Battelle Response to NEON STEAC May 2020 Advisory Report
May 21, 2020

According to its bylaws, the STEAC is "primarily an advisory body to the NEON Project and will provide strategic advice to Battelle, the NEON Principal Investigator (PI), and NEON Project staff on the planning, construction, and operation of the NEON Project and other relevant programs." This response to the STEAC report from May 2020 also combines the input of several members of the program team responsible for the execution of the NEON project. Battelle appreciates the STEAC's recognition of the NEON project's progress in full operations and maintenance, as well as the thoughtful comments that the STEAC provided during their virtual May meeting and formally for this report. Following are responses to the major sections of the Advisory Report.

1. COVID-19 Response

We appreciate the STEAC's recognition of NEON's response to the COVID-19 pandemic during this complex period. Commending the high level of communication across domain managers, who are handling significant uncertainty and pressure, was perceptive and appreciated.
The STEAC noted remaining challenges, including number of people in vehicles, flight options, and required face masks for outdoor work, and they recommended that we continue to seek data to guide our approach to the latter. We followed this recommendation and consequently allowed outdoor work without face masks for individuals 5 meters apart. They further recommended exploring Battelle's options for testing and contact-tracing as they are rolled out. We have recommended testing at our sites in areas of high transmission levels and are continuing to pursue this more generally.

2. How is NEON doing on delivering data products?

Data product availability and data use are a top priority for NEON, and we appreciate the STEAC's recognition of our progress. The STEAC was positive about the NEON system to track

data use issues ('tickets'). They further recommended that NEON develop a prioritized list of challenges that are 'in scope' for NEON data products, possibly public-facing, and another list for requests for new functionality (out-of-scope enhancements or new products). The latter represent opportunities for community development of Code Resources. We will explore options to take on these feedback functions, focusing on ways to bring this information in from users using web forms and similar mechanisms.

STEAC noted the important opportunity to further reduce the lags between data collection and delivery, in particular with instrument data. The STEAC would encourage the development of low-latency level 0' (zero-prime) datasets, that are more derived than raw L0 data but which have not undergone the full QA/QC of L1 data. We recognize the value of near real time data delivery, particular for ecological forecasting use cases. Current instrument systems data processing pipeline redesign efforts for the NEON CI are incorporating tools and approaches that will ultimately enable NEON to fulfill this community need (in the most general sense), while maintaining backward compatibility. Indeed, the CI and ENG teams have implemented a successful prototype of parts of this new system to provide streaming of near real-time (10 second aggregates) raw data at the test tower at NEON HQ. The forecasting use cases are akin in many ways to operational use cases, so the ongoing efforts to decrease latency of data delivery to NEON HQ and develop improved tools for monitoring the health of our instrumented systems will also result in the development of tools that can be applied toward meeting forecasting needs. The effort to improve the new system is ongoing, but there are multiple hardware and software components that needed to be developed and installed before all data product streams become accessible in a near real-time manner – on the order of years (2-3+) rather than months for full implementation. Moreover, additional effort is required to work with the Ecological Forecasting TWG to better define and capture the requirements of the community to facilitate the next steps in the design of such a system.

The STEAC recognized that although NEON would like to better understand and measure data use, without user registration, it is not possible. They recommended continuing the optional registration system but doing more to incentive registration. We agree that we

can improve description of its value more clearly and particularly like the suggestion of providing additional services for registered users, and we will explore options.

The STEAC reiterated (from 2019) its advice to provide dataset DOIs when users download data. Over the past year NEON has been investigating and weighing several options, including the option to provide DOIs for each download, and is committed to providing DOIs for at least the planned annual static releases for each data product, starting at the end of 2020. Given the STEAC feedback, we will revisit this plan with the Data Standards TWG to ensure that this plan is well informed by community feedback and expertise.

We appreciated the encouragement to connect with other data providers who provide similar products. Regarding the specific suggestion to connect with the ORNL DAAC, Dr. Alison Boyer, a research scientist with the ORNL DAAC Environmental Sciences Division and Climate Change Science Institute, has been a member of the Data Standards TWG since 2018. NEON's Data Portal Lead, Dr. Christine Laney, was invited in February 2020 to join the ORNL DAAC's User Working Group (UWG) – the DAAC's external advisory group – for a 3-year term. She has been engaging with this group and actively evaluating options for leveraging their approach and/or resources for NEON's benefit.

Although we regret the latency of the Ameriflux network, we believe this disadvantage is outweighed by the integration of NEON data into a much broader network, and therefore its use by a wider set of users. We further recognize the additional barrier to data use imposed on users who have to leave the NEON data portal for such products, but we have endeavored to leverage existing data pipelines where possible to avoid using valuable resources to reinvent 'existing wheels' where possible. We believe it is the best use of our resources currently to continue this partnership and focus NEON's resources on ensuring the highest quality L1 data are available to feed into Ameriflux's processing pipeline. We are open to revisiting this question in the future, if NEON resources become available and Ameriflux is unable to improve on their latency.

3. How are NEON data being used in service of ecological research?

As previously recommended by the STEAC, NEON is tracking strategic engagement through quantitative benchmarks, and the STEAC was appreciative of this progress. We appreciate their recommendation to continue longitudinal engagement with workshop attendees to see how they are using NEON data. We are currently identifying tools and mechanisms to efficiently track individuals and their data use.

We appreciate the STEAC's enthusiasm regarding mechanisms by which value-added data products may be developed and their commitment to support early career researchers. We are also excited about our new Code Resources, which enable the community and NEON to share code, and we welcome the suggestions of how we might growth this resource and engage new research communities in developing new code and products that optimize and expand the use of NEON datasets. We will consider how to prioritize engagement efforts to increase awareness, use, contributions, and co-development through, e.g., data tutorials or vignettes. The specific suggestions of how to incentivize the community to provide new code packages that make NEON data more usable and attractive were helpful. Given the scale of NEON data products and the multiplicity of ways that researchers need these data, however, we will look to the user community to spearhead these as well.

4. STEAC operations

We appreciate the STEAC's self-study of its effectiveness and its desire for continuity. Given the many changes in NEON including move to full operations, change in STEAC membership, change in the Observatory Director/Chief Scientist, and the current unusual and entirely virtual mode of interaction during COVID-19, we also seek to have continuity, as well as a closer and more regular relationship with the STEAC. Battelle therefore concurs with the STEAC's recommendation not to aggressively pursue a rotation of members at this time. It will be helpful, though, to identify those members planning to depart at some point in the coming year so that coming gaps in specific areas of coverage can be identified in our planning.

5. Items for future discussion

The STEAC pointed out the need to refocus on the broad strategy and vision for NEON, given the attention in recent months to COVID-19. NEON will seek better mechanisms to involve the STEAC in prioritizing project needs, and as well, in helping the Chief Scientist. STEAC wondered whether there was need/value for them to assess the state of interactions between NEON and the ecological community. NEON feels that, though this could be helpful, such assessments are relatively recent and other issues are higher priority.

We truly appreciate the STEAC positive commitment to supporting the full NEON program.