

NATIONAL SCIENCE FOUNDATION
Review (PI Copy)

Proposal:1637685

PI Name:Lovett , Gary

Title: LTER: Long Term Ecological Research at the Hubbard Brook Experimental Forest

Institution: Institute of Ecosystem Studies

NSF Program: LONG TERM ECOLOGICAL RESEARCH

Principal Investigator: Lovett, Gary M.

Rating: Very Good

Review:

In the context of the five review elements, please evaluate the strengths and weaknesses of the proposal with respect to intellectual merit.

Results from prior research effectively summarizes and highlights numerous findings which have resulted in an impressive number of high quality publications. The wide breadth of ecology covered, including mechanistic biogeochemistry, food web and populations studies, and limitations on productivity, benefitted from the long-term data and ecosystem-level experiments.

Proposed research clearly builds on prior findings with a combination of measurements, experiments and models. The range of science has been expanded by adding new investigators, partly in response to suggestions from the mid-term review. Given the focus on disturbance as the conceptual foundation for the studies, a theoretical examination of disturbance would enhance the conceptual foundation. For example, what is the relation between the frequency or magnitude of events considered disturbances and the generation time of the organisms or the response time of ecosystem processes? How might introductions of invasive species be evaluated in an evolutionary context.

The five general questions interlink multiple scales and processes, hence do not lend themselves to definitive experiments or measurements. More specific questions in subsections are more tractable or operational, some largely empirical and others expressed in a theoretical context, e.g. N retention and saturation theory, co-limitation by multiple environmental resources, and the hierarchical-response framework with transient and steady-state dynamics. Though no new theories were proposed, revisions of existing concepts were offered.

The proposed research to examination of retention of N in mineral soil lists measurements but does not show how these measurements will answer the question or that the time-scale of the isotope additions are relevant to long-term storage. While prior measurements of denitrification and resulting gaseous emissions provide a solid basis for further work, it is unclear how the metagenomics shotgun sequencing of community DNA, though biologically interesting, will provide information on gaseous emissions. Also, can the earlier work allow an estimate of the temporal and spatial sampling required to address the question? The long-term, multi-site experimental addition of N and P combined with use of the MEL model is an excellent example of the test of the theory of co-limitation.

The examination of changes in ET, derived from differences between precipitation and stream flow, while locally interesting, would be better motivated if based evidence of regional-scale changes in ET. Given the interest in how changes in the timing of snowmelt influences ecosystem functions and in light

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of trends in the timing, it would seem valuable to include physical model of snowmelt. As part of the studies of in-stream C cycling, it would seem necessary to include measurements of release of CO₂ to the atmosphere from the streams.

As the research expands to the entire Hubbard Brook Valley, could Mirror Lake be included. Furthermore, could not the landscape-scale activities be further expanded to the larger region of northern forests inclusive of forests, streams and lakes.

Given that the team of participating scientists is large, diverse and located at various institutions, the coordination of activities would seem to be challenging. Over the years the program has developed practices to meet the challenge. As described under data management, a procedure is in place to engage researchers in the data system before they begin. Though the facilities section has 'boilerplate' for some institutions, the team is quite well equipped for the proposed work. Project management combines clear leadership roles with several venues for many team members to participate. The transition to new PIs looks sound. Gender and demographic diversity is reasonable

In the context of the five review elements, please evaluate the strengths and weaknesses of the proposal with respect to broader impacts.

The broader impacts are very solid inclusive of K-12 student and teacher programs and undergraduate research, and contributions to national policy discussions and actions.

Please evaluate the strengths and weaknesses of the proposal with respect to any additional solicitation-specific review criteria, if applicable

Summary Statement

Hubbard Brook (HBR) LTER program continues to be highly productive and proposes an ambitious series of questions conceptually focused on understanding response of the northern forest ecosystems to natural and anthropogenic disturbances.