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# The challenges of long-term monitoring

Biodiversity and Environmental Change: Monitoring, Challenges and Direction. David Lindenmayer, Emma Burns, Nicole Thurgate & Andrew Lowe (Editors), 2014, CSIRO Publishing. 624 pp. AU$120.00 (hardback) ISBN:9780643108561; http://www.publish.csiro.au/

At a time of intense and innovative use of ecological datasets, obstacles to acquisition and archiving of fundamental long-term data remain as pervasive as ever. As pointed out in this volume, effective long-term monitoring should extend over 10 years or more, have a well designed structure, a carefully thought out resampling strategy and secure funding. Current trends in how science is done work against this ideal. Public agencies and research institutions, which used to do the bulk of long-term monitoring, are now under great pressure to achieve efficiencies and to devote more effort and resources to immediate concerns. University scientists, as a whole, are disinclined to invest in monitoring other than on a limited and short-term scale: the pressures to publish are too great and the rewards for basic data collection too meagre. Research funding agencies and highly ranked journals are fixated on innovative, ground-breaking research and often explicitly exclude projects and papers mainly concerned with basic data or observations. None of this can be wished away. The current situation is the product of thousands of individual decisions made by policy makers, managers and scientists. The consequence?

'The recent and current reality of environmental reporting and environmental decision making is that supporting data and evidence are rarely used.' (from the Preface).

The implications of this astounding statement should give us pause. Is evidence really regarded as irrelevant? While the multiple environmental crises that afflict the globe may eventually force a radical rethink of our attitudes to ecological data, the immediate challenge is how to sustain biodiversity monitoring in the meantime.

This handsome, beautifully produced volume shows how Australian ecologists have risen to the challenge. It is based in large part on work coordinated through the Australian Government's Terrestrial Ecosystem Network – an Australia-wide collaboration between land management agencies, government departments and universities. Within the TERN network is LTERN (Long Term Ecological Research Network) a collaborative enterprise that coordinates and makes available the data from 35 core studies comprising nearly 3000 long term plots and which forms a part of the International Long Term Ecological Research (ILTER) network. Once a scientific monitoring group joins LTERN, they agree to share data and aspire to certain standards while pursuing the diverse goals, targets and approaches appropriate to their sites and problems. It is a pragmatic response to the huge task of monitoring the vast Australian landscape and its hyperdiverse biota. This book showcases the results of these independent approaches.

David Lindenmayer, who led the editorial team, is an international figure in long term monitoring. Over the past 30 years he has published prolifically on the subject, deriving much of his inspiration from his own practical involvement in the day to day challenges of monitoring. The general overview chapters he leads here are impressive summaries of the LTERN enterprise and reflect his sustained thinking on the hows and whys of monitoring. They are essential reading for anyone contemplating a monitoring project. The bulk of the book consists of a series of chapters setting the Australian scene and then moving systematically through nine terrestrial biomes ranging from alpine communities to tropical rainforest. Each biome chapter is clearly set out with an overview, conceptual model of the major processes and drivers, exposition of threatening processes, major trends and cases studies from the LTERN core sites. Extra material is included as boxes on a wide variety of other topics and

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sites that are not part of the core. The editorial team have worked hard to ensure an impressive unity and clarity in the figures and illustrative material while not suppressing the individuality of the chapter writers. Uniformly high quality images, beautifully produced maps and clear figures, and well organised and written text make it a joy to read.

However, the story it tells is depressingly familiar. Land clearance, agriculture, altered fire regimes, pests, weeds, disease, and climate change collectively threaten a large fraction of the biota and degrade environments. For example, monitoring has revealed that across northern Australia small mammal species diversity and population sizes have been plummeting since the turn of the century mainly as a result of feral cat predation, but with numerous other drivers implicated, including fire, foxes, and cane toads. A quarter of the Australian landmass (1.9 M $km^2$) is involved; the distances are vast; the human population and infrastructure thinly spread; and the problem acute. To put it in perspective: this tropical savannah region is approximately the size of Mexico or three times the area of France. To have a hope of guiding effective conservation action, the monitoring effort must be at a similar scale. With such challenges as their everyday reality, it is no wonder Australians are at the forefront of biodiversity monitoring.

What is the future for long term biodiversity monitoring? Impressive though it is, the LTERN model is a medium term, stop-gap approach. As the authors acknowledge, the monitoring sites are clustered within a few biomes and usually close to major population centres. Each cluster of sites or network has its own focus, time-frame, methodology and funding sources. TERN shows how a maximum return can be extracted from such a network. But does biodiversity monitoring need to be so *ad hoc* and uncoordinated in the first place? David Lindenmayer and team emphasise the desiderata for long-term monitoring: secure funding, outstanding leadership, clear goals, appropriate objectives, conceptual models to underpin data collection, and so forth. However, this amounts to a description of successful programmes, not a guide to how to achieve them. What, then, is the critical element for sustainable monitoring?

When we look at the other aspects of our civilization that we monitor intensively – finance, population, health, infrastructure, accidents, crime – virtually none of the requirements singled out as essential for successful biodiversity monitoring apply. Certainly outstanding leadership is not critical, nor enthusiastic individual effort. A monitoring system that relies on these elements is a monitoring system in trouble. Nor, if we take climate and atmospheric monitoring as an example, need a monitoring system be based on a hypothesis, question or perceived threat to be eminently useful. For over 200 years climate data have been collected simply because climate was seen as fundamentally important. And I believe this is the key. Biodiversity will be comprehensively monitored when it is widely acknowledged as important to do so.

We are not there yet. As this book clearly shows, the conflict between environmental managers who see their funding leached away in monitoring programmes, and therefore ask that they 'be reviewed', and scientists who want another few years of data to make sense of the trends, cannot be resolved at this operational level. However, just as public environmental agencies cannot decide to cease collecting financial data 'because the chief financial officer resigned, and no one else has the same enthusiasm for tracking funding' or 'because we are focusing on staff development this year', they should not be at liberty to not monitor biodiversity. But this needs a solid agreement at very high national and international levels that biodiversity monitoring is an essential activity of a modern state. And what stops us reaching this agreement? National biodiversity monitoring is avoided because of fear of what it might reveal, because it generates an endless series of very bad news stories, and because the solutions for biodiversity loss

are often expensive, if available at all, and may restrict development. Environmental NGOs oppose it because it appears to take funding from interventions and often contradicts the simplistic stories they sell. Politicians are therefore presented with an unsorted list of poorly quantified biodiversity disasters and asked to take action. It is as though the nation's road safety policy was entirely formulated on the basis of media descriptions of spectacular motorway pile-ups.

This exceptional book shows how the scientific and environmental management community needs to respond. In revealing the magnificence of Australia's natural heritage, in quantifying how it is changing, and by untangling the complex of anthropogenic and natural drivers, it shows what is at risk, and provides the understanding necessary for effective action.

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