HOW TO GET A NATIONAL BIODIVERSITY MONITORING PROGRAMME OFF THE GROUND: LESSONS FROM NEW ZEALAND

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ABSTRACT
The Department of Conservation manages protected areas in New Zealand (32 per cent of the land area) and marine reserves. In recent years, it has come under pressure to provide evidence concerning their biodiversity status and trends. In 2011, the Department implemented systematic monitoring of terrestrial, freshwater and marine systems as part of its Biodiversity Assessment Framework. Data generated now form part of the Department's reporting cycle. The system took six years to become operational and met with strong criticism and calls for its abandonment. Here we discuss the development of the system, the arguments raised against it, and how it was successfully implemented. While technical and logistic elements of a monitoring system are important, ultimately implementation depends more on institutional and social factors. The New Zealand effort would not have proceeded without pressure from governmental oversight agencies for evidence-based reporting, backed by legislation requiring biodiversity information. Internal departmental factors included sustained support for the programme by senior managers in the face of staff disquiet, and continuity of personnel charged with its development. In the long term, survival of the monitoring system will depend on greater uptake and use of the data it provides and protection of its budget from arbitrary reallocation.

Key words: conservation outcomes, ecological integrity, evidence-based policy, evidence-based reporting, long-term biodiversity monitoring, oversight and audit, protected areas

INTRODUCTION
The New Zealand Department of Conservation (DOC) manages and reports on biodiversity on nearly all New Zealand's protected areas (including its National Parks and UNESCO World Heritage sites). The public conservation land and waters that DOC administers make up ca. 32 per cent of New Zealand's land area and include protected marine areas. While DOC has a broader advocacy responsibility for national biodiversity and is the lead agency for administering international biodiversity agreements, biodiversity on privately owned land is the responsibility of landowners, regional councils and the Ministry for the Environment (MfE). DOC has come under increasing pressure over the past 30 years to demonstrate through a more quantitative accounting of its activities how well it is fulfilling its obligations regarding the conservation of biodiversity. The impetus for DOC restructuring and expanding its biodiversity monitoring effort came from several important initiatives and policies (Table 1), and ultimately led to the development of a Biodiversity Assessment Framework (BAF) that became operational in 2011 with implementation of the Biodiversity Monitoring and Reporting System (BMRS).

DOC is responsible to Parliament for the conservation of approximately 8 million ha throughout New Zealand, including offshore islands, virtually all of which has statutory protection of some form, and includes National Parks. It also needs to provide information under the New Zealand Environmental Reporting Act (2015), which is jointly administered by MfE and Statistics NZ, and sets out the requirement for comprehensive monitoring of the nation's atmosphere,

Table 1. Progress in the establishment of a national-scale protected area Biodiversity Assessment Framework (BAF) and Biodiversity Monitoring and Reporting Scheme (BMRS). Progress included events or policies with indirect relationships to the development of both BAF and BMRS, and policy documents often directed progress several years before they were published or enacted.

Year	Milestones
1993	New Zealand becomes a Party to the *International Convention on Biological Diversity* and agrees to report on biodiversity at a national level.
1997	First *State of the Environment Report* (Taylor et al., 1997) highlights shortcomings in environmental and biodiversity data and analysis.
2000	*New Zealand Biodiversity Strategy* (DOC and MfE, 2000) includes priority actions for national monitoring.
2001	Formation of DOC *Key Steps* groups to refocus monitoring on outcomes.
2002	MfE, with DOC as a partner, initiates the national-scale plot forest and shrubland network (Carbon Monitoring System) to quantify carbon stocks and biodiversity.
2004	DOC development team reviews New Zealand monitoring and national monitoring systems; recommends ecological integrity as overall goal and outlines a Biodiversity Assessment Framework (BAF) (Lee et al., 2005).
2005	The Land-Use and Carbon Analysis System (LUCAS) established by MfE with DOC as partner, provides a basis for national level biodiversity monitoring.
2005	Green & Clarkson (2005) review *New Zealand Biodiversity Strategy* progress, highlight lack of a framework and a condition and trend-monitoring network.
2006	DOC business case signed off for BAF and development continues on the BMRS.
2010	DOC BMRS programme approved.
2011/12	DOC BMRS monitoring begins with national-scale sampling (Tier 1 monitoring in Figure 1).
2012	DOC annual report includes monitoring data from the BMRS programme.
2015	New Zealand Environmental Reporting Act (2015) passed. Includes ecological integrity as a national goal and establishes legislative requirement for monitoring.

air quality, land, freshwater and marine systems. DOC is also subject to several oversight agencies that monitor and assess its performance. The Treasury signs off departmental budgets and has been increasingly active in demanding evidence-based justification for expenditure. The State Services Commission oversees the performance of government agencies and its governmental Performance Improvement Framework is explicit as to the information required for assessment of progress, and the Office of the Auditor-General undertakes regular audits and reviews of how well this obligation is being fulfilled. Statistics NZ provides guidelines and advice on the collection and analysis of data and is responsible for the archiving and custody of New Zealand-level statistics. The Commissioner for the Environment reports and makes recommendations to Parliament including on biodiversity matters affecting DOC.

Neither the Biodiversity Strategy (DOC & MfE, 2000) nor the subsequent Environmental Reporting Act (2015) has detailed how biodiversity monitoring is to be carried out, or given anything but general guidance as to what is to be included. While DOC is able to actively manage only a small proportion (about one-eighth) of New Zealand's conservation land and about 200 of the 2,800 threatened species, it needs to have broad-scale information to justify its priorities in this regard (Office of the Auditor-General, 2012). Moreover, establishing these priorities does not release it from its obligation to understand what is happening in protected areas that it is not actively managing. The DOC development team therefore concluded that national-level, comprehensive biodiversity monitoring was necessary to understand the multiple threats to ecological integrity in protected areas.

National-level systems such as the BAF and BMRS are uncommon, and most national biodiversity reporting has been based on often unsatisfactory data collected by uncoordinated local systems (Reyers et al., 2013). Here we outline the genesis, development and implementation of the BAF/BMRS with a focus on the problems faced and overcome. Our hope is, that with a better understanding of the forces both acting for and against such systems, more organisations will rationalise and organise protected area monitoring at national, state or provincial scales.

STRUCTURE OF THE BIODIVERSITY ASSESSMENT FRAMEWORK

McGlone et al. (2020) discuss the BAF, its structure and high-level goals (Figure 1), and broad objectives (Table 2) and how they relate to ecological integrity and ecosystem health. Research that underpins the BMRS has been well documented (MacLeod et al., 2012; Allen et al., 2013; Gormley et al., 2015). The BAF framework is hierarchical (Figure 1), with maintenance of ecological integrity as an overarching goal, further decomposed into eight broad outcome objectives (Table 2). The outcome objectives are supported by indicators that state what aspects should be included, and these are supported by measures in which the concrete components are detailed. Finally, elements, the data which will be collected and analysed, are listed. The BMRS then decides which elements from BAF will be prioritised based on criteria including importance, urgency, pre-existing data sets, logistics and finance and then develops protocols and organises monitoring. Much data is provided by partnership with the long-established LUCAS network (Allen et al., 2003). With strict monitoring protocols around collection, archiving and analysis ensuring compatibility between data sets collected at different times and places by different teams, monitoring networks provide high quality data and are remarkably robust (Coomes et al., 2002).

The BMRS programmes fall into three groups: Tier 1, systematic, long-term monitoring for national context; Tier 2, nationally consistent monitoring of those

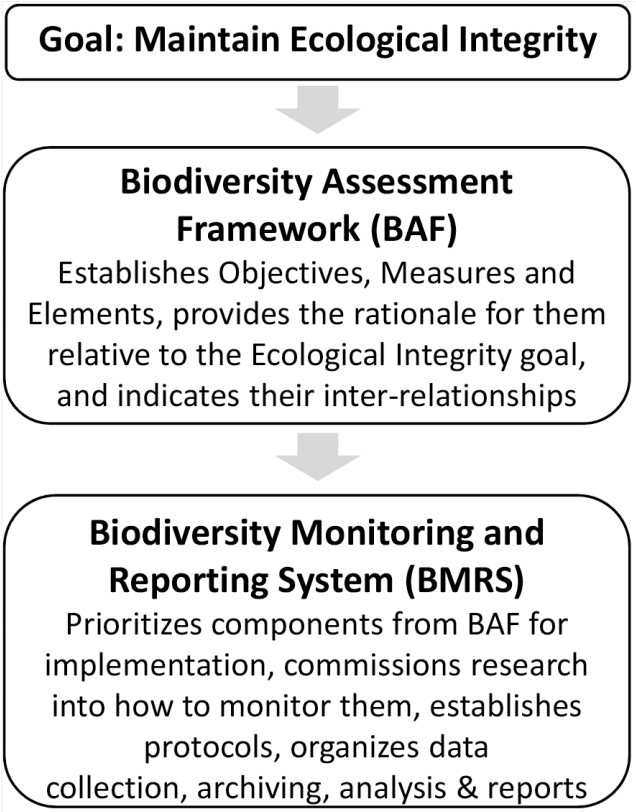


Figure 1. Interrelationships between New Zealand's Biodiversity Assessment Framework (BAF) and the Biodiversity Monitoring and Reporting System (BMRS) to support the overall goal of maintaining ecological integrity.

Table 2. The eight outcome objectives of the Biodiversity Assessment Framework (BAF)

Objective	Coverage
Maintaining ecosystem processes	The extent to which the environment is capable of supporting indigenous ecosystems and the degree to which they are free of disturbance factors that lead to poor ecological outcomes.
Limiting environmental contaminants	Presence and concentration in the environment of non-nutrient contaminants including faecal bacteria, vertebrate toxins, pesticide residues and heavy metals, hormones or hormone mimics as a result of human activities. Persistent litter and disruptive noise in the aquatic environment.
Reducing spread and dominance of exotic species	Documentation of the presence, dominance and rate of increase of exotic species in the natural environment.
Preventing declines and extinctions	Conservation status of all species in the New Zealand biota (as per the New Zealand Threat Classification System); security of threatened and at-risk taxa; loss of genetic diversity in critically reduced taxa.
Maintaining ecosystem composition	Demography of functional groups, their representation, abundance of common and widespread taxa and changes in species diversity.
Ensuring ecosystem representation	The extent, protection status and ecological condition of indigenous ecosystems.
Adapting to climate change	Documentation of changing climates, and the biological responses.
Fostering human use and interaction with natural heritage	Documentation of how humans interact with natural ecosystems in their harvesting of both indigenous and exotic taxa, through recreation within them, and how they use them to gain spiritual and physical wellbeing.

protected areas and species being actively managed for reporting on trends and management effectiveness; Tier 3, intensive, targeted monitoring for research and evaluation (Figure 2). While Tier 2 and Tier 3 monitoring have a local focus, application of consistent protocols, data analysis and archiving facilitate a roll-up to higher or national levels. The BAF is modular and new components can be introduced or redundant ones removed with little disruption. It is comprehensive and, in outlining what an ideal system would be, ensures that decisions on what to include in the BMRS are made with a good understanding of the potential choices. Finally, while threats to biodiversity play a large role in the structuring of the BAF, it also asks for the collection of contextual data. Further details are given in McGlone et al. (2020) and results from currently active components of the BMRS are detailed on the DOC website (https://www.doc.govt.nz/our-work/monitoring-reporting/national-status-and-trend-reports-2018-2019).

DEVELOPMENTAL AND IMPLEMENTION ISSUES

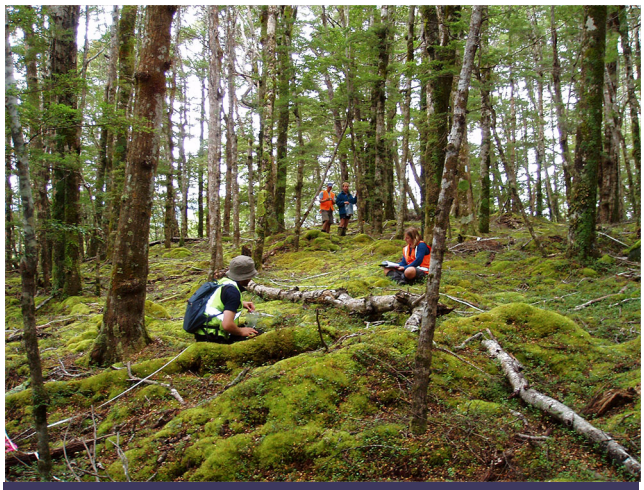
Development and implementation of the BAF/BMRS were complex and difficult. Every substantive organisational or social problem we encountered was outlined in a publication on the development of the Western Australian Rangeland Management System (Watson & Novelly, 2004). Following their lead, we discuss the various environments that determine the success or failure of a monitoring system.

The scientific environment

Many scientists are sceptical of long-term monitoring programmes of the status and trend type central to the BMRS. It is frequently suggested that they are: not based on a particular management problem or scientific question; not optimised; poorly specified or lacking *a priori* hypotheses; too broad in scope; poorly stratified or not replicated, and biased; often of low statistical power; and often consist of large but inefficient sample

Figure 2. The New Zealand Biodiversity Monitoring and Reporting System's (BMRS) hierarchical structure from national (broad-scale) monitoring through to site-specific, research studies.

sizes (Nichols & Williams, 2006; Wintle et al., 2010). These critics argue that poorly thought-out and implemented monitoring wastes resources, and of course this is true. In its place they suggest monitoring based on scientific hypotheses and targeted towards assessing conservation actions (Nichols & Williams, 2006). In particular, they prefer 'question-driven' monitoring that makes *a priori* predictions which are then tested, ideally by adaptive management (Lindenmayer & Likens, 2010). However, although approaches combining observations, experiments and theory are superior for advancing ecological understanding (Wotton & Pfister, 1998), they are resource-intensive and thus will limit the system's scope and focus to known threats more than is perhaps wise. Adaptive management experiments in particular, despite their great potential, are prone to disappointing outcomes (Allen et al., 2011), and are often abandoned before rigorous results are obtained (Westgate et al., 2013).



BMRS Tier 1 Field teams completing the monitoring and measurements of biodiversity on a forested plot © Mike Perry, Department of Conservation

The conservation environment

From our New Zealand experience, many conservationists are indifferent to or sceptical of the value of data. Monitoring is often believed to be a waste of scarce conservation resources, as the problems and their solutions are thought to be well known. Therefore, many conservation organisations cannot credibly assess their effectiveness and impact (O'Neill, 2007; Josefsson et al., 2020). For instance, in New Zealand, community restoration projects are popular but little monitoring is done, and the few groups that do monitor are unconvinced of the benefits of sharing their data (Sullivan & Molles, 2016).

The institutional environment

Watson and Novelly (2004) set out the institutional problems faced by a monitoring system. As noted by a respondent to an Australian study of environmental monitoring and evaluation practices, when the need for these activities is raised, leaders "nod their heads and go 'Mmm' and nothing happens" (McIntosh, 2019). Even when undertaken, monitoring is often diffuse, spread over multiple budgets, and vulnerable to neglect or relegation. The focus is on easily obtained data related to implementation measures. As Kapos et al. (2009) have shown, this is largely irrelevant as regards outcomes. When outcome measures are reported, the focus is on places and species where most effort is directed and success more likely. For an organisation such as DOC, with an overall responsibility for protecting natural ecosystems but lacking commensurate funding, biodiversity status and trend reporting will inevitably give the impression to some extent of continuing failure. It is difficult for any organisation to present data placing it in a poor light and most avoid doing so (Pentland, 2000). A culture of critical evaluation of outcomes is therefore often lacking (Kapos et al., 2009).

An ever-present risk is organisational restructuring and turnover. The massive realignment of New Zealand public institutions in the 1980s and 1990s destroyed much biodiversity capacity through loss of funding, staff, institutional knowledge and data (Young, 2004). DOC has had three restructurings since 2004, and the BAF/BMRS survived only because key staff remained in place despite restructuring, an indication of the importance that the programme had acquired.

The individual environment

Within a conservation organisation, be it governmental or not, the focus is on direct action to make a difference. Therefore, monitoring is often lacking or short-term, driven by individual enthusiasm and often involves idiosyncratic techniques and a lack of secure data archiving or analysis. When the place, target, methods and timing are at an individual's discretion, monitoring can be highly enjoyable, yields information of direct relevance to local issues, provides job satisfaction, and career enhancement through development of individually held expertise. Such activities are therefore supported by conservation staff. However, few such individually initiated monitoring efforts transition to the second or third generation (Westoby, 1991). Because these efforts absorb resources but often yield little permanent benefit, they need to be replaced or at least augmented by standardised sampling regimes supported by protocols, data analysis and archiving. However, our

experience is that monitoring protocols are adhered to only when rigorously backed up with regular training and review because participants are reluctant to abandon favoured techniques, cut corners for cost or time reasons, and often experiment with new techniques or simply drift from the guidelines. A further factor is that systematic monitoring may be viewed as uninteresting or irrelevant as it often involves control sites where no management activity has taken place, or common species in unremarkable locations. If monitoring programmes are perceived as not delivering immediate benefits to staff, overt or surreptitious attempts to thwart them will inevitably begin.

Managers, as recognised by Watson and Novelly (2004), want to leave a mark on their organisation. They are therefore loath to commit too much time or energy to promotion and management of pre-existing, long-term programmes that lock up funding that could otherwise be deployed on new initiatives.

All these problems were manifest within DOC. A *Performance Improvement Review* by the State Services Commission (2014) stated that, although many within the organisation were strongly values-based and passionate about conservation, there was "…limited enthusiasm for evaluation as a regular part of DOC business activity". Conservation still mainly relies on expert opinion, anecdote and intuition: an evidence-based culture is not widespread in New Zealand or elsewhere (Cook et al., 2012; Sutherland et al., 2004).

Funding environment

Science funding agencies in New Zealand and elsewhere are reluctant to fund long-duration programmes. Well-established long-term monitoring networks such as NEON in the United States and TERN in Australia undergo periodic crises in funding (Mervis, 2015; Lindenmayer, 2017). Donors to NGOs often specify that their contributions are spent only on conservation action. Despite the New Zealand Environmental Reporting Act (2015) mandating comprehensive reporting, no provision under the Act is made for funding the collection of data.

HOW THE BIODIVERSITY ASSESSMENT FRAMEWORK HAS ADDRESSED THESE ISSUES

Initial steps

In 2004, a development team of managers, conservation professionals, conservation scientists, ecologists and ecological modelers drawn from the government-owned Crown Research Institute Landcare Research and DOC began development of a new comprehensive monitoring system. The team early on became mired in heated discussions about approaches and techniques. The issue of whether monitoring should be focused on assessing the success or otherwise of conservation interventions (Overton et al., 2015), or have a broader ambit including surveillance, common organisms and regions not under management, split the team. In retrospect, the group should have been less technically focused and more inclusive, as many of the debates were about broad goals

Helicopter landing in alpine to pick up BMRS Tier 1 field teams © Kathrin Affeld, Department of Conservation

and issues (What is the ultimate aim? Which components of biodiversity? Who will do the monitoring? At what cost?) that cannot be settled by science alone. Participation of NGO, local body and central government participants (such as MfE, Treasury, Statistics New Zealand) would have been advantageous to complement a group largely made up of scientists.

As part of the initial investigation, a comprehensive review was carried out of national and DOC monitoring, together with a review of Australian, British, Canadian, European Union and United States monitoring systems (Lee et al., 2005). Preparation of this review helped the development group to reach two major conclusions: first, that the overall goal of conservation in New Zealand should be ecological integrity; second, that monitoring would be broadly inclusive and national (McGlone et al., 2020). Given there are large information gaps regarding New Zealand biodiversity, it was realised that monitoring that was narrow in scope ran the risk of giving an incomplete picture. Furthermore, a focus on conservation interventions would neglect most conservation land and deprive managers of vital comparative background data. The Local Unit Criteria and Indicators Development (LUCID) forest monitoring programme of the US Department of Agriculture (Wright et al., 2002) was selected as a suitable template for further development.

Consultation

The broad outline of the BAF and the proposal for monitoring under the BMRS were presented at a series of workshops for DOC staff around the country and to the ecological community at a monitoring symposium in 2004. The development team published its review of needs, international monitoring programmes and an outline of goals and potential indicators and measures in 2005 (Lee et al., 2005). During the development of the individual monitoring components of the BMRS, workshops for DOC staff were held and reports and peer-reviewed publications produced detailing the finalised proposals.

While the ecological community was therefore well aware of the plans for a new monitoring system, the development group did not anticipate just how severe the criticism of the proposal was to become. These later critiques (McSweeney, 2013; Brown et al., 2015) focused on the wisdom of broad-scale monitoring. As discussed below, Tier 1 monitoring is not the only component of the system, but this is widely misunderstood. It may have been helpful to have engaged directly with some of these influential critics earlier in the process to ensure that at the very least they grasped the intent of the whole BAF/BMRS scheme.

Research, protocol development and review

Intensive development of methodology and small-scale trials were initiated which took several years. Research was commissioned on all aspects, including sampling design, and power analysis (MacLeod et al., 2012; Allen et al., 2013; Gormley et al., 2015). Protocols for monitoring were developed and updated, manuals written and training sessions for staff undertaken. Scientists with experience in international monitoring programmes undertook external reviews and discussed the project. The programme was commended by the Auditor-General's Office in their regular review of DOC performance.

The project was also subject to internal assessment and critique. An internal DOC managerial review focused on the 2010 business plan which directed resources diverted from local monitoring projects to Tier 1 (national scale) monitoring (Figure 3). Objections put forward by affected managers covered a wide range of

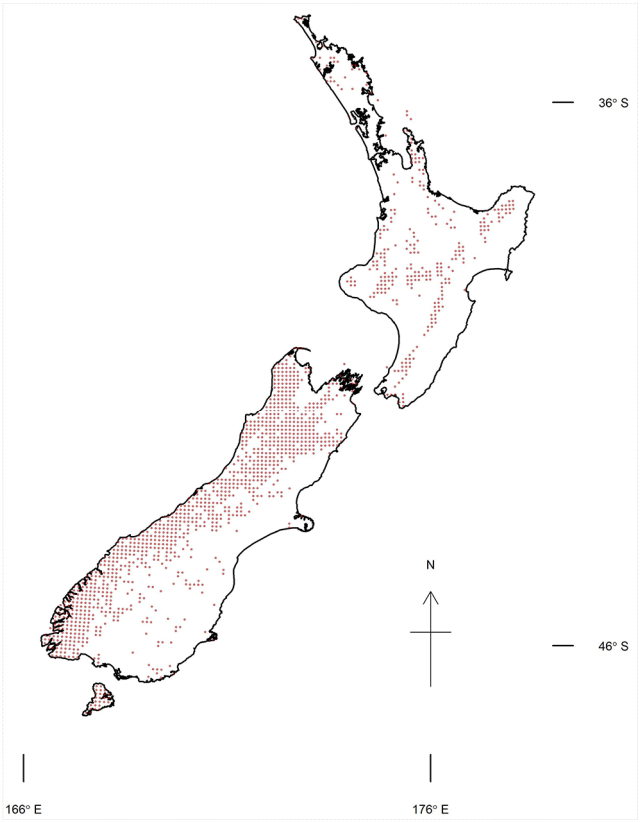


Figure 3. Distribution of sampling points for Tier 1 (broad-scale) monitoring on public land throughout New Zealand in the Biodiversity Monitoring and Reporting System (BMRS).

issues. The lack of relevance of Tier 1 monitoring to DOC's main responsibilities because rare and endangered species and ecosystems would be under-represented was raised. This objection was largely due to a misunderstanding of the implementation plan, in which Tier 1 was essentially underway, while Tier 2 was in development. However, it also reflected a misunderstanding of DOC's role. While it needs to prioritise its actions, it has a duty to report on the consequences of such priorities for areas where it undertakes no management. Objection was made to the burden of national-level monitoring falling to DOC and the expense of Tier 1 monitoring. However, DOC has oversight of all biodiversity on conservation land, and thus has national-level responsibilities it cannot avoid. We agree that systematic monitoring schemes are expensive but their inherent flexibility means that costs can be deferred if need be without doing major damage. Some managers questioned the wisdom of centralisation because local knowledge and skills would be lost. We agree this is a short-term concern, but much of this local knowledge is ephemeral as it is rarely well documented or archived and turnover of staff inevitably means loss of this knowledge. Managers also argued that existing monitoring expenditure had been overestimated and was therefore not available for diversion. This argument is just one of the many familiar institutional ploys to resist resource reallocation. Finally, some managers argued that as Tier 1 monitoring was long-term and broad-scale, the most likely outcome that would be observed would be no significant change, and this could put DOC at risk of negative reviews. This was the most concerning of all, as it speaks to a situation in which the main aim of managers is to portray their activities as having been successful and their wish to have monitoring to reflect this through focusing almost entirely on areas of intense management effort, and to ignore the broader situation where the state of New Zealand's national biodiversity continues to decline (Green & Clarkson, 2005; Brown et al., 2015).

Organisational change

It is often stated that a monitoring system needs a champion or a small group of enthusiastic, dedicated individuals (Lindenmayer et al., 2014) and indeed this seems to be the case in practice (McIntosh, 2019). As comprehensive monitoring systems will invariably face stubborn opposition, we agree that champions are needed initially. However, if a monitoring system is to survive, reliance on individual initiative must be superseded by an organisational solution. National-level, long-term monitoring requires centralised coordination, logistical expertise, trained monitoring staff, and a secure budget.

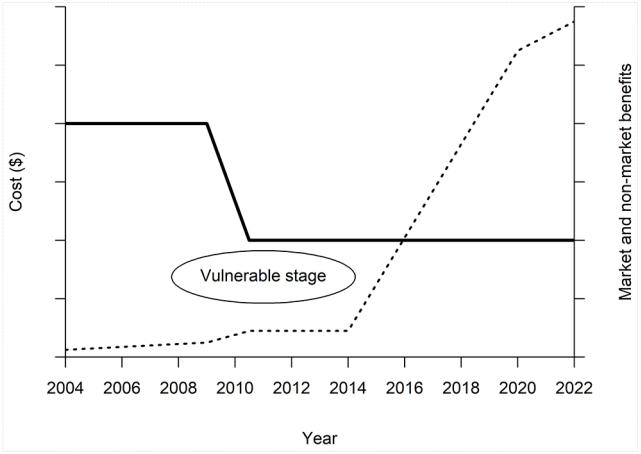


Figure 4. Developing and deploying a monitoring scheme is expensive and the benefits are slow to be realised. Schemes have a vulnerable stage during the mid- to late-deployment and early-delivery phases, when resource requirements are high (solid line) and outweigh benefits (dashed line). After Watson & Novelly (2004), with permission from John Wiley & Sons, Inc.

Dealing with opposition

Watson and Novelly (2004) give an example of the predictable sequence of events that opposition to monitoring programmes follows (Figure 4). Opposition is muted at first because ambitious programmes generally collapse under their own weight and thus inaction or passive resistance is the wisest course. Opposition increases after several years of programme operation when the disruption, development and start-up costs are apparent, but not the benefits. This vulnerable stage lasts from year 4 to year 8, by which time sufficient monitoring cycles have been completed to demonstrate its value.

The BAF/BMRS followed this pattern: in 2006 approval was given for development and Tier 1 monitoring was initiated in 2011. A severe, highly public critique of the system followed in 2013 (McSweeney, 2013). Further criticism that the benefits did not match the costs came with the publication of *Vanishing nature: facing New Zealand's biodiversity crisis* (Brown et al., 2015). The timing closely fitted the Watson–Novelly model (Figure 4). Within DOC, commencement of centralised, protocol-based monitoring and decreased local autonomy became a focus of resentment. This development could have been anticipated given that external reviews of DOC revealed a significant disconnect between many of

its professional staff and management (Office of the Auditor-General, 2012). Opposition came from managers whose operations and staff would be affected by the BMRS. Vital support at this stage came from upper-level managers who were championing the programme, and the governmental oversight agencies (State Services Commission, Office of the Auditor-General) who had been promoting better and more systematic assessment programmes in the government sector. Providing well documented plans, analyses, research and preliminary results to bolster this support was essential.

In retrospect, although establishing Tier 1 monitoring as the first operational component of the BMRS made logistical sense as it built on a pre-existing programme (LUCAS), it made the promotion of the broader concept difficult. Critics saw Tier 1 as the whole programme and assumed that rare and endangered species and habitats would be ignored. Faster delivery of relevant, local monitoring information would have made the whole project more palatable.

CONCLUSIONS

"*Good systems tend to violate normal human tendencies*" William Eckhardt (quoted in: Poundstone, 2019).

Monitoring and reporting of status, trend and outcomes is well established for many aspects of our society. We expect up-to-date information on a nation's population, finances, safety and health and a myriad of other aspects of modern life. We do not expect policy and assessment to be based solely on the 'local knowledge' of practitioners – no matter how valuable this is. Biodiversity monitoring and reporting is well out of step with these international trends. National-scale biodiversity monitoring systems have been slow to develop because, while many organisations and researchers could make use of the data, its collection is not a high priority for them. Those systems which have developed often arise from forest monitoring networks which, at least initially, had a clear commercial imperative (see for example, the Mexican national biodiversity system: Garcia-Alaniz et al., 2017). Given the scientific, institutional and individual resistance to large-scale, systematic monitoring, only a well-organised, well-supported national approach can succeed.

The key to developing a national system is therefore two -fold. First, high-level governmental pressure has to be exerted to make monitoring a priority. Second, monitoring has to be placed in the hands of those who see monitoring itself as a mission and who derive professional and individual satisfaction from doing it well. While citizen science initiatives such as iNaturalist can provide useful support, they cannot substitute for this core professional expertise (McKinley et al., 2017).

On the basis of our experience, if the following factors are lacking, we would not advise initiating a systematic monitoring scheme at a national scale:

- legislation mandating the collection of biodiversity information;
- governmental oversight and audit agencies exerting pressure for evidence-based reporting;
- biodiversity agencies engaged in evidence-based policy and assessment;
- inter-institutional support for collective effort.

The most important practical considerations for systematic monitoring at any scale are:

- a high-level framework to guide and coordinate lower-level effort;
- research guiding statistically valid selection of sites, ecosystems and organisms;
- development of monitoring expertise, training and development of strictly implemented protocols;
- a dedicated budget not subject to large yearly fluctuations.

To ensure longevity, we believe the following might be important:

- professional biodiversity monitoring staff;
- regular presentation of results and findings through annual reports, policy and business papers and the media that demonstrate the value of monitoring;
- freely available monitoring data to support research, conservation activity, and feedback through scientific publications and peer review.

We have described how New Zealand got a national biodiversity programme off the ground but are well aware of issues around its continued ability to fly. Even though the BMRS provides the evidence base needed for conservation and policy purposes, its future is by no means secure. As a long-term organisational commitment, it remains vulnerable to budget cuts if other aspects of the DOC's operations are considered to have higher priority. In this, it is no different from many other activities. However, the great advantage of setting up systematic, professionally conducted monitoring is that it provides data and infrastructure of permanent

worth. In this sense, it is crash-proof. Establishment of networks of monitoring sites and locations, documented procedures that are well adhered to in practice, and archiving and publication of results (Bellingham et al., 2020) ensure that hiatuses in data collection are less damaging than they otherwise might be. However, the best guarantee of continuity must be the eventual acceptance by national governments that, if they accept that they have a duty to protect biodiversity, they must also accept responsibility for the systematic collection of information about it, just as they do for so many other aspects of modern life.

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RESUMEN

El Departamento de Conservación gestiona las áreas protegidas de Nueva Zelanda (32% de la superficie terrestre) y las reservas marinas. En los últimos años, se ha ejercido presión para que aporte pruebas tanto en relación con su situación como con las tendencias en materia de biodiversidad. En 2011, el Departamento puso en práctica la vigilancia sistemática de los sistemas terrestres, de agua dulce y marinos como parte de su Marco de evaluación de la biodiversidad. Los datos generados forman ahora parte del ciclo de presentación de informes del Departamento. El sistema tardó seis años en entrar en funcionamiento y fue objeto de fuertes críticas y exigencias para que se abandonara. Aquí analizamos el desarrollo del sistema, los argumentos que se presentaron en su contra y cómo se logró implementar con éxito. Si bien los elementos técnicos y logísticos de un sistema de vigilancia son importantes, la implementación depende –en última instancia– más de factores institucionales y sociales. El esfuerzo de Nueva Zelanda no habría avanzado sin la presión de organismos gubernamentales de supervisión para la presentación de informes sobre la base de datos comprobados, respaldados por legislación que requiere información sobre biodiversidad. Entre los factores departamentales internos cabe citar el apoyo sostenido al programa por parte de los altos directivos ante las preocupaciones del personal, y la continuidad del personal encargado de su desarrollo. A largo plazo, la supervivencia del sistema de vigilancia dependerá de una mayor asimilación y utilización de los datos que proporciona y de la protección de su presupuesto frente a una reasignación arbitraria.

RÉSUMÉ

Le Département de la Conservation gère les aires protégées en Nouvelle-Zélande (32% de la superficie terrestre) et les réserves marines. Ces dernières années, il a fait l'objet de pressions visant à fournir des preuves concernant l'état des aires protégées et de leurs orientations en matière de biodiversité. En 2011, le Ministère a mis en œuvre une surveillance systématique des systèmes terrestres, d'eau douce et marins dans le cadre de son évaluation de la biodiversité. Les données générées font désormais partie du cycle de présentation des rapports du Département. Le système a mis six ans pour devenir opérationnel et a rencontré de vives critiques et des appels à son abandon. Nous abordons ici le développement du système, les arguments avancés à son encontre, puis la manière dont il a été mis en œuvre avec succès. Bien que les éléments techniques et logistiques d'un système de surveillance soient importants, sa mise en œuvre dépend davantage, en fin de compte, de facteurs institutionnels et sociaux. L'effort de la Nouvelle-Zélande n'aurait pas été réalisé sans la pression des agences de surveillance gouvernementales pour obtenir des rapports fondés sur des données probantes, appuyés par une législation exigeant des informations sur la biodiversité. Les facteurs internes au service comprenaient l'appui soutenu des cadres pour le programme face à l'inquiétude du personnel, et la stabilité du personnel chargé de son développement. A long terme, la survie du système de surveillance dépendra de son utilisation accrue, de l'application des données recueillies et de la protection de son budget contre une réaffectation arbitraire.