STEAC SPRING 2020 MEETING REPORT

Submitted 2020-06-05

Due to the COVID-19 pandemic, the STEAC's face-to-face meeting planned for May 21-22 in Boulder, CO was instead held as a virtual meeting and abbreviated to one day, May 21. Twelve of the STEAC's thirteen members were in attendance. While we would have preferred the greater time, flexibility, and face-to-face interactions that an in-person meeting would have afforded, the committee is thankful for the time and effort that key staff and domain managers at NEON put into updating us on the status and accomplishments of the Observatory and the open discussion of challenges and opportunities moving forward. This report to Battelle is organized around five sections: COVID-19 Response, data product delivery, data product use, progress toward strategic goals, and STEAC operations.

1. COVID-19 Response

Notable progress: Over the past three months the STEAC has closely followed NEON's response to COVID-19, which included an initial shutdown of field operations and headquarters, a shift to remote work, and an extensive planning effort about how to safely bring the Observatory back online. Even under normal circumstances, managing NEON domain logistics is highly challenging, and the shutdown and restarting of field logistics in each domain, as well as specific challenges given municipal and state regulations, are added layers of complexity. Domain managers presented on the measures they are taking to ensure employee safety while simultaneously ensuring that work can get done, including requiring face masks while working, having thermometers available for temperature checks, creating static work teams to limit the number of people interacting, and increasing disinfection protocols. Domain managers also noted that they are working to provide flexible schedules to staff that have childcare constraints and individuals from high risk households. Similar measures were discussed for operations at headquarters, which have been restricted to just those components that require in-person activity to support field operations (shipping and receiving, repair, calibration, etc).

Overall, we are impressed with the response by NEON/Battelle, both at headquarters and at the domain level. Battelle's handling of the situation has been professional, informed, and well-measured and we have not heard any negative concerns from staff or community. We support the procedures and formal protocols being put in place for bringing sites back on-line, such as the "stoplight" dashboard, frequent meetings, and efforts for domains to learn from each other. Finally, we are excited to see sites starting to resume activities where it is appropriate to do so.

Constraints & Suggestions: The STEAC noted some remaining challenges facing NEON in their COVID response, with the top difficulty being limiting the number of people in a vehicle. Although protocols have been developed to limit transmission risk, travel to field sites requires multiple individuals in a vehicle. Data products that are collected via airplane are still problematic and discussions will have to continue to determine if those flights will be an option this year. Requiring face mask usage while doing physically demanding field work and in very

hot, humid areas is also a challenge. The STEAC recommends continuing to look for data that could help inform mask usage in outdoor settings in order to potentially allow some work to be done without a face mask when person-to-person distances are sufficient. Domain managers whose sites have begun to open have been providing information to other domain managers that are still preparing to open. This is a great example of sharing information and efficient communication and should be commended.

Battelle is developing an SOP for staff contact-tracing when exposure is suspected. Improved availability of testing for workers, both for current infection and for antibodies (assuming these tests are reliable), could help provide valuable information. The STEAC recommends continuing to explore this as a future component of standard operating procedures.

2. How is NEON doing on delivering data products?

Notable progress:

Data products: The STEAC is impressed with the progress on data availability and data use has increased. Closing the latency on the surface-atmosphere exchange (SAE) data to two months is impressive, especially considering that this work has proceeded under challenging conditions imposed by the COVID-19 crisis. The STEAC also appreciated seeing new sources of information about the NEON data user experience, for example from “ticket” inquiries, and feedback from the NEON data summit.

Data Portal: We noted overall improvements in the data portal and associated access points to NEON data. In particular, we note the following positives: 1) Usability testing and folding those outputs into portal improvements; 2) Development of new tools for easing access and compiling of NEON data, e.g. new versions of neonUtilties, but in general healthy package development visible in github. We encourage continued growth of these tools that lower the barrier for users to bring NEON data into their local workflows. 3) Improvements in usability of the portal, including retirement of the old Data Browser and the new “explore data products” page, and new visualizations (e.g. time series). 4) Building in better safeguards for API access, including API tokens needed to download larger datasets. 5) Great documentation for accessing data - overall there is a lot of content to help people learn how to use tools and data.

Users and Collaborations: The STEAC applauds the partnerships with data users and producers with shared interests (Phenocam, NASA, BOLDsystems, AmeriFlux, GBIF, iDIGBIO, NPN, CUAHSI, StreamPULSE, MG_RAST, AERONET).

Constraints & Suggestions:

Data Products: While we were excited to see an analysis of “ticket” inquiries, our discussion also highlighted a need to track additional challenges users have encountered with data products that are not reported through “tickets”, for example based on conversations with the TWGs and members of the community. We would encourage NEON to develop a more systematic list of known challenges with existing data products. Furthermore, this list could be split into two

sections, one for challenges that are within the existing scope of a product, and the other itemizing requests for new functionality that would enhance existing data products or create new products that would benefit the community. The former would benefit from prioritization and possibly public-facing issue tracking. The latter represent opportunities for community development of Code Resources (see section 3)

During the recent NEON-Ecological Forecasting Initiative (EFI) RCN workshop[1], participants demonstrated enthusiasm for using NEON data in near-term forecasts, but expressed concerns about data latency for forecasting applications. There is an important opportunity to work to further reduce the lags between data collection and delivery, with instrumental data being the top priority. 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 QAQC of L1 data.

Data portal: Data portal development is generally on track and we don't have significant concerns about the functionality of the portal. Because Battelle does not require data users to register, their insights into who is using their datasets and their ability to solicit new developments, new code and new needs from their user base is limited. The STEAC recognizes the importance of Battelle and NEON better understanding users and their needs, and there are many good justifications for setting up a user registration for access to data products. That said, many in the community are resistant to registration and a required registration would discourage data use (e.g. making classroom use more challenging). We recommend continuing the current tiered system (where registration is encouraged but not mandated) but we think more could be done to develop clear descriptions of the value of registration (and limitations if users choose to not register). It may be worthwhile to further incentivize registration for frequent users (e.g. develop something like "NEON-PRIME"), perhaps with faster download speeds or updates on new data and tools.

Dataset digital object identifiers (DOIs) offer an opportunity to efficiently track published papers, code, and educational materials. In 2019 the STEAC encouraged the NEON project to provide dataset DOIs when users download data. The STEAC recognized the challenges with assigning DOIs, and suggests that in addition to providing DOIs for an entire release, consider offering DOIs at download. A portal tracking downloads and their DOIs for users could provide an additional incentive for users to register their downloads and increase the odds of DOIs being reported in publications.

Users and Collaborations: The STEAC encourages NEON to connect with other data providers that provide similar products and have responded to the challenge of producing tools to enhance data use. NEON might benefit from a partnership with the Oak Ridge National Lab DAAC, which produces similar products as the AOP (e.g. the Airborne Data Visualizer). Finally, with respect to SAE data, while the STEAC applauds the work already done to integrate NEON flux tower data into the AmeriFlux network, concerns remain about the latency of the Ameriflux network (users will experience delays accessing the gap-filled and partitioned data), and the

[1] Held virtually 5/12-5/13 of 2020

additional barrier to data acquisition and integration with other NEON products imposed by having to redirect users outside of the NEON data portal for access to gapfilled, partitioned fluxes.

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

Notable Progress:

Engagement: We appreciate the increased focus on tracking strategic engagement through quantitative benchmarks that can identify progress and areas for continued growth. This was recommended in our previous report and we were excited to see progress. The use of data tutorials through the NEON website has grown exponentially, outpacing benchmarks (10% increase in page views per year).

NEON workshops have been successful at engaging under-represented groups and creating increased interest in using NEON data. We suggest continued longitudinal engagement with workshop attendees through surveys as a tool for understanding whether attendees are using NEON data in their work, and why or why not. We are encouraged to see that the present use of NEON data in publications is high compared to historical benchmarks from other observatories.

The Data Portal News feed to alert users is a useful improvement.

Constraints & Suggestions:

Code Resources and Data Products: Despite substantial work on the part of the NEON outreach team, many communities of ecologists are not yet fully utilizing NEON data, and scientists from other disciplines (e.g. hydrology, land-atmosphere interactions) are even less engaged with the NEON project. We discussed with great enthusiasm the many opportunities that exist to engage these research communities in developing new code and products that optimize and expand the use of NEON datasets. The promise of NEON hinges on its usefulness for inquiry at policy- and management-scales extending far beyond a single site, watershed, or tower footprint. Activities like the EFI-RCN workshop are beginning to provide valuable insight into what steps are necessary to bring existing NEON data products closer to this promise; for example, up- and downscaling necessary to harmonize site-level time series with gridded spatial datasets. There is clear community interest in derived-products that better match the target variables for stakeholder management, integrated with other networks, and are ready for multi-scale applications. **The STEAC is enthusiastic about mechanisms to support community-led development of value-added data products**, which may have the added benefit of supporting early career scientists and strengthening interactions between NEON and other networks. We will prepare a separate memorandum recommending NSF invest in supporting early career researchers to develop new insights and new open use tools that leverage NEON datasets.

We feel there are particularly important outreach opportunities around NEON's Code Resources, a relatively new feature that allows the community (and NEON) to share code. We strongly encourage the continued growth of this resource and engagement efforts to increase awareness, use, contributions, and co-development. Data tutorials or vignettes that accompany

community code contributions could increase engagement with those resources and could create successful broader impacts. Particularly well-used vignettes could also be recognized to incentivize their creation.

A key question is how to incentivize the community to provide new code packages that make NEON data more usable and attractive. NEON could take a variety of actions to increase community involvement on this front. First, NEON could provide transparent guidance to the community (i.e., on their website and social media) on what types of code packages are perceived to be most requested or needed. Second, NEON could recognize researchers who produce particularly valuable code packages (as measured by downloads or some other metric). This recognition could be in the form of an award or in some other form. Third, NEON could consider organizing a special issue in a research software/methods oriented journal. Fourth, NEON could organize hackathons specifically around community code development. Finally, for data products that require more sustained research and development, NEON could make the research community aware (e.g. NEON newsletter, social media) of upcoming funding opportunities from NSF and other agencies that might be appropriate venues for computational proposals (e.g NSF CISE).

4. STEAC operations

The STEAC is interested in evaluating its effectiveness and has prepared surveys for both NEON and STEAC to fill out. We hope to get feedback and responses from a wide range of NEON and Batelle personnel.

We discussed the turnover for STEAC members. Certainly some people may leave, and if so, we will recruit to fill gaps caused by departures. However, given the value of having some continuity during this transitional period, we will not aggressively encourage turnover this year.

There is a sense that one valuable function of the STEAC has been to meet informally with a wide range of NEON personnel, including the Chief Scientist, usually over lunch, during our in-person meetings. Certainly these meetings have been valuable to and appreciated by the STEAC. It would be good to schedule these small group meetings at future meetings. If the STEAC gatherings are virtual, we could use the ZOOM breakout room feature for these small group meetings.

5. Items for future discussion

The short timeline for the meeting precluded covering some items in depth. We note just a couple of the highest-ranking “parking lot” issues below.

One parking lot issue was the larger strategy and vision for NEON, in relation to the overarching goal of “better understand[ing] how U.S. ecosystems are changing[2]”. It is perhaps not surprising during the COVID19 crisis that most of the focus of the STEAC meeting was on the immediate response to the pandemic. As we emerge from this crisis into a new normal it will remain important to reconnect to this larger agenda and especially how the components that

[2] https://www.neonscience.org/about

NEON delivers to the community enable high-level science and society objectives as suggested through consultative processes such as NAS reports.

NEON prioritization was a critical issue for the STEAC prior to COVID-19, and it will remain a key topic to revisit. The discussion at the board meeting covered some ground on the roles of NEON staff, TWGs and the STEAC in helping that prioritization process, and more time devoted to this topic on calls and the Fall board meeting are warranted.

The STEAC is keen to consider how to be most useful to the Chief Scientist. Is there a need/value for us to assess in a semi- or more formal way the state of interactions between NEON and the ecological community?

The STEAC did not have time with staff to check on issues of overall morale, which is much easier in a meeting on-site. The STEAC remains committed to serving a role to support the NEON enterprise including the staff who collectively drive success of the organization.