NEON Technical Working Groups

2020 First Quarter Report

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National Ecological Observatory Network (NEON) is a project sponsored by the National Science Foundation and proudly operated by Battelle.

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

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 to optimize 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 2020 funding year (November 2019-January 2020).

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

Note: Contacted TWG co-leads in December 2019 about holding meeting in January or February, but no response received. FY2020 meeting now tentatively scheduled/proposed for March. Preparing revised charter to expand remit of TWG to cover AOP data products and data quality, as well as presentations focusing on revised flight campaign schedules for 2020-21.

TWG Recommendations

N/A

NEON Response

N/A

Aquatic TWG

The Aquatic Technical Working Group provides expert knowledge across the fields of Aquatic Ecology, Biogeochemistry, and Ecohydrology. This group is broadly geared toward aquatic observational sampling and instrumentation along with associated data products, design and maintenance documents, protocols, and algorithms.

Summary of Activities

Kickoff meeting was held on 12/20/19. Introduced group and NEON points of contact, updated group on AOS and AIS status and challenges for 2020. Mentioned achievements and partnership with GLEON (Global Lake Ecological Observatory Network).

TWG Recommendations

TWG group members recommended that NEON correct SUNA (nitrate sensor) data from DOC (dissolved organic carbon) interference. DOC also absorbs UV (ultraviolet) light, which the SUNA uses to measure nitrate. The TWG also recommended that NEON apply a temperature correct chlorophyll-a data. Temperature affects fluorescence, a process known as quenching. A similar temperature correction is already applied to NEON fDOM (fluorescent dissolved organic matter) data. This kicked off an ongoing discussion about SUNA nitrate data quality via comparison with analytical lab samples.

NEON Response

The SUNA internal algorithm already attempts to compensate for DOC interference. We decided further SUNA-DOC corrections are site/situation dependent (variable in both space and time based on the aromaticity of DOC) and not easily without a large amount of additional information. Moreover, based on existing literature, nearly all NEON sites have DOC concentrations below the level where the effect is likely to be outside currently published uncertainties in nitrate measurements. Chlorophyll-a temperature corrections are applicable to all sites and may be added in the future. SUNA-grab sample analysis was performed during commissioning, but NEON Aquatic Science should develop a workflow for regular data review (bi-annual).

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

This TWG focused on general status updates and group introductions for new members, as well as discussion of a few TWG member identified data quality issues. We also discussed plans to identify what NEON priorities should be for the isotope data products during the remainder of 2020.

TWG Recommendations

The TWG members recommended that we check our reported reference gas uncertainties, as they look higher than expected. They also requested that we look into the root cause of some unusual measurement values that occurred for a time period at two sites. High priority items identified by the TWG were monitoring data quality and continuing with the low humidity dependence (LHD) tests currently in progress.

NEON Response

We investigated all issues brought up by the TWG. For the reference gas uncertainties, we suspect a mapping issue of values sent from the Calibration, Validation and Audit Lab (CVAL), through the processing pipeline, to the output HDF5 files. This is now in troubleshooting with our cyberinfrastructure team. For the unusual measurement values, we confirmed sensor problems. For the affected time periods at each site, we raised the science review quality flag to mark these data as invalid. We plan to implement the LHD tests along our current plan as suggested.

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

TWG reviewed a sample use request for mammal ear punches (*Peromyscus polionotus*), by a researcher conducting a functional and conservation genomics project.

Note: Meeting delayed while Katie Levan on maternity leave. First meeting planned for March.

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

The December 5, 2019 kickoff meeting was attended by nine new and returning Bird TWG members, three members were unable to attend. In addition to the previously identified priority topic of optimum sampling windows, members identified additional topics including:

1. Consideration of additional data QA/QC processes,
2. Need to identify research questions that can be addressed with bird and ancillary NEON data, and
3. Continued exploration of bio-acoustic monitoring (including for fine-tuning sampling windows based on detected arrival dates).

With regard to the first topic of optimum sampling windows, we briefly discussed how sampling windows have been determined to date, provided a summary of those dates for each site, and a summary of the actual field sampling dates in the data collected through 2019.

TWG Recommendations

No recommendations were made at this initial meeting.

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

Launched TWG on 12/18/19 with 15 members. This meeting included member introductions and an overview of NEON's strategic engagement process, activities of the education and engagement team, and the role of the TWG for the upcoming year. During the second meeting (01/14/20), the group charter was reviewed and approved. Two co-chairs were selected: Anya Hartpence, ECCOE Community Engagement Officer, TSSC Contractor to USGS EROS and Miguel Fernandez, Director, Latin American and the Caribbean Programs, NatureServe. The group reviewed a communication going out to all of NEON's TWG members requesting information on social media and other networks NEON should leverage. The TWG co-leads met with the co-chairs on 01/29 to discuss the agenda for the February meeting. The TWG plans to meet monthly moving forward.

TWG Recommendations

The group requested detailed information on available education and outreach resources and staffing of the education and engagement team. A question was raised whether NEON had ever conducted a comprehensive needs assessment with the community to identify NEON's engagement priorities.

NEON Response

The information requested was made available to the TWG members on their shared workspace. During the February meeting, the co-leads will be presenting a brief overview of the findings from the community engagement assessment report from 2018 that guided development of the strategic engagement plan. The agenda includes discussion of these findings to identify whether additional data might be needed to prioritize the activities of the TWG in the upcoming year.

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

The Data Standards TWG kicked off this year's TWG on December 19, 2019. We reviewed the charter and logistics of meetings and collaboration for coming year. We discussed needs for easier ways to cite data and code packages, as well as need for making the AOP data viewer usable in a dedicated webpage, in addition to the current model. In our second meeting, on January 6, 2020, the TWG reviewed NEON's acknowledgement and citation guidance/policy documents. We discussed CC0 and CC-BY licensing and the opportunities for NEON to provide more coherent guidelines to the ecological research community. The TWG also discussed upcoming changes to NEON's web portals.

TWG Recommendations

The Data Standards TWG made the following recommendations in Q1:

1. Include a bib/ris text file for data product citations with data downloads in addition to the existing copy button.
2. Create a "make citation" function in the neonUtilities package.
3. Add a new functionality to the neonUtilities package - when a user runs stackByTable(), the function will print out guidance on how to properly cite the data.
4. Create a separate interface for AOP data viewer, in addition to the current modals.
5. Use CC0 licensing where possible for data.
6. Improve documentation around citing NEON outputs.

NEON Response

1-3: These are feasible, and our team has done some preliminary research.

4: The AOP viewer iframe can be popped out into a separate webpage/interface, and this has been recommended by other users. This can put on data portal team's to-do list, likely in late Spring.

5. Need to compile rationale for Science Data Quality Integrated Product Team (SDQ IPT) and leadership.

6. Our team has been working on a draft citation document, which has been preliminarily reviewed by the SDQ IPT. The need for better citations as previously been noted by Annual Operations Review (AOR) panel and others.

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 though workshops, educational materials, and code/data product development.

Summary of Activities

The Ecological Forecasting TWG kicked off with an introductory meeting on 19 December 2019. We reviewed the charter, logistics of meetings, and collaboration for coming year. The charter was approved. During the second meeting, held 14 January 2020, the TWG discussed forecasting interests in the group and interests that are known about from the community. This group felt that there should be a high priority on finding a place to run code that pulls NOAA GEFS 21-member ensemble data clipped to NEON sites (could be a subset), and store in a centralized place. The code is written; it and the output data need a place to live. This may close to a Tier 2 community code project. The TWG agreed to write a one-pager describing needs for this work. The TWG also confirmed that they would like to leverage the Ecological Forecasting Initiative Research Coordination Network (EFI RCN) to better define community needs from NEON data.

TWG Recommendations

No recommendations were made at these initial meetings.

NEON Response

N/A

Fish TWG

The Fish Technical Working Group provides expert knowledge and support for the development of field-based protocols and strategies for standardization of sampling across NEON aquatic sites.

Summary of Activities

Kick off meeting; new members introduced, discussed possible upcoming questions, and reviewed past year's success at the BLUE (Blue River) site. The TWG had previously recommended a larger diameter net, and it appeared to work at higher flows.

TWG Recommendations

N/A

NEON Response

N/A

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

Held FY20 kick-off meeting in December. Gave brief overview of relevant sampling and data products for new members. Updated everyone on new protocol innovations - sampling with a UAV and creation of crown polygon shapefiles. Asked for technical input on possible chemical contaminants - do we want to clean the leaves given high metal concentrations in some tissues (suggesting dirt/dust inputs).

TWG Recommendations

Yes, group thought we should be cleaning the leaves. Exactly how to do it was discussed in depth over email. The chair sent a reference and proposed a method, then others weighed in. Ultimately, the group agreed on a path forward for how to modify our sample collection to include cleaning of the foliar tissue.

NEON Response

The new leaf cleaning protocol was implemented for the 2020 protocol.

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

Note: Meeting delayed while Katie Levan on maternity leave. First meeting planned for March.

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 meeting in Q1. It took a lot longer than expected to pull information about past AOP data product catalogs, combined with other recent priorities. This info is in final review but will be sent out to the TWG very soon looking for feedback on our LiDAR data products. A meeting will be set up during Q2 to discuss products and relevant recommendations.

TWG Recommendations

No new recommendations yet but it is worth noting that lidar instrument requirements that the TWG gave feedback on in FY19 have been included in an RFP to acquire a new lidar system.

NEON Response

N/A

Notes

No recent activity but planning to reach out for feedback in near future.

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

Held kickoff meeting in December: new member was introduced, and Charter was reviewed; Discussed issues with sequence data quality and lack of quality flagging of sequence data; Discussed workshop proposal

TWG Recommendations

Recommend instituting quality flagging as soon as possible, general support for draft quality flagging criteria, seeking more community input

NEON Response

Beginning internal discussions on proposed quality flagging approach.

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 continued a discussion surrounding the adequacy of disease vector / pathogen sampling given low capture rates of specific known vector species. We also heard from a TWG member who recommended the separation and possible analysis of bloodmeals from blood fed mosquitoes for both ecological and epidemiological reasons.

TWG Recommendations

The TWG recommended placement of additional traps that target disease vector species, especially gravid traps since they will attract species that have already fed and are thus more likely to be infected. BG sentinel traps were also discussed although the TWG felt that the location of NEON sites may not be well-placed to capture the species those traps target (Aedes aegypti and albopictus). The TWG was also quite positive about the potential for either identifying mosquito bloodmeals or isolating those mosquitoes for interested researchers.

NEON Response

NEON staff are drafting an OS IPT proposal to optimize the mosquito disease vector sampling, including potential additions of different trap types. A TWG member is drafting a proposal and budget that further considers the potential for identifying host bloodmeals from blood-fed mosquitoes.

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 the vouchering plan for opportunistically collected small mammal mortalities as well as the potential for a targeted vouchering program. We also made plans to re-consider which fecal samples (fresh or trap) to collect for sample storage.

TWG Recommendations

The TWG agreed with the biorepository and NEON's assessment that the cost and time associated with preparing all vouchers as study skins and skeletons is not warranted. It was suggested that preparing a subset as skins/skeletons with the rest preserved individually in ethanol would provide a good balance. Future discussion of which tissues to extract will occur in the February call. Generally, trap fecal samples are thought to be useful due to their greater quantity and future discussion will determine the best way to implement.

NEON Response

I have shared the TWG's recommendations with Laura Steger at the biorepository. Our February call will include additional discussion of the vouchering plan and will inform any final decisions made. Once additional discussion of fecal sampling changes occurs an OS-IPT proposal will be submitted.

Soil Sensor TWG

The Soil Sensor Technical Working Group (TWG), provides feedback on all aspects of sensor measurements made in the TIS soil plots, including soil temperature, soil moisture and salinity, soil CO_2 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

Held FY20 kick-off meeting and elected chair for FY20 (Michael Loik). Summarized progress over the last year:

1. Megapit Soil Archive has continued to receive requests with 12 requests approved to date resulting in 3 peer-reviewed publications and 4 conference presentations;
2. The proportion of available valid data has improved for every single soil sensor data product over the last year, although additional improvements are still needed for some products (especially soil moisture, heat flux and soil CO2 concentration)
3. Developed and tested R code to calculate soil CO2 fluxes at all NEON sites with work ongoing to improve reliability and make the data publicly available. Proposed soil sensor priorities for FY20.

TWG Recommendations

TWG approved soil sensor priorities for FY20:

1. Finish deployment of more reliable throughfall sensor
2. Move heat flux plates from 8 cm deep to 5 cm deep
3. Test and select a new soil moisture sensor (current sensor has been discontinued)
4. Develop R code to process all soil sensor data products through the new data processing pipeline
5. Release the soil CO2 flux data product
6. Continue manually flagging suspect data as needed
7. Provide support to the user community as needed.

NEON Response

FY20 priorities adopted.

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 2020 TWG activity has focused on discussion of data quality impacts resulting from a problem with LI7200 infrared gas analyzer (IRGA) pressure data stream mapping. Flux data median error resulting from this issue is between 1 and 5 percent, and proportional to site elevation. We asked the TWG to advise about the seriousness of this issue for data quality, and what they suggest regarding whether to reprocess data, and if so, how to prioritize reprocessing. We also inquired about determining thresholds for what constitutes a minor vs. major data quality concern.

TWG Recommendations

The TWG recommendations for this issue were varied, with most of the group recommending that reprocessing data should have a medium priority and should be done prior to the 2020 version release. Two members felt that reprocessing for any known error should be a top priority for any known data quality issue, no matter how small. This began a broader discussion about how communicate known issues with end users, additionally considering that NEON flux data are also served via the AmeriFlux data portal. The TWG recommended including a 'known issues' section on the download page, rather than reporting issues in the data portal news. There was also concern of not being able to notify users who had already downloaded the data and would be less likely to re-visit the website and read the warning message. This also brought up the question of whether NEON should continue submission of data with known issues to AmeriFlux.

NEON Response

For prioritizing data reprocessing, we decided to primarily go with the majority opinion which was to reprocess data prior to the release of the 2020 version. Discussions of reprocessing with our cyberinfrastructure team led to the optimization of hardware to be able to be more responsive to these types of requests in the future. This new hardware is currently in testing and we hope to be able to respond to the more conservative members of the TWG by reprocessing the data well-ahead of the 2020 version release. In response to messaging users, the data portal team updated the 'change log' on the data download page to say 'issue log' and we have added an entry to communicate this error. We asked AmeriFlux management to advise whether we should continue submission of these data, they confirmed that we should continue as planned. AmeriFlux keeps track of who downloads each dataset, and we plan to develop a strategy to directly notify those users.

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 FY20 kick-off meeting in December. Gave brief overview of relevant sampling and data products for new members. Asked for technical input on high nitrite in KCl blanks and whether the group thought we should analyze samples 2x, with and without the cadmium column, to deal with this issue. Also requested feedback on possible changes to the sampling design for litterfall biogeochemistry, this second topic required a short follow-up meeting.

TWG Recommendations

Group did not think analyzing KCl extracts with and without cadmium was worth the extra cost, given lingering uncertainties in whether soils consistently, abiotically remove all nitrite from the salt powder and do not turn some of it into nitrate. Instead, they recommended we find KCl with low nitrite contamination. During the follow-up call to discuss litterfall, the group was presented with several options to improve the biogeochemistry design. Tradeoffs between spatial and temporal aspects were discussed, but members ultimately agreed with NEON scientists that analyzing all functional groups throughout the year but pooled across plots was a reasonable compromise. Compared to the current design, this swaps the spatial for temporal component but adds groups and is likely a better way to get annual flux-weighted chemistry, which will be the most common use of these data.

NEON Response

We are trying to find a low-contamination KCl powder that is affordable. If we cannot, there may be a way to remove the nitrite by acidifying and sparging the solution made from the less expensive KCl, but that will take work to set up in the domain labs. We will explore the latter if the former is unsuccessful. We decided to prototype the new litterfall design in two sites this year (TREE and BART) to see if the workload is feasible for the field ecologists and to work on method kinks. If it goes well, I will propose to change the sampling strategy Observatory-wide in the future.

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

Held FY20 Kickoff meeting. Agenda and discussion focused on the progress and current status of TIS data quality. Feedback was requested on additional quality checks that should be performed on TIS data collected during the early construction period, given the addition uncertainty in installation and maintenance protocols. Background: A significant amount of previously unpublished TIS data collected during early construction will become available after reprocessing occurs in March/April 2020. The science team plans to perform additional quality checks on some data products prior to publishing.

TWG Recommendations

The TWG recommended several product-specific quality checks to perform on early NEON data, such as cross-comparison of wind direction collected with the 2D and 3D wind sensors. The TWG also recommended general quality analyses that could be performed to test the assumptions involved in data processing and quality control, such as assessing whether the turbine in the aspirated temperature shield actually functions above the theoretical threshold of 12 m s-1.

NEON Response

TWG recommendations on data checks to perform on early NEON data were incorporated into planned checks. The additional recommendations on general quality analyses to perform were recorded, but it was noted that the timescale for implementation would be much longer and the effort prioritized among other quality improvements.

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

The TWG held a kick off meeting. Activities included: initiation of chair selection process, introduction of members, challenges and questions to be addressed by the TWG during this working group cycle, and discussion of best way for the TWG to function including frequency of meeting and the use of SharePoint as a space to enter feedback and recommendations.

TWG Recommendations

The TWG agreed to consider a co-chair framework, suggested quarterly meetings, agreed to the use of a shared space on the NEON intranet (TWG SharePoint space) for collecting feedback and recommendations, agreed to the suggestion of an TWG meeting at ESA, and provided some feedback on the initial TWG-specific challenges presented: ideas for fuzzing threatened and endangered species including engaging Fish and Wildlife Service, and annually updating invasive species designation lists.

NEON Response

Additional follow-up is needed and planned for Q2. We look forward to working with this group on these questions and challenges.

Notes

It is worth noting that many of the issues will overlap with the internal Taxonomy Working Group formed by the Science Team.

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

For Vegetation Structure protocol, discussed previous TWG recommendation to measure a subset of Tower Plots annually and measure full suite of Tower Plots every 5 years; focused on whether all growth forms should be measured annually in the subset at as many sites as possible or whether slow-growth increment sites with dendrometer bands should be treated differently than faster-growth sites. For Coarse Downed Wood protocol, discussed which criteria are appropriate for suspending sampling due to lack of qualifying particles. The TWG Chair (Dr. Christopher Gough) proposed that the TWG discuss drafting a memo to the NSF regarding NEON creation of an official NPP product based on existing NEON plant productivity and biomass products; the TWG aims to discuss this idea further in Q2.

TWG Recommendations

For Veg Structure implementation in Tower Plots, the TWG recommended annual measurement of all growth forms in the Tower Plot subset wherever possible; the TWG also recognized that annual measurement of small growth forms at some sites may not be possible if very slow growth increment cannot be detected or if impact on sensitive vegetation affects plot integrity (e.g., deep bryophyte layers). For Coarse Downed Wood, the TWG recommended using Veg Structure to determine if qualifying vegetation is present, and at these sites to conduct tallies every 5 years if transects at > 10% of plots intersect a particle. The TWG emphasized the importance of reporting zeroes, and TWG Field Science representative indicated that it takes very little time to conduct tallies when few particles are present.

NEON Response

For Veg Structure, the NEON TWG lead has taken a proposal to the Ops-IPT to measure all woody growth forms on an annual basis in the Tower Plot subset, regardless of slow-growth vs. faster-growth increment status. For Coarse Downed Wood, the protocol author will take a proposal to the OS-IPT to clarify sampling suspension guidance in the protocol based on TWG recommendations.

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

We discussed additional ways to sample ticks that are being missed with the drag/flag method. We also talked about priorities for implementing the new tick-borne disease testing for small mammals. We also considered ways to improve the timing of sample collection so that we optimize collections at certain California and southeastern NEON sites.

TWG Recommendations

The TWG strongly recommended sampling attached ticks from small mammals as the primary method of effectively sampling tick abundance/diversity at some sites. The TWG did not think CO_2 traps were worth the effort because they only trap a small subset of active-host-seeking ticks. The TWG suggested adding (*Rickettsia parkeri*, Heartland virus and Powassan virus) and removing (*Borrelia lonestari* and *ehrlichia chafeensis*) a few pathogens from the list of pathogens for which small mammal blood will be tested. The removed pathogens are either not common/pathogenic (*B. lonestari*) or not likely in small mammals (*ehrlichia chafeensis*). The suggested additions are highly pathogenic (viruses) or thought to contribute to more human infections than the data currently show (*R. parkeri*). It was also recommended to test over a wider time-frame rather than restrict to peak nymphal activity Our sampling window at several sites is missing adult tick activity. The TWG recommended extending sampling and/or adding a single winter sampling date at sites with adult winter activity.

NEON Response

The current small mammal sampling protocol does not allow for collection of ticks due to limitations on handling time of these small mammals. Consideration of protocol changes that could allow for tick sampling from mammals would require reductions in other handling activities such as bleeding. This question will be revisited after pilot data from this field season can be assessed for pathogen prevalence. I have adjusted the list of pathogens for testing small mammal blood in the RFP for laboratory testing and will plan to test blood samples from all time-points rather than restricting testing to a particular bout. I will develop an OS-IPT proposal to adjust tick sampling windows at the sites identified in the most recent phone call on Jan 30.