

# The Victorian Naturalist

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**The Pest Issue**



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# The Victorian Naturalist

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December



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## Introduction

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Upon occasion, *The Victorian Naturalist* receives articles that can be published together as a special issue relating to a single theme. This serendipity occurred in 2010, when all articles in 127(4) concerned one or more environmental weeds. The present issue is the first that focuses solely on Australia's environmental pest species. *The Pest Issue* was suggested by Dr Desley Whisson from Deakin University, who is thanked for her editorial assistance and efforts in searching out willing authors.

*The Pest Issue* provides readers new to the topic with an entry into the world of Australian environmental pests and their management, while the expert is alerted to current projects

and practices. Articles are not in any particular order, but are loosely divided into three groups. The sequence begins with four ostensibly miscellaneous papers, each of which demonstrates the human dimensions of pest issues. Whisson *et al.* provide an overview of the history of pest plant and vertebrate introductions and their impacts. For more than a decade, Acclimatisation Societies introduced into Australia, acclimatised and domesticated species deemed useful or desirable; and introduced native species into areas of Australia where they were previously unknown. But, of course, too much of a good thing causes it to lose some, or all, of its gloss. Proliferation of certain plants and

# Community-led approaches can lead to better outcomes for management of European Rabbits *Oryctolagus cuniculus* and other invasive species

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## Abstract

European Rabbits *Oryctolagus cuniculus* are incredibly devastating pest animals in Australia and New Zealand. For over 150 years, different approaches to managing impacts of Rabbits have been considered with varying levels of success and longevity. The focus of Rabbit management has traditionally been directed towards mitigating the impacts on agricultural production, where the economic costs are significant. Negative environmental, social, and cultural impacts are often overlooked. We briefly report on the history and problem of Rabbits and their management, leading to the focus of the paper—a community-led approach to managing Rabbits via the Victorian Rabbit Action Network (VRAN). This approach considers that the key to successful strategies for management of European Rabbits is to understand the stakeholders. More specifically, it is about understanding the individuals and organisations involved in Rabbit management and having a deep appreciation of their interests, needs, knowledge and experience, and of the political and cultural dimensions. This approach to Rabbit management brings together different types of knowledge, experiences and perspectives to address a common problem. It fosters creativity and innovation, is flexible, nimble and agile, and coordinates limited resources effectively. This inclusive approach, which has broad reach across rural and regional communities of Victoria, has resulted in a positive change in mind-set and practice. VRAN may be considered a blueprint of what can be achieved for all system participants through shared responsibility in addressing a significant biosecurity issue. It offers a mechanism whereby significant issues facing our society, such as the relationship between biodiversity, climate change, loss of habitat and invasive alien species, can be discussed and acted upon. (*The Victorian Naturalist* 137 (6), 2020, 210–219)

**Keywords:** community, engagement, invasive species, Rabbits, wicked problems

## Introduction

The European Rabbit *Oryctolagus cuniculus* in Australia and New Zealand is an incredibly devastating mammalian invader. Only the House Mouse *Mus musculus* exceeds the abundance of Rabbits in Australia as an invasive alien mammal (Williams *et al.* 1995). Indeed, Rabbits are considered the most widespread and abundant wild herbivore in southern Australia (Mutze 2016) and have a major presence and impact in every state. The sheer number of Rabbits in Australia, their broad distribution across much of the continent, combined with their herbivory and semi-fossorial habits means that this species poses a significant threat to biodiversity

through land degradation and competition with native herbivores (Reddiex *et al.* 2007; Commonwealth of Australia 2016a).

Over the past 150 years, management of Rabbits in Australia has primarily focused on mitigating their economic impacts (i.e. negative impacts on agriculture). Soon after Rabbits were successfully introduced to Victoria in 1859, authorities across Australia recognised that they seriously impacted Australia's primary production. The speed, scale, and extent of the reaction by authorities to manage Rabbits was unheralded. The first legislative tool, *The Rabbit Destruction Act 1871*, was

introduced on 21 December 1871 to 'provide for the destruction of Rabbits in Tasmania' (Stoddart and Parer 1988), followed by similar legislation in other jurisdictions in subsequent years. Recognising that continent-wide spread was inevitable, twenty-six years later the Western Australian Government took action to prevent Rabbits expanding into that state. The world's longest fence was started in 1901 and completed in 1907 to prevent the westward movement of Rabbits into the pastoral areas of Western Australia (Williams *et al.* 1995). This was a significant capital investment in prevention, which turned out to be unsuccessful. Australia's Rabbit-proof fences and their remnants today are testimony to the risks posed by, and consequences of, this species' presence.

According to contemporary estimates, Rabbits cost rural economies across Australia more than \$200 million per annum (Gong *et al.* 2009). This impact cost estimate is typically framed in terms of lost agricultural production, and, to a lesser extent, cost of control (Reddiex *et al.* 2007). The economic analyses of McLeod (2004) and Gong *et al.* (2009) have been used to quantify the monetary impact of Rabbits. These provide supporting evidence for additional research and development, particularly for biological control methods in Australia, such as boosting Rabbit biocontrol via an additional variant ('K5') of Rabbit Haemorrhagic Disease Virus (RHDV1) (Strive and Cox 2019).

With the focus on managing the economic impacts of Rabbits, a variety of tools and techniques have been developed, applied, and adapted. These include the introduction of legislation over time (e.g. *The Rabbit Destruction Act 1871* in Tasmania, the *Rabbit Destruction Act 1875* in South Australia, *The Rabbit Suppression Act 1880* in Victoria and the *Rabbit Act 1902* in Western Australia), a suite of extension products and tools to inform communities how to manage Rabbits (Williams *et al.* 1995), chemical control tools (e.g. 1080, pindone, fumigation), physical control tools (e.g. warren ripping, ground shooting), and biological control (e.g. RHDV1 and myxomatosis) (Williams *et al.* 1995; Brown 2012). These tools have been very effective at reducing Rabbit numbers and negative impacts, and produce associated economic and environmental benefits (Cooke *et al.*

2013). However, the inexorable reproductive biology of Rabbits has made such effects ephemeral over time. Rabbit populations are not static; they move, and are thus a common property problem, a 'wicked' one at that. Hence, a collaborative, coordinated landscape-scale approach to management is necessary. The key to success in our experience is community participation, engagement and empowerment (Adams *et al.* 2019; Reid *et al.* 2019), so that control programs are locally relevant, 'owned' by the community, and more resilient to shifting government priorities and staff turnover. Empowering communities to take ownership of Rabbit management is the main focus of this paper.

### **Rabbits are a significant environmental problem**

Rabbits are one of the most widely distributed pest animals in Victoria, occurring in a wide range of habitats. They are found from sub-alpine regions through to the arid landscape of the Mallee, throughout the central ranges and grasslands through to the southern and eastern coastal plains. Soil is a major indicator of susceptibility to Rabbit infestations, with the species preferring deep and sandy soils. Non-arable rough country, which includes creeks and river banks, erosion gullies, rocky outcrops and forest grassland interfaces, is particularly susceptible to high Rabbit densities (Myers *et al.* 1994). The Rabbit population across Victoria fluctuates significantly as a result of factors such as breeding events, the impacts of bio-control agents or extreme climatic events (e.g. droughts), and availability of feed (Commonwealth of Australia 2016a).

Rabbits have a disastrous impact on Australian flora and fauna, competing with wildlife for food and shelter, damaging native plants through grazing, and preventing the regeneration of seedlings. Figures 1–5 provide examples of the severity of damage Rabbits can cause. Rabbits impact over 300 species listed as threatened under the *Environment Protection and Biodiversity Conservation (EPBC) Act*, including 44 fauna species and 260 plant species (Commonwealth of Australia 2016b).

According to Williams *et al.* (1995), decades of intensive grazing pressure by Rabbits (alongside other introduced animals) has likely





**Fig. 1.** Evidence of Rabbit grazing causing ringbarking of tree.



**Fig. 2.** Paddock overgrazed by Rabbits and grazing-height of tree foliage demonstrated.



**Fig. 3.** Disturbed soils with weeds result from Rabbits selectively grazing and removing palatable pasture and tree species.



**Fig. 4.** Impact of Rabbit grazing on seedling.



**Fig. 5.** Rabbit grazing on new planting.



permanently altered Australian landscapes, with many grass and herb species having disappeared prior to the introduction of Rabbit biological control. The same authors reported that the extent of damage to rangeland shrubs and trees is often masked by their long life span and episodic regeneration; however, the replacement rate of ecologically sensitive rangeland vegetation communities is often insufficient to prevent their disappearance in the long-term, even when Rabbits are present in low numbers. Bird *et al.* (2012) reported damaging impacts on she-oak regeneration at much lower densities than previously reported and suggested that the low-density threat is likely to be mirrored in many other tree and shrub species. The review conducted by Williams *et al.* (1995) suggested that for many of the more palatable native species—for example, some species of *Acacia*, *Stipa* and *Danthonia*—there may be no safe Rabbit density, with regeneration observed only when Rabbits are completely excluded.

Beyond their direct impacts on seedling survival, Rabbits also significantly damage native animal populations through competition for food resources, habitat damage, and indirect impacts on predator populations. Cooke and Mutze (2018) reported on the similarities between the quality of foods selected by Rabbits and those needed by young kangaroos, and observed increases in kangaroo numbers following removal of Rabbits. Bird *et al.* (2012) showed increases in both kangaroo and wombat numbers following Rabbit control, but that the higher density of both genera had no measurable effect on native seedling survival rate. Pedler *et al.* (2016) reported that the release of RHDV1 has been the single most important factor in dramatic increases in the numbers of several small threatened mammals in arid inland Australia, due to decreased competition for food resources and declines in Rabbit-dependent predators. A lag-time between a decline in Rabbit numbers and the corresponding drop in predator numbers can result in intense predatory pressure on native mammal species for a short period after the Rabbit crash. If the Rabbit reduction is sustained through ongoing management, this pressure occurs once; if Rabbit numbers ‘yo-yo’ due to improved seasonal conditions or lack of ongoing management, the

predatory pressure happens again and again, causing severe and lasting damage to native mammal populations (Williams *et al.* 1995).

### **Reframing the Rabbit problem**

There is no easy solution to the Rabbit problem—Rabbit management is a classic ‘wicked’ problem (Rittel and Weber 1973) with its tangle of economic, ecological, sociological, and political influences. Management of Rabbits in Victoria is complex, in part because there are so many organisations involved, each with differing agricultural and environmental objectives. This situation has resulted in the wide distribution of investment across organisations, each with their own institutional arrangements and politics. The structure of our public institutions often does not allow integrated programs across the triple bottom line (agricultural/economic, social and environmental outcomes), meaning environmental and social drivers are often lower in priority than agricultural ones.

A range of effective, scientifically proven Rabbit control methods are available (Williams *et al.* 1995). But across any given landscape, the acceptable level of Rabbit density differs depending on the outcome sought: in cropping areas, a few Rabbits might be acceptable from a production (agricultural) perspective, whereas complete eradication of Rabbits is fundamental to the environmental drivers on Macquarie Island (Springer 2016). Similarly, densities of less than one Rabbit per hectare can continue to suppress native seedling survival in sensitive conservation areas (Bird *et al.* 2012) but may be enough to meet landholders’ regulatory requirements under the *Catchment and Land Protection Act 1994*. Moreover, these regulatory requirements might protect agricultural values, but they may fall short of achieving environmental protection. Managing Rabbits for environmental outcomes typically requires more intense management inputs.

Across Australia there has been an institutional shift towards a model of ‘shared responsibility’ for biosecurity (Council of Australian Governments 2019), including for management of invasive species such as Rabbits. This shift recognises that governments cannot act alone to deliver or enforce the sustained and coordinated efforts that are needed for effective



control (Martin *et al.* 2016), and that greater community involvement and collaboration is needed. But despite the strength of the control methods and technologies available to manage Rabbits, there is no comparably robust framework for managing the human dimensions of Rabbit control (Martin *et al.*, 2016)—that is, the human behavioural and social capacity elements that determine the likelihood of individuals and communities to initiating and maintaining an effective Rabbit control program.

In addition to a shift towards ‘shared responsibility’ (Council of Australian Governments 2019) there are some systemic socio-economic and cultural forces afoot in rural and regional Australia that play significantly into the dynamic of managing invasive alien pests. Some of the key changes that impact invasive species management include diminishing resources (declining public investment), changes in government priorities, less capability (fewer people) and capacity (declining knowledge base), and a growing disconnect between rural and urban communities. These changes, and shifting cultural norms associated with them, can be seen in communities where ‘tree changers’ have limited knowledge or interest in land management obligations (Ragusa 2010), or communities where there is a skewed age demographic (O’Callaghan and Warburton 2017) which is then reflected in the activities of community Landcare groups.

### **A community-centred approach to Rabbit management**

Given the Rabbit’s prolific breeding and mobility, coordinated and cooperative approaches to managing Rabbits are imperative. Yet across the socio-political system there are multiple stakeholders across both public and private institutions. These stakeholders have varying interests and capacities, and differing incentives and constraints that affect their participation in addressing Rabbit management problems. Because of these complex arrangements and barriers, aspirational approaches to Rabbit management, such as tenure blind (e.g. Braysher *et al.* 2012), could be considered unachievable. Instead, a facilitating organisation mechanism is required to support a co-operative and collaborative approach involving both public and

private land managers. The status quo approach to Rabbit management is a regulatory paradigm of command and control, i.e. enforcement. A new paradigm is needed—one which is disruptive to the status quo approach and reflective of contemporary community expectations and available resources.

In this context, our first step was explicitly to embrace the complexity of Rabbit management in Victoria. We deliberately identified Rabbit management as a ‘wicked’ problem (Adams *et al.* 2019), with no single solution; responsibility for management resting with multiple actors; and no precise definition of the issue (Head and Alford 2008). This framing recognised the inherent contestability and political nature of the ‘Rabbit problem’ and the need for sustained behavioural change on the part of multiple parties (Australian Public Service Commission 2012) as central to effective management and control. Rather than focusing on either agricultural or environmental outcomes, our approach was to deepen the participation of all stakeholders, particularly community, to develop a community-led approach. In concert with community partners and private landholders, we sought to co-create a model of cooperative governance, ensuring that people most affected by Rabbits are central in the process of defining the problems, co-creating strategies to address these problems, and sharing in investment decisions. Through this collaborative effort, the Victorian Rabbit Action Network (VRAN) was co-created as an enabling structure for Rabbit management in Victoria. Under this model, multiple initiatives were developed to build capacity and capability of the people who manage Rabbits through training, community engagement and promotion of best practice control techniques.

### **Victorian Rabbit Action Network (VRAN)**

VRAN was established as a vehicle to reframe the collective thinking about the Rabbit problem and how it can be managed. It is a cooperative institution between citizens and government, conceived and built on the basis that Rabbit management in Victoria can be improved by bringing everyone together. Such improvement stems from the differing expertise, experiences and insights that people who do not normally

work together bring to the discussion and collaboration. This ‘new’ or non-redundant information is a source of learning, creativity, and innovation for individuals and across the group. As a facilitating entity, VRAN provides the strategic mechanism to bring community voices and experiences into the design and development of programs. This recognises that community-led approaches are as much about social empowerment as they are about solving technical problems. Community-led approaches can improve the resilience and effectiveness of management programs by building social capacity, bringing local knowledge and experience to bear, changing institutional structures and processes, and shifting to shared decision-making. VRAN provides a mechanism to enable more integrated, inclusive, and constructive politics among those involved (government, non-government and private organisations, and individuals). The politics and relationships formed through the facilitating processes of VRAN serve to sharpen attention and thinking on the desired outcomes and how to achieve them. Inevitably, the outcomes address managing the impacts of Rabbits for economic, environmental, and social value rather than just one of these elements.

A key strength of the VRAN approach is its focus on enabling outcomes by responding to needs identified by the participants themselves, largely through communication, training, education, coordination, networking and working to a common goal. That is, learning how to apply a control tool in the right circumstance is a core skill that is required regardless of whether the objective is to protect biodiversity or agricultural land. Collectively understanding the nuances associated with the application of management tools for biodiversity (e.g. not

being able to warren rip an ecologically sensitive area) or cultural protection (e.g. protecting Aboriginal burial sites) enables communities and governments to reach a common understanding of what needs to happen and how to achieve it. The approach has brought together stakeholders that once worked independently at best or against each other at worst.

**Emerging impacts of VRAN**

As with any disruptive initiative, it is important to measure the change that can directly be attributed to VRAN. In an independent impact analysis (ACIL Allen 2017), the two most significant changes attributable to VRAN were an increase in knowledge and awareness of the need for coordinated Rabbit management and the development of supportive networks to deliver effective Rabbit management. VRAN has increased knowledge and collaboration, built confidence in best-practice Rabbit control, improved relationships and networks across different parts of the Rabbit management system, and changed mindsets about how institutions and community groups can work together (Table 1).

The cooperative governance model ensures that people most affected by the Rabbit problem are central in the process of defining the problems, co-creating strategies to address these problems, and sharing in investment decisions. Through VRAN, there has been a significant shift in governance for Agriculture Victoria, one requiring government biosecurity directors and program officers to engage democratically with citizens in sharing decision-making responsibility and power for Rabbit management—in effect, to work as democratic professionals (Dzur 2018). Now, instead of Agriculture Victoria delivering its programs to

**Table 1.** Impact of VRAN in first three years of establishment. Source: ACIL Allen (2017).

**Key observations**

|                    |  |
|--------------------|--|
| Reach              | Engaged more than 5200 people directly and indirectly<br>34% of these people were engaged with Landcare  |
| Change in mind-set | 55% of people changed their views on collaboration<br>59% of people have been inspired to increase rabbit management activities<br>55% of people have increased confidence to manage Rabbits |
| Practice-change    | Over 80% of people have made changes to how they consider integrated approaches to rabbit management   |

the community, it is working with the community to design programs, so that they are locally supported, relevant and more effective.

### Case Study—Neds Corner

Neds Corner Station is the largest freehold property in Victoria. It is an example of the ecologically significant Victorian mallee habitat that is extremely sensitive to intensive grazing from livestock, native herbivores and Rabbits (Sandell 2002).

In 2002, Neds Corner was purchased by the Trust for Nature in recognition of its biodiversity, geological and Aboriginal values. Trust for Nature set about removing livestock and undertaking a program of extensive Rabbit and European Red Fox control, as well as large-scale revegetation activities. Now, what was once described as ‘bare sand hills, grazed by thousands of Rabbits which weren’t allowing any native regeneration’ (P Barnes, manager Neds Corner Station, Trust for Nature) is vegetated with saltbush and bluebush vegetation. At the peak of the Rabbit problem, spotlight counts were averaging 30–35 Rabbits per kilometre, and after a decade of work, the average is now 0.4 Rabbits per km.

VRAN has leveraged and added to the success of Rabbit management at Neds Corner, with flow-on benefits for the broader Mallee ecosystem. The manager of Neds Corner was one of the first graduates of a VRAN training program on Rabbit management (called a bootcamp). The bootcamp laid the groundwork for developing an ongoing community of practice called the Leaps and Bounds learning network. This network meets regularly to share information, experience, and expertise on Rabbit management. Through the bootcamp and the Leaps and Bounds learning network, the manager of Neds Corner felt his approach changed from killing Rabbits to a more strategic approach of managing their impacts. The success of Neds Corner as an exemplar of Rabbit management and the advocacy of the VRAN approach has had flow-on benefits to the broader community (ACIL Allen 2017). Sharing of experiences on the complexity and challenges of managing Rabbits on a large scale, combined with advocacy of continual learning and reflection, empowers other communities that are dealing with similar issues (Muth *et al.* 2019).

### Discussion

It is important to frame our work in terms of contemporary biosecurity policy in Australia. The first principle of the Intergovernmental Agreement on Biosecurity (IGAB) is that ‘Biosecurity is a shared responsibility between all system participants’ (Council of Australian Governments 2019). Although ‘shared responsibility’ is central to our approach to Rabbit management, there is a tendency for this term to become overused and therefore unhelpful. Moreover, there is often limited attention paid to the second part of the principle being ‘all system participants’. The focus of our work has been on both the ‘shared responsibility’ and the ‘system participants’, which we consider to be essential for complex biosecurity issues such as Rabbit management. As Australia’s key national biosecurity policy, IGAB is not particularly informative about how its principles can be implemented by the broader community or system participants. Therefore, we believe that VRAN could be considered a blueprint of what can be achieved for shared responsibility of a significant biosecurity issue in Australia.

VRAN is an important enabler of ‘shared responsibility’ and is a facilitating organisation for the ‘system participants’. It brings together people with different ideas, experience, and expertise. VRAN has made it possible to learn creative and innovative activities in a safe, non-judgemental environment. Through VRAN’s network-building function, the many stakeholders involved in Rabbit management in Victoria now have a more accurate working knowledge of what is happening in practice and how community action on Rabbits can be made more effective. As a result of VRAN, a wider range of knowledge, expertise and experience can now be harnessed for determining interventions that improve the quality of Rabbit management in ways that are locally relevant. Environmental objectives are treated in the same manner as agriculture protection. Mechanisms enabled by VRAN, such as training, education, learning networks, community engagement and so on, have broad reach in terms of numbers of people and geographical regions (Table 1).

Another important principle of IGAB is that 'System participants are involved in planning and decision-making according to their roles, responsibilities and contributions' (Council of Australian Governments 2019). Shared responsibility and decision-making requires sharing of power. VRAN has shifted power relationships and dynamics for all involved, and such shifts can be empowering for some interests and threatening for others. It is unavoidable that the matters that VRAN addresses are politicised. Diversity of opinion is critical for a democratic process. We have found that shifting the power dynamic is a key part of the disruptive nature of VRAN. It is also a key reason for VRAN's success and more reflective of true system participation.

At the heart of VRAN are relationships. The relationships stemming from VRAN have not only been instrumental to VRAN's success but have also prepared the people, organisations, and communities involved to deal more quickly and more effectively (because they know each other) with other unrelated issues, both known and unimaginable, that will confront them in the future. This may be the real legacy of VRAN: preparation for handling the radical uncertainty (Kay and King 2020) that is the existential reality of life and living in our world. VRAN offers the vehicle where the relationship between biodiversity, climate change, loss of habitat and invasive alien species (Pereira *et al.* 2012) can be discussed and acted upon.

We believe the VRAN approach can be applied to other complex issues concerning invasive species: many stakeholders; diverse and contested views; shortage of funds; and, as noted, complicated lack of, and/or failure of regulatory or policy tools. This approach is important where there is discrepancy in the value of investment across the triple bottom line and/or real or perceived lack of leadership from government (Martin *et al.* 2016). For Victoria, the management of deer (Davis *et al.* 2016) would be an ideal application.

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## Eradication of Feral Pigs on Quail Island to protect and restore ecological values

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### Abstract

Feral Pigs (*Sus scrofa*) were illegally released onto Quail Island in 2008 and subsequently caused damage to soil and vegetation on the island. Damage observed across the 700 ha island included pugging, creation of wallows, competition for water, creation of trails, promotion of weed spread and predation of wildlife. Control activity undertaken periodically since 2013 was scaled up in 2019 to include aerial and ground shooting. No Feral Pigs were detected on the island in the twelve months that followed ground shooting, suggesting that the population had been eradicated. This paper reports on the procedures required to eradicate a small Feral Pig population on an ecologically sensitive island. (*The Victorian Naturalist* **137**(6), 2020, 219–227)

**Keywords:** island restoration, Ramsar, invasive species, camera detections, aerial and ground shooting, poison baiting

### Introduction

Quail Island (38.234003S, 145.291267E), located within the North Western Port Nature Conservation Reserve, is a Ramsar Convention-listed wetland of international importance due to its ecological, botanical, zoological and

hydrological importance. Significant vegetation communities include herb-rich woodlands, swampy scrubs and woodlands, heathlands, mangrove, samphire shrubland and saltmarsh communities. Salt Lawrenca *Lawrenca spicata*