In summary, LTER systems can provide a standardized infrastructure to collect comparable data to answer the questions of today, and a rigorous scientific basis to address future challenges. We invite scientists to integrate stand-alone studies within innovative LTER approaches to provide future generations with the management tools to move beyond the confines of our current limited biodiversity knowledge.

References

Letters Response

Improving ecological monitoring

David B. Lindenmayer1 and Gene E. Likens1,2

1 Fenner School of Environment and Society, WK Hancock Building (43), The Australian National University, Canberra, ACT 0200, Australia
2 Cary Institute of Ecosystem Studies, Millbrook, New York, NY, 12545, USA

We welcome the comments of Haughland et al. [1] regarding our paper on Adaptive Monitoring [2]. As monitoring programs have had such a poor record of success over the last 3–4 decades, there is a clear need to improve their ability to provide important, if not unique, ecological insights. Therefore, debates about how to make much needed improvements are both healthy and essential. This was the underlying motivation for us to develop our Adaptive Monitoring paradigm [2].

We have major concerns about the underlying design of both ABMI and PPBio and remain unconvinced that these approaches provide ‘real solutions for biodiversity monitoring’ [1].

Both PPBio and ABMI are what we term ‘passive’ monitoring programs [3] because they lack management interventions or treatments in their experimental or survey design. For example, the stratification entity for ABMI is space. However, the distribution of the many organisms of interest could be strongly influenced by other factors, such as vegetation type, logging, fire, and insect attack. While such kinds of ‘passive monitoring’ can sometimes help identify broad trends (e.g. whether environmental conditions are getting ‘better’ or ‘worse’), such an approach makes it extremely difficult to identify or understand the mechanism influencing a change in an ecosystem or an entity. This deficiency is especially problematic when there are multiple stressors with cumulative effects because it confounds assigning causality to observed trends. Thus, while Haughland et al. [1] argued that both PPBio and ABMI aim to address questions about how multiple human stressors effect biodiversity, their design makes it difficult to tease apart cumulative effects or help understand why such effects have occurred. By contrast, we strongly co-concur with Nichols and Williams [4] and re-iterate that the most effective monitoring programs will be those that are statistically well-designed with relevant management interventions to help the robust identification of the mechanism(s) that give rise to a pattern or trend [2,3]. Understanding mechanisms in ecology is essential because it is fundamental to identify effective solutions to reverse negative environmental trends such as recovering declining populations of threatened species [5]. In addition, it is critical for generalizing to other landscapes and regions and hence ensuring that ecology, environmental management and conservation science are more than disciplines based on case-studies [6].

Haughland et al. [1] noted that good long-term ecological research (LTER) systems aim to ‘track changes at scales appropriate to management (hundreds to thousands of kilometers)’. We are acutely aware of this goal as the leaders or past leaders of LTER sites ourselves. Yet, programs like PPBio in Australia are based on ~30 plots with 1-km × 1-km grid spacing [7]. This scale may be appropriate for some things but totally inappropriate for others. Rather than develop a generic single-scale framework with a ‘one-size-fits-all’ approach to monitoring programs, we believe it is more likely that a robust design at an appropriate scale can be developed if a monitoring program is underpinned by specific questions.

Haughland et al. [1] accused us of ‘perpetuating a false dichotomy between traditional research and innovative programs like AMBI and PPBio’. We have no intention of creating false dichotomies – far from it as we are deeply motivated to help promote increasing numbers of more effective monitoring programs worldwide [3]. However, we

Corresponding author: Lindenmayer, D.B. (david.lindenmayer@anu.edu.au).


0169-5347/ – see front matter © 2009 Elsevier Ltd. All rights reserved.
contend that all good monitoring programs, irrespective of whether they are traditional or so-called innovative ones, must have a common set of fundamental underlying characteristics [2,3]. We singled out ABMI and PPBio (among many others which we find problematic) because the documentation available to us did not provide information on three key characteristics: well-developed and readily-tractable scientific questions, a conceptual model of the ecosystem(s) in question, and a robust and statistically-based experimental design.

Debate is essential for progress in science and we welcome discussions that help to improve the truly appalling record of ecological monitoring to date. We are not convinced that PPBio and AMBI represent innovative or effective solutions to monitoring problems. Nevertheless, we have recently discussed holding an international meeting on approaches and methods in ecological monitoring with one of the authors of the paper by Haughland et al. [1]. We believe that such a meeting would be extremely helpful in promoting better monitoring programs around the world.

References

Harnessing diversity in gardens through individual decision makers

Dave Kendal, Nicholas S.G. Williams and Kathryn J.H. Williams

Melbourne School of Land & Environment, The University of Melbourne, 500 Yarra Boulevard, Richmond, VIC., 3121, Australia

Goddard et al.’s [1] review is a welcome contribution to the study of the ecological effects of urban gardens in western developed countries. However, we disagree with their proposition that gardens should be ‘managed collectively’ to enhance native urban biodiversity. This may in fact be counterproductive as the very high vegetation diversity observed in gardens is the result of many individual decision makers. Instead, we argue that the key to biodiversity conservation in urban gardens is developing a greater understanding of the factors driving both the positive (high diversity) and negative (low proportion of native plants) ecological outcomes of peoples’ gardening practices. Both research and practice should focus on understanding and harnessing the extraordinarily high species and structural diversity that result from current gardening practices in ways that enhance broader ecological functioning.

Urban ecology studies suggest that coarse, census district-level socioeconomic factors such as household income can be used to explain variations in the diversity and abundance of garden vegetation [2]. However ecology studies that have treated individual gardens as independent units (e.g. [3]) have identified enormous variations in diversity and use of native plants between closely located gardens [4]. This suggests that it is factors operating at the individual household level driving the distribution of garden vegetation. Studies in the social sciences and humanities support this by suggesting that peoples’ gardening behaviour is heavily influenced by household-level factors such as gender [5], age [6], cultural background [7] and personal attitudes towards gardening effort [8]. Research that identifies relationships between these social factors and ecological outcomes will allow us to make informed policy decisions about maximising biodiversity conservation in gardens.

Gardens are a place where the social and ecological become blurred and not easily reduced to simple dualisms such as native or exotic [9]. As described by Goddard et al. [1], there is evidence that both native and exotic garden vegetation can have positive effects on the diversity of other organisms. A greater emphasis on the functional traits of garden vegetation rather than nativeness and exoticness may help us understand how different types of garden vegetation can contribute to biodiversity conservation in general. Social research can also contribute by identifying socially acceptable ways that native vegetation can be incorporated into gardens (e.g. [10]).

Many gardeners want to create gardens that are beneficial for wildlife and the broader environment. Improving the ecological outcomes of gardens requires a better understanding of peoples’ gardening attitudes, motivations, behaviours and choices. This information can then be used to inform the individual decision makers to maximise structural and biological diversity and expanding the roles that the native plants can play in satisfying their diverse gardening requirements.