

Collaborative research at primarily undergraduate institutions

At a recent conference, one of us was introduced to a scientist from a funding agency as being from a small college. The scientist promptly said, “Oh, yes, the *education* group is at the next table”. This well-intentioned remark is representative of a common view that faculty from primarily undergraduate institutions (PUIs) are educators only. Over the past two decades, concomitant with the growing recognition that research enhances education, PUIs have increasingly hired faculty who are educator–scientists, committed to conducting innovative research and integrating it into their teaching. Many PUI ecologists have long-standing, dynamic research programs, mostly conducted at the local scale, but which have the potential to address larger scale questions. We assert that cultural, institutional, and funding changes – to facilitate collaboration among PUI scientists – would allow these researchers and their students to contribute more fully to continental-scale ecology.

Research at PUIs may attract less notice than programs at large research universities (RUs), because PUI faculty members generally conduct research differently from their RU colleagues. PUI faculty research time is limited by substantial teaching loads of two to four courses per semester, so research often progresses more slowly. PUI scientists also tend to have fewer “supporting resources”, such as laboratory facilities, instrumentation, and grant offices, and lack graduate students and technicians to carry out experiments and assist with training undergraduates. As a result, research projects tend to be smaller, restricted in spatial scale, and are less likely to be supported by grant funding. We have learned to be creative in designing sound experiments with “shoestring” budgets that fit within these constraints. Our strong education mission drives us to involve students in each step of the research process and to test hypotheses accessible to these junior scientists. None of these differences in approach decrease the value of our research, yet these issues may act as barriers to the inclusion of PUI faculty in large, national research initiatives. We suggest that fostering collaboration among PUI scientists will allow our independent research projects to be linked into larger, integrated experiments that could span multiple spatial and temporal scales.

Many of the most important questions in ecology require integrating data across space, time, and biological scales in ways that are impractical or impossible for single researchers to undertake. Ecologists at PUIs are an untapped pool of quality research scientists, who could effectively address these questions in networks of research teams. This model proved effective for the Collaboration through Appalachian Watershed Studies (CAWS) group, which brought together faculty and students from 13 PUI institutions to share data and methods for studying local watersheds. Collaborations like these leverage resources, facilitate cross-training, and integrate insights across geographic scales. We believe that such collaboration is vital to ecological discovery and that we bring something unique and useful to the table, both as scientists and as educators. Because ecologists at PUIs work closely with students in classes and teaching labs, we can integrate quality data collection into courses, thereby expanding the research team and allowing ongoing educational exercises to contribute to novel ecological insights. We also play a vital role in research training, and send a disproportionately high number of students into PhD programs. Collaborative ecology at PUIs will prepare undergraduates well for participation, as graduate students, in large-scale research efforts, such as Ecotrends and the National Ecological Observatory Network.

To better harness PUI research resources and increase our contributions to national research priorities, we are calling for changes in ecological funding structures and the way research productivity is assessed. We appreciate the “Research at Undergraduate Institutions” and “Research Experiences for Undergraduates” programs at the National Science Foundation (NSF), but these do not necessarily encourage collaboration. Currently, there are funding opportunities for either research or networking (eg NSF’s Research Coordination Networks program), but not both, and we argue that collaborative work would proceed more effectively with funding that combines these elements. Furthermore, we believe that collaborative activity at PUIs will increase with changes in the way academic and funding institutions credit research contributions; more professional recognition for authorship of datasets, authorship with undergraduates, and authorship on multi-authored articles should increase appreciation of PUI research. We see encouraging shifts in our professional culture that facilitate collaborative work, and we want to ensure that PUI scientists are included in this important development. One of the key missions of NSF is the integration of teaching and research. Engaging PUI faculty and students in relevant, multi-institutional, collaborative research that addresses ecological questions of national importance is one model for achieving that mission.



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