

Proposal Panel 1 : 1832210

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Panel Summary

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Long-Term Ecological Research Program
2018 Renewal Panel

Results of Prior LTER Support: The Harvard Forest (HFR) LTER has had a significant influence on the field of ecology for over 30 years, both in terms of establishing theory and providing long-term data sets for a broad set of users. The program has been highly productive, published six new synthesis books, and has been very active in LTER leadership as well as in formation of innovative programs such as the Science Policy Exchange effort. Two works were added to the LTER Arts collaboration, a volume of photography and a book of environmental journalism.

Substantial contributions to ecology include revision of successional theory and community dynamics in northeastern forests, development of a regional perspective dating back to the beginning of European settlement, better understanding of regional carbon budgets, and ecological consequences of forest conversion. The proposal uses this foundation to anticipate changes in forest patterns and species, forest soils and biogeochemical cycling, insect invasion, and modern New England land use regimes.

1.) Intellectual Merit:

Strengths: The overarching goal of LTER VI is to understand and predict the impacts of global change on temperate forest ecosystems from site to regional scales. The proposal is well organized around five questions and the different components hang together nicely. Throughout the proposal, the relative importance of various ecosystem drivers are considered, building on an original HFR hypothesis that the effects of land use far exceed natural disturbances and climate change/drivers. The project does a nice job building on what has been accomplished in past grant cycles (LTER I-V) toward new proposed research in LTER VI. The panel also appreciated how the project considered contrasting results from experiments, observations, and models to motivate next steps.

Areas that were viewed as specific strengths include the utilization of the Forest Landscape Model, the integrative aspects of the proposed BeCON experiment, and the expansion of the phenocam network. The focus on the impact of wildlife, specifically beaver, was viewed as a promising new direction. The panel also appreciated the addition of farmlands to the conceptualization of the land use regimes as well as a new focus on the ecological implications of forest ownership change to investors.

The proposal and past work are unique and important because they extend local site-based efforts regionally, advancing science in decision-making and stewardship throughout New England. The team also has an impressive record of synthesis, with three new volumes to the LTER Publication Series during the last phase of funding.

The scientists and their collaborators on this team are well-qualified to address all ecological aspects of this inquiry, and to extend new knowledge to society. The team is very capable and has a long track record of leveraging the LTER to acquire funds from a variety of organizations.

Weaknesses: The panel felt that the proposed LTER research could be further enriched by including a wider set of social science and urban planning scholars.

The project should consider enhancing links with several LTERs. For instance, scenario development with CAP seems a promising avenue. Also, with the addition of Harvard Farm and research about the impact of an increasing agriculture footprint to meet local food demands, there is an opportunity for cross-site research with KBS. While KBS focuses on using ecological concepts to improve agriculture within fields, HFR proposes to use agriculture as a conservation tool across an increasingly urbanized ecosystem.

There was some concern that the proposal lacked critical methodological information to evaluate the plan. While the reviewers gave this stellar group the benefit of the doubt, it would be helpful in the future to more specifically detail approaches. While this issue ran throughout much of the proposal, specific examples include the C14 measures and how the FLM model would be conditioned on the tree-ring and pollen data sets. The team should also consider formal power analyses in their treatment of uncertainty and rationale for additional measurements.

The project should consider within-site integrated synthetic work. For instance the PIs could compare effects of exogenous and endogenous drivers across projects and develop predictions about when and where certain types of response might most contribute to landscape dynamics. The focus on

how different trajectories may predict future dynamics can address some concerns about the need for long-term data going forward.

2.) Broader Impacts:

Strengths: Impacts are wide-ranging and substantial, including collaborative engagement with decision-makers and training of land managers, interactions across the arts and humanities to reach the broader public, to K-12 education.

Research is integrated very nicely with their broader impacts. Several efforts were specifically considered strengths in facilitating participatory research. In particular, the New England Landscape Futures Project provides a means to integrate past knowledge about forest successional dynamics with current conditions to facilitate future outcome projections. The Wildlands to Woodlands program uses tools to help conservation planning of both agriculture and forests. Massachusetts Keystone Project trains 25 community leaders in a three-day workshop at HFR. The K-12 Schoolyard LTER Program engages 3,000 students in 50 schools in hands-on data collection and analysis. The impressive array of synthesis publications and materials for the general public provides a model for LTER science outreach.

Weaknesses: The project might consider ways to assess the students they reach and the outcomes they achieve, particularly in relation to reaching students underrepresented in STEM.

3.) Information management and technology:

Strengths: The information management at the site was uniformly strong. EML is used on project servers to support a highly functional set of search and explore interfaces. Datasets were easy to identify, with logical file organization. Information on the site data portal and EDI were very consistent. Non-standard dataset standards were well thought out, and documented in EML on both the project data portal and EDI. Preview datasets using scripts was a strength.

Weaknesses: The panel encourages more thinking about a future plan for the IM at the site. One possibility might be further development of data visualization techniques.

4.) Project management:

Strengths: Foster has provided strong leadership to this project. The planned transition from Foster to Thompson appears carefully considered. Frey also takes a leadership role, another logical transition, and the project is planning for the anticipated retirement of Ellison.

Weaknesses: Although the group has frequent meetings, there was little information on how the funding and research decisions are made. As a part of the transitions in leadership, it may be helpful to formalize these processes.

5.) Additional Comments or Areas of Special Concern:

No additional concerns were noted.

7.) Synthesis and Recommendation:

The proposed activities of Harvard Forest LTER VI build on the substantial contributions of LTER I-V with an integrated approach that both links past landscape dynamics with projections for the future and links this basic research with broader impacts through engagement of key stakeholders. The research has strong implication for future land use planning at the regional scale. The panel appreciates the efforts of the project team to make their science accessible to the general public and their data sets accessible to the general research community.

The panel recommendation is: Competitive

This summary was read by the assigned panelists and they concurred that the summary accurately reflects the panel discussion.

PANEL RECOMMENDATION: Competitive

Cognizant Program Officer Comments

Long-term Environmental Research (LTER) Program
Renewal Competition, April 25-27 2018

Review Scores: 4 E, 2 V, 1 G

Project summary: Funding is requested to continue a long-term study of how New England forests function and respond to natural and anthropogenic disturbances. Researchers will continue experimental and observational studies on responses to variable climate, invasive species, and different types of land use. New studies will be implemented on carbon fixation at multiple scales, analysis of below-ground carbon stocks, microbial dynamics in hemlock forests infested by hemlock woolly adelgid, and development of a modeling framework.

Results of prior NSF support: Harvard Forest LTER site (hereafter HFR) has produced a dizzying number of highly impactful studies over its 30-year history. Within the last funding cycle, the PIs have published in leading journals of general science (Science, Nature, Nature Climate Change) as well as in leading journals of ecology (Ecology, Ecological Applications). They've also authored six new synthetic books. They have continued long-term experiments on many types of disturbance -- hurricanes, chronic nitrogen addition, soil warming, die-off of a foundation species (hemlock) -- and maintain monitoring of forest-atmosphere carbon exchange, soil respiration, weather, hydrology, vegetation dynamics, phenology, ungulate populations, and land-use. Overall, this is a very strong record of Intellectual Merit accomplishments.

With respect to Broader Impacts, HFR hosts an REU site that provides mentoring to 20-30 undergraduate students each year, collaborates annually with approximately 50 teachers to engage more than 3000 K-12 students in forest ecology, supports dozens of graduate students and post-doctoral fellows in research, engages stakeholders in land management and conservation, and helps spearhead the Science Policy Exchange, a highly novel partnership that brings together ecologists, economists and community experts to inform policy. These activities, both broad and deep, are highly commendable.

Review Criteria:

Panelists were asked to assess the proposal according to 4 key components, identical to the review of all other LTER renewal proposals: 1) Intellectual Merit, including both site-specific research and involvement in cross-site activities, and application of results to management or policy decisions; 2) Information Management and Technology, including deliverable products from data management that contribute to compliance with LTER Network goals of full data accessibility; 3) Site Management, including personnel, fiscal, administrative, institutional, and logistical issues.

Panelists assigned to the proposal included an individual with expertise in information management, as is standard practice for all LTER renewal proposals.

Intellectual merit:

The LTER Working Group (hereafter "the program") agrees with the consensus of panelists that this proposal is outstanding and certainly worth funding. The PIs took to heart and adequately responded to suggestions from the mid-term site review. For example, they incorporated uncertainty into their modeling framework. It's impressive that they have already published some of that work.

HFR's approach -- combining historical records, long-term datasets, and experimental and observational data collected across multiple scales (physiological to remote sensing) with regional models to forecast landscape changes -- is powerful. It's a sign of health that the PIs are re-thinking some of their prior conclusions because of new, unexpected results. Specifically, HFR's foundational hypothesis that land use is the key driver of ecosystem change is challenged by the strong and interacting impacts of global change factors. Results are almost certain to be broadly relevant because those factors are, after all, global.

Most important for an LTER renewal proposal, the PIs clearly laid out how analysis of data already in hand has motivated new questions that require additional data and analyses to answer. Thus, new studies are nicely justified and dovetail with ongoing work. For example, BeCON plots will provide insight on the soil carbon dynamics and the microbial basis for recovery from a major type of disturbance (hemlock woolly adelgids), both important for understanding the regional carbon budget.

The program notes the especially strong collaborative initiatives that continue to push HFR in new directions. The program and panelists agree that a recent CNH award will foster expansion and new application of the Forest-Landscape Model (FLM), which is exciting. Likewise, the PhenoCam network of cameras will be linked with similar networks (including at another LTER site, Hubbard Brook) to create a regional database of phenological changes,

which will be used to model large scale patterns of carbon and water cycling. These types of partnerships do not happen spontaneously -- they require vision to establish and significant attention from PIs to maintain.

Despite these strengths, the program acknowledges several weaknesses expressed by reviewers: (1) Methodological details are too thin to confidently assess effectiveness of the permanent plot studies, BeCON, and some modifications of the FLM. Related to this, some panelists were turned off by what they perceived as an underlying message of "trust us" from the PIs; (2) Despite the attention to human activities on forest structure and function, few social scientists are engaged in HFR research; (3) The conceptual framework is not as cohesive as it could be, nudging the project towards sprawl rather than integration. The program views these as relatively minor issues. The first reflects a hard-to-strike balance between breadth and depth that is especially challenging in proposals of this type. The second can be viewed as an opportunity, perhaps already being met by new collaborations with PIs of the CNH award. Regardless, social science is not a required component of non-urban LTER sites. The third is most problematic. There was disagreement about the conceptual framework among panelists -- some admired it, some thought it was adequate, and some were disappointed by it. The program comes down in the middle. Most HFR activities are well integrated. Whether that integration is in spite of or because of the conceptual framework is not a major concern at this point.

(Humorous aside: A panelist said she craved something sweet every time she encountered "C uptake" in the Project Description)

Broader impacts:

The program agrees with panelists that the Broader Impact activities of HFR are outstanding. They are cast in many directions, all meaningful. The PIs have a long and successful history of working with stakeholders to shape research products that will be generally useful. This goal of "actionable science" is highly admirable (and in contrast to projects in which PIs either hope for or assume societal relevance). It is clear that translation of HFR science will occur for management and decision-making at many scales, from individual landowners to state and federal agencies. The New England Landscape Futures Project, for example, is an innovative combination of databases, modeling, and stakeholder engagement to project changes in land use and understand how they are impacted by global change drivers. The web-based scenarios modeling tool is especially interesting and promising. Wildlands to Woodlands is an outstanding outreach program and partnership with the Highstead Foundation that has provided publications, presentations, and extensive online resources for a wide diversity of stakeholders. Through the Massachusetts Keystone Project, HFR will continue to provide annual 3-day training workshops to 25 community leaders and land managers, with the goal of integrating science, decision-making and stewardship.

HFR is also highly successful in engaging the general public through a museum program that includes real-time displays of environmental sensors and phenology web-cams, a collaboration with artists to visually interpret HFR results to broad audiences, a user-friendly website of HFR activities, and numerous materials written for non-scientists.

HFR is an active participant in the LTER Schoolyard Ecology program, which trains teachers about the value of long-term ecological research and provides access to many educational resources for K-12 classrooms. The REU program is especially strong, bolstered by university contributions. Its success in broadening participation is highly commendable.

Panelists wished for more evaluation of Broader Impact activities. The program notes that assessment of Broader Impacts is not required, although it certainly can be useful.

The Postdoctoral Mentoring Plan is disappointingly short and generic, but adequate.

Information Management:

The program agrees with panelists that information management is a strong suit of HFR. Staff responsible for information management have clearly defined roles and their communication with researchers is effective in creating buy-in. Meta-data, quality control, and back-up procedures are excellent. HFR is ahead of the curve with respect to management of non-standard types of data. Publicly available data are generally up-to-date, easily discovered and accessed. The level of consistency between the EDI data portal and HFR's own website is admirably high. Providing pdf summaries of each dataset is novel among LTER sites and applauded. The Data Management Plan is thorough and appears to be rigorously followed. The program notes no weaknesses but agrees with panelists that the site should continue to push innovation and implement improvements (e.g., further development of data visualization techniques).

Site Management:

Transition to a new PI is a particularly vulnerable process for LTER sites. The program agrees with panelists that HFR has handled that process smoothly. The team of PIs has diverse expertise. Administration of HFR is highly integrated with that of Harvard Forest and clear mechanisms are in place for coordinating research activities at the site. Annual meetings of site personnel appear effective in creating a sense of community, updates on all types of activities, and opportunities for within- and between-site syntheses. The site has a strong record of collaboration with scientists not otherwise affiliated with Harvard Forest. However, the Management Plan is lacking in detail about how new scientists can be supported in the early phases of collaboration. This may be a missed opportunity for recruitment of scientists from underrepresented groups. More generally, the program agrees with panelists that it would be beneficial to develop a more formal and/or transparent process for prioritizing financial and logistical support of current and potentially new personnel. This period of transitional leadership provides a good opportunity to do so.

Panel Recommendation: Competitive

Program recommendation: The Program agrees with the panel's assessment and recommends funding.