



NEON Technical Working Groups

2022 First 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 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 quarter of the 2022 funding year (November 2021-January 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

Kickoff meeting held on Jan 19, 2022. TWG lead summarized changes NEON has made over past months in response to previous recommendations from the TWG. Lead showed TWG new Teams page, but they preferred to continue using e-mail for communications.

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

Kickoff meeting held on 1/12/22 to introduce new group, new members, set expectations, and introduce algae taxonomy and D11 BLUE fish concerns. Dylan spent some time presenting on the electrofishing concerns at D11 BLUE.

TWG Recommendations

Group suggested collaborations with local groups on the ground near the BLUE site and suggested that fish data at BLUE is important and may need more resources. Anndrea Navesky took the action to provide a list of contacts to Dylan.

NEON Response

Dylan followed up with presentation and discussion with Aquatic Science team and with D11 field staff.

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

The group met December 13, 2021, and NEON staff gave an overview of engagement at NEON and welcomed new members. The group discussed ways to conduct meaningful outreach when everything is virtual.

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

No meetings were held.

TWG Recommendations

N/A

NEON Response

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

Kickoff meeting was held on November 30, 2021 for new members; Tim Morin was selected as Chair. The group reviewed recommendations from the previous year and discussed goals for Award Year 2022. Second meeting was held on January 28, 2022; Quinn Thomas presented an overview on the EFI-NEON forecast challenge, lessons learned from the first year, update on what's happening on year 2, and desires for NEON data availability.

TWG Recommendations

- 1) NEON staff and TWG members could work with EFI RCN folks to better advertise the competitions that did not see good participation last year (e.g., Beetles forecasting).
- 2) Outreach on how to access low-latency meteorological (met) data that Dave Durden has made available.
- 3) Reduce latency on aquatic sensor data (similar to what Dave has already done for the met data).

NEON Response

NEON staff (Eric Sokol and Dave Durden) will continue to work with the TWG for the first two recommendations and will inquire about the possibility for recommendation 3. We did inform the TWG that it is not likely we will be able to make the aquatic sensor data available in near-real time until the pipeline is moved over to Pachyderm (large effort that is currently underway). We communicated a rough estimate on timeline is a year or two for that at the soonest, but we will look into this further to provide a more precise timeline for the TWG.

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

Kickoff meeting was held January 18 , 2022 where the group discussed TWG goals for the year. These include providing input on flagging criteria for foliar chemistry data and review of the foliar sampling protocol given the plan to revise it soon. TWG was asked whether incorporating a new set of community-generated crown delineations (<https://www.biorxiv.org/content/10.1101/2020.11.16.385088v1>) could help improve quality of NEON field delineated crowns.

TWG Recommendations

Stephanie Bohlman suggested that incorporating the benchmark dataset might be worth exploring and volunteered to discuss further how this might be done. An idea was proposed to try this out at one of the sites conducting foliar sampling in 2022 to assess whether it is helpful.

NEON Response

No response available yet; TWG lead will follow up with Dr. Bohlman as the sampling season approaches to determine how best to implement.

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

No meetings were held, but NEON staff and the TWG had email correspondence about two items in November 2021. Firstly, Courtney Meier shared with the group the posting for the hire of a replacement microbial bioinformatician given the resignation of Dr. House in August 2021 that the TWG had offered valuable input on in Q4 Award Year 2021. Dr. Meier also solicited input from the group on the recommended decision-making the NEON field staff should make in the face of dry-ice shortages.

TWG Recommendations

The TWG recommended that samples be collected even if storage conditions between the field and the lab were less than ideal, if these conditions are noted in the metadata. They proposed options such as well insulated coolers that are pre-chilled and investigating using CO₂ to generate dry ice.

NEON Response

Dr. Meier communicated the TWG recommendations to the NEON field staff. Dry ice availability has improved in recent weeks.

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 a kickoff meeting November 14, 2021 to introduce new members and discussed some older topics such as how to improve the number of positive pathogen test samples and whether to store blood-fed mosquitoes separately. We also discussed the new topic of what to do when taxonomists change their identification of a species in the dataset after data have been published.

TWG Recommendations

It was suggested that positives may be rare due to the rural location of many sites. It was also mentioned that blood-fed mosquitoes may be rare enough in the light traps that we use that it would not be worth the effort to save them separately. Finally, as long as the taxonomist ID changes are rare, the TWG approved of the strategy of using a separate *identificationHistory* table to thoroughly document all changes and the associated observers. TWG recommendation was to continue our current approaches to these topics.

NEON Response

NEON appreciates the TWG input.

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

We discussed prioritization of ear samples across 3 competing uses (barcoding, archive and pathogen testing). We also discussed the use of N95s for sampling in D17 as well as app enhancements to provide enhanced warning if a taxonID or sex would be changing on entry of recapture data.

TWG Recommendations

Archival uses of ear tissue can be low priority because whole voucher specimens can be used to supplement ear tissue use. Rare individuals should be prioritized for barcoding uses.

NEON Response

Sara Paull's code for sample selection for different uses incorporated all these suggestions.

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

NEON requested TWG input via email (November 15, 2021) on the number of soil plots, number of measurement depths, and using horizon-specific or standard measurement depths for the new combined soil temperature, electrical conductivity, and water content sensor.

TWG Recommendations

Majority recommendations were to maintain measurements in all five soil plots per site, have 7 measurement depths per profile for temperature and 6 for water content and electrical conductivity, and use standard measurement depths rather than horizon-specific depths.

NEON Response

Majority recommendation will be implemented when the new combined sensor is selected and deployed.

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

Held kick-off meeting January 22, 2022, where group was reminded about resolution of previous items (litter chemistry, biological soil crusts) and discussed possible TWG activities for this year (review of protocols, creation of data tutorial). Additionally, TWG was asked for input on the possibility of allowing KCl extractions for soil inorganic N to be conducted by the external lab that analyzes the solutions (instead of NEON techs) and the impact of certain method changes that would accompany this (air-dry soils, 1M KCl).

TWG Recommendations

Group was concerned about extractions taking place after shipping, since 'overnight' is not always reliable and rates continue to change. Delays in extractions would likely introduce variability/issues. Group also favors sticking to fresh soil if possible, since extractable pools increase in air-dried soils. Stephen Hart shared several classic methods papers that illustrate impact of changes in soil and solution conditions.

NEON Response

NEON will stick with the current protocol of extracting fresh soils within one day of collection using 2M KCl. This should lead to more consistent data amongst the sites and over time.

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

NEON requested TWG input on shifting the timing of Vegetation Structure measurements at D17 TEAK site to earlier in the season (late June) from what is currently scheduled based on MODIS-EVI (late July).

TWG Recommendations

TWG recommends beginning Vegetation Structure at TEAK in late June, to allow time to complete the measurements before fires/snow in the autumn. Maintaining a consistent start date in late June is very important.

NEON Response

TEAK Vegetation Structure start date moved to late June moving forward.

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

No meetings were held.

TWG Recommendations

N/A

NEON Response

N/A