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: Excellent, 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.

The authors present a very good summary of research conducted to date, including some of the long-term work at Hubbard Brook related to air pollution, climate change, and forest disturbance. Conceptual framework is based on how disturbance drives changes in the interacting components of the ecosystem-- vegetation, food webs, hydrology and biogeochemistry. These changes interact on a physical template imposed by the landscape. The way in which the ecosystem responds may further modify the template and alter biotic change.

The overarching research theme of this proposal is the response of ecosystem structure, composition and function to disturbance, with emphasis on multiple interacting disturbances, legacies of past disturbance, and new directions in experimental and comparative studies.  Previous cycles of the HBR-LTER used 'Forest Disturbance' to describe processes such as forest harvesting and windstorms that damage forest structure. They now broaden this category to 'Changing Biota' to also encompass biological changes caused by invasions of non-native species and migrations of more southern or low elevation species into HBR. To me, it seems like a good theme, but I'm not entirely convinced that changing biota alone makes the new funding cycle different from previous ones.

The investigators propose five integrative questions:
1) How will legacies of past air pollution, particularly depletion of exchangeable cations and accumulation of organic matter, S and N in the soil, affect the future structure and functioning of forest and stream ecosystems?  
2) What are the soil, microbial and vegetation processes that have permitted N export in stream water in the reference watershed to remain low despite continued N pollution and cessation of biomass accumulation in the watershed forest?  
3) How will simultaneous and interactive effects of climate change, air pollution, plant succession, and invasive species alter the structure, function and biodiversity of the future forests of HBR?  
4) How will changing climate seasonality, particularly changes in spring snowmelt, soil thawing, and phenology of microbes, plants and animals, affect ecosystem functions and food webs?  
5) Is N availability a key driver that integrates microbial, plant and animal population dynamics?  

These questions are interesting and span across disciplines, so answering these questions is a laudable goal.

Going forward, research focuses on four themes (changing atmospheric chemistry, changing climate, changing biota, and geophysical template/ecosystem responses), each of them integrated with very specific and insightful questions.

Synthesis and integration of research findings will take place via quarterly group research meetings, using the five integrative questions as platforms for discussion. A lead organizer will be in charge of each of these questions/meetings. I find this approach reasonable and effective, because it will allow for ample discussion and integration of various research efforts while maintaining a structured consolidation of all products.

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

Education and outreach efforts at this site have been broad and diverse. This proposal seeks to maintain relations with teacher and professional development programs, K12 schools, create classroom lessons for middle- and high-school teachers, provide tours, expand forest science dialogues, develop two new science links projects on winter climate change and regional water use.

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

Summary Statement

Well written proposal that builds on long-term work at Hubbard Brook with an excellent execution plan. My only criticism is that the advances in the conceptual framework of this proposal seem incremental rather than transformative. The group is made of really productive investigators and will certainly deliver.