



# **NEON Terrestrial Biochemistry Technical Working Group**

## ***2020 Annual Report***



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National Ecological Observatory Network (NEON) is a project sponsored by the National Science Foundation and proudly 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 the Terrestrial Biogeochemistry TWG during the 2020 funding year (November 2019-October 2020).

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).

## Q1 – November 2019-January 2020

### Summary of Activities

Held award year (AY) 2020 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 functional 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 logistics. If it goes well, the TWG lead will propose to change the sampling strategy Observatory-wide in the future.

## Q2 – February 2020-April 2020

### Summary of Activities

There were no direct interactions with the TWG, but lots of work implementing previous quarter's recommendations.

### TWG Recommendations

Last quarter, the TWG recommended that we find a source of KCl powder low in nitrite. The previous suppliers had concentrations that were high enough to prohibit our ability to detect NO<sub>2</sub>/NO<sub>3</sub> in low-concentration sites. They also recommended that we shift the design for litterfall biogeochemistry sampling to better capture annual fluxes.

## NEON Response

Following a thorough search, a source of 'ultrapure' KCl that is very low in both nitrite and nitrate across all lots tested (n = 3) was identified. For bouts starting in spring 2020 and onward, this reagent will be used, and blank concentrations monitored to ensure this solves the issue. In regard to the litterfall work, a prototype SOP was developed including new equipment and workflows and was disseminated to the field staff in domains 1 and 5 in preparation for 2020 field season implementation.

## Q3 – May 2020-July 2020

### Summary of Activities

Communicated observatory status in the face of COVID-19, then discussed a variety of topics including NEON linkages with other data repositories, user tutorials related to biogeochemistry data, method options for KCl inorganic N analyses, and different ways to pool litter samples for biogeochemical analyses.

### TWG Recommendations

TWG was glad to hear about data sharing between NEON and other repositories, recommended we look into COSORE, FRED and TRY to expand our reach. Dr. Steven Hall shared his positive experience using second-derivative spectroscopy for KCl nitrate analyses and suggested this may be something for NEON to look into. The TWG was positive on the idea of our prototype to pool litter samples across plots for chemical analyses. In their experience, mass varies more across space compared to chemistry (within litter type), so pooling is a fair tradeoff to get more temporal coverage and more functional groups analyzed.

## **NEON Response**

NEON reached out to the leads of FRED to discuss adding our root observations to FRED v 4. They are excited about this idea and it will likely proceed sometime in the next year. NEON is waiting to see if the use of an ultra-pure type of KCl powder solves previous issues with nitrite contamination. If it does not, we absolutely will explore the second derivative method and are glad to know about this option. NEON is continuing to run the litter prototype at 2 sites and will ask the TWG to review data once available and weigh in on whether the Observatory should switch methods.

## **Q4 – August 2020-October 2020**

### **Summary of Activities**

No activity for Q4.

### **TWG Recommendations**

N/A

### **NEON Response**

N/A.