teams (e.g., an event at future ESA conferences, blog posts highlighting successful teams, a feature of best forecasts on their websites, etc.) both as an incentive for participants and to increase visibility of the competition to recruit more participation.

NEON Response

We proceeded with the recommendation to create blog series featuring EFI NEON forecast challenge success stories. This kicked off with a meeting including NEON communications staff and EFI staff along with the NEON TWG to identify a strategy to select challenge teams to interview and a timeline for publication of the blog articles (will attempt to post articles before the upcoming EFI meeting at the end of May 2022). EFI is also interested in cross-posting the blog articles on their website.

RE NEON ecoforecasting webpage updates, recommendations will be passed along to Zoe Gentes to make updates to the content on the page.

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

The group met March 21, 2022 and March 30, 2022 to review the current outlier flagging routine for macro and micro nutrients, which was put in place as a result of some erroneous data making it to the portal back in 2018 (those data have long been removed and re-analyzed). The group was asked to evaluate the workflow and give feedback as to whether a similar procedure should or could be used for other plant traits. In addition, the group was asked to weigh in on how to prioritize foliar sampling given staffing challenges during 2022.

TWG Recommendations

The group was generally supportive of the flagging routine and liked the idea of implementing a similar routine for other traits like LMA, lignin, etc. They requested that more documentation be provided to end users regarding the criteria for outlier flags. In regards to staffing and prioritization, they recommended to allow technicians to reduce replicate numbers for the most common taxa (for example, from $n = 5$ to $n = 3$ or 4), and not spend a lot of time chasing rare species, although if easily sampleable they should still be collected.

NEON Response

The outlier detection routine for other plant traits has been added to the QC script for plant foliar data, although no flagging has been implemented at this time. It may be possible to add flags in the near future. The TWG lead will also plan to add more documentation around QC checks and flagging to the Data Product User Guide. The prioritization recommendations were conveyed to the OS team and Field Science.

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

No meetings were held.

TWG Recommendations

N/A

NEON Response

N/A

LiDAR TWG

The LiDAR Technical Working Group assesses and recommends strategies for developing and implementing techniques for instrument calibration and data validation, operational instrument testing, and product data formatting for vegetation remote sensing.

Summary of Activities

No meetings were held.

TWG Recommendations

N/A

NEON Response

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

The group met on February 8, 2022 with Dr. Stefan Green, Rush University, to hear about the results of the pilot efforts to generate quality ITS data from NEON samples, and Dr. Green's recommendations for how to move forward with these analyses. Prior ITS analyses of NEON samples have not consistently met quality criteria, including number of merged reads.

TWG Recommendations

The TWG recommended using Dr. Green's piloted methods to analyze all samples collected in NEON Year 2019 (Nov 1, 2018, through Oct 31, 2019) to generate ITS data. The results of that effort will then be used to inform the plan for samples collected after Oct 31, 2019.

NEON Response

NEON staff have worked with Dr. Green to move these analyses forward per the recommendation.

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

We had an email discussion about sampling priorities for mosquito data in response to staffing shortages.

TWG Recommendations

The TWG recommended prioritizing sampling that captures phenology shifts as well as early spring (April/May) sampling bouts to capture mosquito diversity and the species most likely to shift under climate change. Late summer sampling for pathogens was a lower priority given the rarity of pathogens in mosquito populations. They also suggested that if a bout must be truncated to a single sample collection (rather than a morning and evening collection), that the night-time collection should be prioritized but that sampling collection should be timed to incorporate the entirety of both the dawn and dusk period.

NEON Response

The guidance for field staff regarding which sampling should be prioritized was updated to incorporate all the TWG comments.

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 ultimate goal is to phase out the use of sulfur-hexafluoride as tracer gas.

Summary of Activities

Share cleaned up data plots and STAN model results.

TWG Recommendations

TWG recommended stopping SF6 releases at 12 sites and moving to 4 model slug releases per year to assess whether hydraulic characteristics change. Recommended target flows to try and capture for 10 sites to complete gas releases. Recommended preparing the data and code to be shared in a public repository and writing up and publishing results.

NEON Response

Bringing the TWGs recommendations to the OS IPT.

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

On April 6, we discussed the best responses to sample degradation resulting from small mammal sampling at wetland sites as well as sampling priorities for small mammal data in response to staffing.

TWG Recommendations

For site degradation, the TWG preferred the option of installing protected walkways (in lieu of not sampling these land cover classes or reducing sampling effort). They would like to see spatial continuity as much as possible and suggested installing walkways at current sites whenever possible, even if the site location needs to shift by 50 m to accomplish this. The TWG also recommended prioritizing 3 nights of sampling at pathogen grids before sampling diversity grids to preserve the capacity to use the data for mark-recapture analyses. They also indicated that if only one bout is possible, the later-season bouts provide the most useful snapshot of the community, but bouts should be spread across the season to the extent possible.

NEON Response

TWG lead Dr. Thibault shared the site degradation guidance with the working group examining observatory-wide solutions for wetland damage avoidance. She also updated the guidance for field staff regarding which sampling should be prioritized to incorporate all of the TWG comments.

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

The annual TWG kick-off meeting was held on February 14, 2022. We reviewed current data product and Megapit Soil Archive status and identified priorities for the current TWG year. Mike Cosh was re-elected as TWG Chair. A TWG recommendation was requested via email on March 15, 2022, in relation to potentially changing the soil plot relative humidity sensor height at the DELA and LENO sites to minimize downtime due to flooding. TWG responses were provided up to March 22, 2022.

TWG Recommendations

The TWG approved the proposed priorities for the coming year. The TWG recommended permanently changing the DELA and LENO soil plot relative humidity sensor height to ~2 m to minimize downtime due to flooding.

NEON Response

The soil plot relative humidity sensor was moved to ~2 m high at LENO on March 29, 2022, and at DELA on April 6, 2022.

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

No meetings were held.

TWG Recommendations

N/A

NEON Response

N/A

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

Group was asked over email for input on a couple of topics. First, TWG discussed very high %N values in a plant foliage samples - should these data be retained or discarded, should NEON resample? Next, the group was asked to weigh in on how to prioritize soil sampling given staffing challenges in 2022.

TWG Recommendations

Regarding high foliar %N, the TWG asked questions that lead to closer examination of the field data, which revealed the status of the species at the time of sampling was 'leaves not fully expanded.' Given this the TWG felt the elevated nitrogen data was plausible and suggested the data be retained. Regarding sampling prioritization - the TWG agreed with Dr. Weintraub-Leff proposal to prioritize sites and bout types such as: coordinated 5-year biogeochemistry > core sites > off-year gradient. Additionally, the TWG recommended NEON sample as many of the 10 soil plots as possible, dropping within-plot replicates if needed, as this gives better site-level estimates of soil properties.

NEON Response

The upper limit for % nitrogen in the data portal ingest system was raised from 5% to 5.5% for plant foliage samples so that these data could ingest. The prioritization recommendations were conveyed to the OS team and Field Science.

Terrestrial Instrument Data QA/QC TWG

The Terrestrial Instrument Data QA/QC Technical Working Group represents a diverse set of NEON data users and experts, in the relevant disciplines of biometeorology, soil science, ecology, and data science. The overarching goal of the TWG is to ensure that NEON delivers the highest quality data possible with the available resources and that quality information is adequately communicated to data users. The TWG broadly covers terrestrial instrument measurements, data processing, data monitoring, and data publication as they relate to quality.

Summary of Activities

No meetings were held.

TWG Recommendations

N/A

NEON Response

N/A

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

No meetings were held.

TWG Recommendations

N/A

NEON Response

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

On April 7, 2022 the TWG discussed two Herbaceous Biomass sampling problems and resolution and evaluated a proposal to publish plot-level %cover data for sites that implement a 'targeted' litter trap strategy.

TWG Recommendations

- 1) HBP problem 1: Use of grazing enclosures at TEAK_053 plot where most of subplot 21 is covered in downed logs. TWG recommended suspending use of enclosures in subplot 21 and retaining use of enclosures in subplot 41.
- 2) HBP problem 2: At PUUM site, woody-stemmed species that qualify for HBP are all perennial and it is impossible to determine which leaves were produced in the current year for productivity clip harvest. In the short-term, staff have been instructed to clip everything, which overestimates herbaceous production from these plants. TWG recommends suspending clip of herbaceous woody-stemmed species for which annual growth cannot be determined.
- 3) LTR data product and publication of %cover data: TWG recommends publishing plot-level %cover data for sites using 'targeted' trap approach. TWG recommends using LiDAR data to generate estimate if possible; graph paper survey data are acceptable.

NEON Response

- 1) Submitted a RITM to the OS-IPT to propose suspending use of enclosures from subplot 21 in TEAK_053.
- 2) Submitted a RITM to the OS-IPT to propose eliminating clip of 'wst' growthForms at PUUM for which current-year growth cannot be determined.
- 3) Working with Katherine Murphy on AOP team to determine feasibility of determining %cover of vegetation > 2 m height using LiDAR data in plots where targeted LTR trap placement is employed.

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

On March 9, 2022 we discussed sampling priorities for tick data in response to staffing shortages as well as optimization opportunities surrounding collection and enumeration of tick larvae and pathogen testing of nymphs.

TWG Recommendations

The TWG indicated that at least 4-5 plots should be sampled during a bout of tick sampling, but that even a single bout or a transect with less than 80m sampled contains useful data that should be retained. They also recommended spreading sampling across the season, while still prioritizing bouts at the time of highest nymph collection to aid with the pathogen testing needs. All TWG members concurred that larval counts are a low-value data point since they do not impact human health and are of limited value in population models. They endorsed efforts to save time such as counting larval clusters instead of individuals, or just indicating presence/absence should be considered. The TWG agreed with the current guidelines regarding prioritization of which nymphs are archived or pathogen tested. They offered insight into which pathogen tests could be cut if we move to a per-pathogen costing scheme.

NEON Response

The guidance for field staff regarding which sampling should be prioritized was updated to incorporate all the TWG comments. TWG lead Dr. Paull has initiated discussions with field staff about the preferred optimization of larval sampling and will bring any resulting recommendations to the OS-IPT for consideration.