

**Billions of dollars are being spent across Australia on a range of environmental issues including weeds, feral pests, and revegetation. It's a big and ongoing investment yet we have little in the way of feedback informing us on the ecological return on this investment. The solution, of course, is to establish a monitoring program to provide this feedback. Unfortunately, effective monitoring is rarely implemented.**

It's not that significant resources aren't set aside for monitoring. Millions of dollars are spent on it each year. Unfortunately, most of what is done is being wasted as current monitoring programs have no realistic chance of detecting changes in the variables of interest. This is partly because detecting change in ecological systems is genuinely difficult. However, the failure can also be attributed to the inability of professional ecologists, conservation practitioners and bureaucrats to effectively work together.

## Why monitoring fails

Monitoring fails for a variety of reasons. In general terms these reasons can be grouped under three broad headings:

**Funding:** Funding needs to be sufficiently long-term to allow a change to be detected over and above the natural temporal fluctuations in the system in question. The time period required will vary among different systems, but there are few ecological variables likely to show significant change in less than five years. Ten years is a sensible minimum target for most ecological monitoring programs.

**Objectives:** A monitoring program cannot possibly succeed without a clear articulation of what success would mean. This entails choosing one or more variables to represent the change of interest, and specifying what degree of change would be considered sufficient to trigger a management response. While it's self evident that a monitoring program needs simple measurable objectives, they are invariably absent, complex or unmeasurable.

**Sampling design:** Having defined the change of interest, the most fundamental requirement of the sampling design is that it should be capable of detecting that change if it actually occurs. This means obtaining enough data to pick up change beyond natural variability, but also setting an ecologically appropriate level of statistical power. Another neglected issue is that sampling design should be approached with learning and improvement explicitly in mind. Early results should be analysed promptly and, if they point to deficiencies, used to refine the sampling regime so that it becomes progressively more efficient.

## Who's doing the monitoring?

There are three sectors involved in ecological monitoring: researchers in academic institutions; conservation NGOs and community groups; and

government agencies. Each of the groups has different objectives in collecting ecological data, but they are all afflicted with the same deficiencies; that is they lack: long-term funding; sampling designs that yield high statistical power; and analysis to inform conservation management decisions. One of the paths to improving the quality of monitoring data and facilitating its use in decision making includes greater engagement with quantitative scientists.

## Divided it'll never work

Critical to improving monitoring is a need to improve collaborative relationships among researchers, conservation managers and bureaucrats. At present these three groups, who are all crucial to the success of monitoring, work in largely separate professional worlds, strive towards different goals and are rewarded in different currencies.

Researchers are under constant pressure to develop novel ideas and convert them into technical publications that are unlikely to be read by managers and bureaucrats. Managers are typically swamped by the logistical concerns of designing and implementing programs and don't have the luxury of spending the long hours delving into the fine details of analysis, let alone the communication of discoveries. Bureaucrats must respond to the capricious demands of their political masters, including the management of project funding and reporting processes, which may have little or nothing to do with sound ecological analysis.

Under this organisational framework, those whose cooperation is most critical to making monitoring work are largely cut off from each other's ideas, opinions, goals and terminologies. Amidst this culture of insularity, opportunities for ecologically meaningful monitoring continually slip between the cracks.

## A vigorous dialogue

No one is suggesting that improving monitoring is easy. Properly funding, designing and analysing ecological monitoring studies is a difficult challenge requiring sustained attention, input and a commitment from all parties involved. However, it is not a challenge that we can afford to ignore. If we do, the critical task of monitoring will continue to be a largely disjointed, sporadic and ineffectual activity (as it is today). Eventually the Australian public will ask the tricky question: what outcomes did our investment in biodiversity conservation achieve. When they do we will need to have compelling and credible answers.

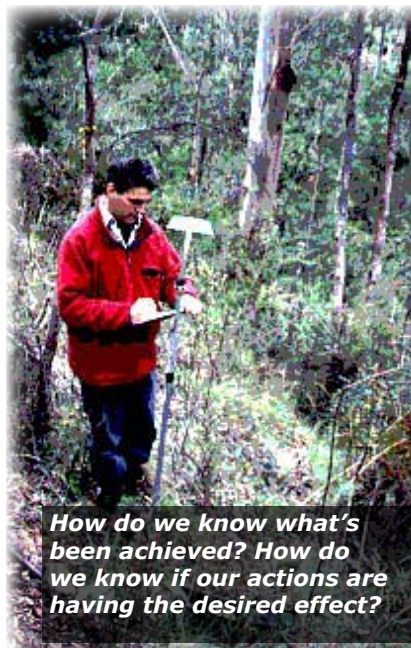
## Further reading

The ideas presented here are based on the paper:

Field SA, O'Connor PJ, Tyre AJ and Possingham HP (2007) Making monitoring meaningful, *Austral Ecology* 32, 485-491.

## AEDA Info Sheet #1.1 (Oct 07)

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*How do we know what's been achieved? How do we know if our actions are having the desired effect?*