Mainland islands - restoration at larger scales.

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ABSTRACT

Recent initiatives have been taken aimed at restoring ecosystems at sites on the New Zealand mainland. These projects are based largely on successes in recovering threatened species and eradicating pest mammals on offshore islands, and controlling them at mainland sites. Focused on the threatened wattlebird kokako, the Mapara project in the central North Island has been important in demonstrating that intensive pest management is achievable, and that important conservation objectives may be attained at mainland sites. Apart from developing more sustainable management programmes consideration is now being given to achieving wider ecosystem restoration goals at the Mapara reserve in addition to kokako recovery. Six mainland island projects are currently being undertaken by the Department of Conservation. These projects are important in that they have ecosystem-focused restoration goals. The challenges these goals represent should not be underestimated. A nationally coordinated programme of management experiments at mainland islands is probably the best way to meet these challenges.

Introduction.

Offshore islands have played a key part in successful biodiversity conservation programmes in New Zealand. Combining the translocation of threatened native species with the eradication of exotic mammal pests from islands has allowed for extinctions to be averted and important species recovery objectives to be met (Clout & Saunders 1995). Based on these successes, more recently plans have been developed to broaden management goals, from solely species recovery and habitat rehabilitation, to community and ecosystem restoration (Mansfield & Towns 1997).

Notwithstanding the ecological importance of offshore islands and the significant conservation management opportunities they offer, islands represent only a small fraction of the total New Zealand environment. Important ecosystems such as fertile lowland plains, terraces and swamps are virtually absent from offshore islands. Conservation programmes aimed at these and other ecosystems can only be undertaken at mainland sites (Meurk & Blashke1990).

Unlike "true" islands which are surrounded by water, mainland islands lie adjacent to other lands which are not subject to integrated conservation management programmes. While terrestrial mammals are capable of reaching even remote oceanic islands, re-invasion rates can be expected to be much higher at mainland sites than at true islands. Since managing the impacts of introduced mammals is central to protecting New Zealand's indigenous biodiversity, it is hardly surprising that species recovery and habitat rehabilitation projects have been largely confined to true islands to date. The on-going intensive control of pests and, in particular, limiting their re-invasion, is the primary focus and a major component of current Mainland Island projects. Site attributes such as their shape, size and proximity to

other pest habitats are important considerations in defending mainland islands against pest reinvasions.

Controlling pests.

On the New Zealand mainland where pest animals are able to colonise relatively easily, sustained eradication is generally not feasible. Important advances in controlling herbivorous pest mammals at mainland sites however, have been made. For example, more focused and consistent deer control operations in high priority areas constituted a significant advance over previous relatively ineffectual "clean-ups of problem animals" in high density areas (Miers 1985). Planned approaches based on minimising the impacts of browsing mammals at prioritised conservation sites are now being applied by the Department of Conservation to a growing array of pest animals including brushtailed possum (Trichosaurus vulpecula), feral goat (Capra hircus) and Himalayan thar (Hemitragus jemlahicus) (Parkes 1996). The development and application of improved control techniques such as aerial hunting of goats and deer and the aerial distribution of toxic baits, to periodically reduce possum populations to low densities, have also contributed significantly to achieving important habitat protection objectives.

Conservation management at mainland sites has been focused on protecting identified biodiversity assets; that is, maintaining the status quo or minimising further loss. The practical difficulties in managing the impacts of pest mammals at mainland sites mean that only relatively small areas can be intensively managed on an on-going basis, whereas larger areas are subjected to less frequent management. While important control objectives have been achieved at some sites, a range of factors serve to limit the value of the conservation outcomes of these protection management programmes. Pest control regimes are typically focused on only one or a few, of a range of pests present. While populations of critical pests may be reduced to levels where desired conservation outcomes are achieved, any benefits may be offset by "ripple effects" in other pest populations. For example, intensive control of rodents has led to stoats (Mustela erminea) switching to preying primarily on birds once rodents became unavailable (Murphy & Bradfield 1992).

The sheer logistical problems in controlling critical pests to densities where they do not have unacceptable impacts on identified conservation resources, and maintaining them at low densities in the face of reinvasion pressures from adjacent areas represents another important factor in limiting the success of conservation programmes at mainland sites.

The Mapara project.

The initiation of the Mapara project in 1989 constituted an important advance in conservation management in New Zealand. Located in the northern King Country, the Mapara Wildlife Management Reserve is a 1400 hectare fragment of cutover podocarp/hardwood forest in an essentially pastoral landscape. The reserve was chosen as a conservation management site because a population of the threatened wattle bird kokako (Callaeas cinerea wilsoni) persisted there. A further important consideration was that the reserve was viewed by managers as "an island of forest in a sea of pasture" (Saunders 1990) where recently-developed pest animal control techniques could be focused and pest re-invasion could be potentially managed on

the borders of the reserve. The aim of the Mapara project was to investigate the cause of decline and to increase the kokako population within the reserve using an experimentally-based management approach. The Mapara project formed part of an eight year adaptive management experiment (Walters & Holling 1990) in the central North Island involving two treatment areas and one non-treatment area in similarly-sized forest fragments containing kokako (Innes et al.in press). Results to date have been quite spectacular: the kokako population's decline has been halted and the adult population doubled in four years (Bradfield & Flux 1996).

The Mapara project has been important for several reasons. Firstly, it showed that pest animal populations such as possums and ship rats (Rattus rattus) could be reduced to very low levels and maintained for ecologically meaningful periods. Secondly, significant increases in kokako chick output and adult density could be attributed to the pest control applied. Thirdly, the application of an adaptive management approach (including scientific coordination, detailed monitoring, treatment switches and non-treatment comparisons) allowed for scientifically robust conclusions to be reached (Innes et al. in press). Research results indicated not only the importance of predation by introduced mammals such as possums and ship rats as a factor limiting kokako survival, but also the population levels of critical pests which may need to be achieved. As a result of the Mapara project, Innes et al. concluded that very low population densities of possums and ship rats would need to be achieved at the onset of the kokako breeding season for several consecutive years if kokako populations are to be recovered. Such information is extremely valuable to managers in planning species recovery and ecosystem restoration projects at mainland sites where different suites of pests may be targeted for control.

While the Mapara project continues to be focused on kokako recovery, observations of other ecological responses to intensive pest animal control (such as changes in vegetation composition, structure and phenology, increased invertebrate community diversity and increases in the numbers of forest birds counted) led to a recognition that wider ecosystem restoration goals may be more appropriate for the reserve. A draft strategic plan for the reserve prepared in 1996 includes a vision statement that "Mapara is a national model in sustaining indigenous biodiversity and key endemic species of flora and fauna typical of the Taumaranui Ecological District" (Bradfield 1996). Given the progress which has already been made, and the declared vision to broaden the focus of research and management, it is likely that the Mapara project will continue to be an important "flagship" for conservation management at mainland sites for the forseeable future.

<u>New restoration projects</u>.
In 1995 and 1996 six mainland restoration projects were initiated by the Department of Conservation (Fig.1). Intensive management is currently being undertaken over about 8,500 hectares in these projects. They range from 117 hectares at the Paengaroa reserve in the central North Island to more than 6,000 hectares in the Hurunui South Branch area in north Canterbury.

It could be argued that these areas are too small to significantly contribute to national biodiversity conservation objectives. In acknowledging the major challenges involved in successfully restoring mainland ecosystems, however, there is good sense in adopting a strategic approach starting with relatively small areas where management objectives are more achievable and where responses may be easier to observe. While there are obvious limitations to expanding operations at "habitat islands" which are surrounded by essentially exotic environments such as farmland, extensions to original core management areas have already been proposed at two of the "habitat complex" mainland islands (northern Te Urewera, Hurunui). It can be anticipated that, as confidence grows in the efficacy of the management applied, core management areas will be further extended, leading to more significant conservation outcomes in a landscape context.

Fig 1. Mainland restoration projects initiated by the Department of Conservation in 1995 and 1996.

INSERT MAP HERE.

These projects are important in that they represent a move towards a more ecosystem-focused approach, rather than directed at protecting one or two threatened species or controlling some of the pests present. They reflect the Department's declared intention to focus on ecosystems as entities as well as the species within them (Anon. 1998). Each of these mainland island projects has a declared goal which includes the concept of "ecosystems" (Table 1). These goal statements also identify an intention to restore biodiversity values rather than to protect the status quo.

Table 1. Mainland restoration project goals.

PROJECT	*GOAL*
Trounson Kauri Park	***'To restore ecological processes and components of a kauri/mixed podocarp hardwood forest ecosystem including the re-introduction of regionally extinct or threatened flora and fauna.'***
Northern Te Urewera	***'To acknowledge and nurture the mauri of the northern Te Urewera ecosystem.'***
Boundary Stream	***'Boundary Stream Scenic Reserve will be restored by careful nurturing and enhancement to the vibrant ecosystem it once was. It will be a place where the public can visit and enjoy a flourishing fauna and flora reminiscent of a typical Hawke's Bay forest of the past. It will be a showpiece for the conservancy, providing a centre for community involvement and demonstrating what can be achieved in protecting and enhancing biodiversity given sufficient resources, enthusiasm, commitment and public support.'***
Paengaroa	***'To restore and enhance the outstanding biodiversity of Paengaroa Scenic Reserve. To utilise the reserve's outstanding values to promote public awareness of the composition and functioning of a unique ecosystem with many rare elements.'***
Rotoiti	***'Restoration of a beech forest community with emphasis on the honeydew cycle. A restoration goal such as this has been expressed evocatively as 'restoring the mauri (health and life force) of the forest ecosystem'***
Hurunui	***'To protect the beech forest ecosystems of the North and South Branches of the Hurunui River and restore them as much as possible to their original states and secure their species assemblages and unique habitat character. To***

	develop effective and efficient predator and pest control programmes for large valley based beech forest habitats, and to ensure these developments are tested in a robust and scientific manner.'

<u>Challenges.</u>
While these goals may be seen as a natural progression from the single species/critical pest management approach, the challenges that they represent should not be underestimated. Careful deliberations are required in order to define in practical terms what is meant by "ecosystems" and how to place boundaries on ecosystem management areas. Theoretical and logistical difficulties in defining ecosystems and setting management boundaries, it could be argued, mean that it is both inappropriate and unrealistic to set ecosystem-focused goals. Furthermore, there is still no general agreement on the key elements of restoration in a New Zealand context. For example, it has been suggested that restoration goals must include a previous time period to which restoration is directed (e.g. Atkinson 1994), whereas others have suggested that more flexible requirements are more appropriate (e.g. Norton 1998). A more realistic goal, it could be argued, would be to restore species assemblages or, perhaps, biological communities where the focus is on managing the linkages between selected species. In recognising the advances which have been made, and the declared intention that conservation management should be ecosystem-focused, a cautious and sequential approach should be adopted recognising these limitations whilst moving towards more holistic, sustainable management regimes.

An important challenge in adopting an ecosystem focus for management will be to refine management objectives and performance measures so that our understanding of ecosystem processes and of ecological responses to management is enhanced. A "learning-by-doing" (Walters & Holling 1990) approach is likely to be most productive in achieving a better understanding, and in determining the potential for managing natural resources using an ecosystem focus. Once strategic questions have been identified, a nationally coordinated programme of management experiments is likely to be the most efficient way to make further advances. Given that intensive management and associated monitoring and research are features of mainland island projects, they would appear to have unique attributes as "natural laboratories" where our understanding of ecosystem processes, and of our ability to appropriately manage what remains of New Zealand's natural biodiversity, may be advanced. Such experimental restoration areas would also be important sites where cooperative research projects could be focused, and where education and advocacy programmes are based.

Acknowledgments

Thanks are due to my Department of Conservation colleagues Rod Hay, Don Newman, Jaap Jasperse and Chris Edkins for providing helpful comments and advice on a draft of this paper.

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