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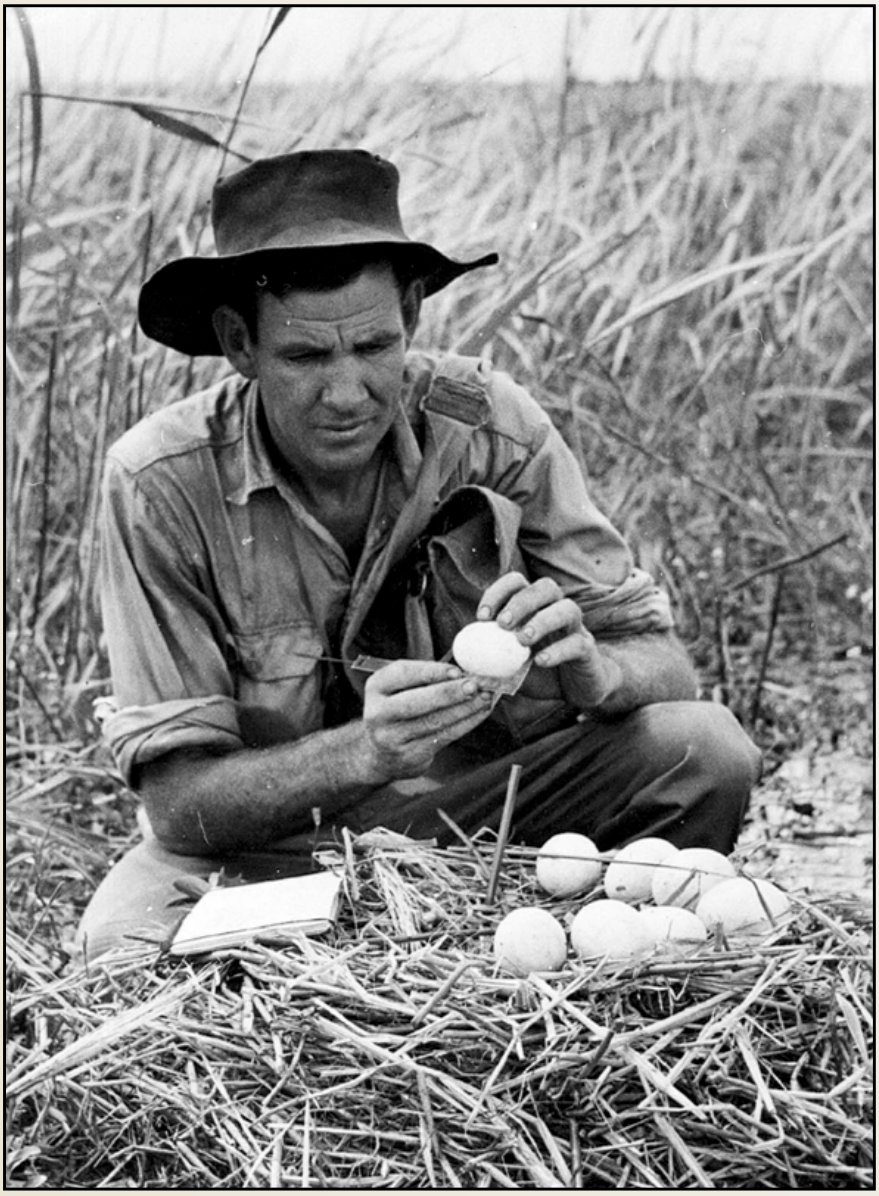
Ecology takes on the human touch

CSIRO Wildlife and Ecology turned 50 this year amid debate about funding directions that favour applied research. While some fear the loss of 'pure science', others say that people belong to system, and understanding and influencing their role is part of the challenge of ecological research.

Alastair Sarre reports.



Research by CSIRO Wildlife and Ecology has provided the basis for managing duck hunting and understanding relationships between waterfowls and their habitats. A former chief of the division, Harry Frith, is pictured measuring eggs in the field.

Wildlife ecologist Rob Lambeck spends a fair bit of his time staring through binoculars. He's looking for birds – quite rare birds, these days – in the remnant bushland of Western Australia's wheatbelt.

But it's not the only reason he needs good vision. He's one of a new generation of scientists at CSIRO Wildlife and Ecology, which, like the wildlife, has been undergoing testing times of late. There has been a change in the forest of its personnel: the old growth, nurtured in the post war years and highly productive for several decades, is beginning to make way for new stock, new scientists, who vie for the canopy openings.

The process has been – still is – traumatic, compounded by some dramatic changes in the wider environment. Indeed, the mere survival of the division in the rough-and-tumble world of funding cuts and policy shifts is surely a tribute to the quality of its science and its personnel. This year, the division is celebrating its 50th birthday. It's a time of reassessment: where has the division come from, and where is it going?

For Lambeck and his colleagues, both young and old, new visions are beginning to emerge. And they concern the future not only of the division, but of the nation as well.

The evolving animal

Like many things biological, the division started off small. Francis Ratcliffe, a scientist with a great love of Australian wildlife, was asked to

establish a CSIRO Wildlife Survey Section in 1949. But native species received scant regard in those days: the primary purpose of the new section was to find better methods of dealing with the arch enemy of Australian farmers: the rabbit.

And success came much sooner than expected. Since the 1930s, the myxoma virus had been proposed as a biological control agent, but it had proven ineffective in trials. Ratcliffe and his fledgling Wildlife Survey Section set out to conduct one last, conclusive test, releasing the virus on properties along the Murray River.

For a while, nothing happened. Then, in late 1950, reports started coming in of a massive rabbit die-off along the Murray, Murrumbidgee, Lachlan and Darling rivers. Ratcliffe dubbed it 'a spectacular epidemic which for scale and spread must be almost without parallel in the history of infections'. Myxomatosis had arrived – and so too had wildlife research.

According to Hugh Tyndale-Biscoe, who was starting his career in science at this time, the success of the myxoma virus did two things for Ratcliffe and his team. 'It brought a lot more money into the Survey Section, and raised its profile enormously,' he says.

Research into rabbit control continued – the myxoma virus didn't solve the problem completely – but the section was able to begin studies on native fauna. In the early days, the emphasis remained on 'pests'. The emu, the red kangaroo, the black cockatoo, the magpie goose and the dingo were all the subject of studies because of their perceived economic impacts on grazing and agriculture. But gradually, the emphasis shifted towards studying the native fauna for its own sake.

This shift was magnified with the appointment in 1961 of a new officer-in-charge, Harry Frith.

'Conservation was beginning to grow as an element of concern in Australia,' Tyndale-Biscoe says. 'Harry Frith was a very good advocate of the need for research on the native animals – birds and mammals particularly – and he encouraged the study of the native fauna.'

Frith himself conducted pioneering studies on mallee fowl, ducks, zebra finches and native pigeons and doves and was one of the first proponents of a national park at Kakadu. Other scientists under his command produced some of the earliest information on such distinctive species as the numbat, the echidna, the common magpie, the tammar wallaby and the lyrebird.

Research on individual species continued through the 60s and 70s as the section grew in stature. It became the Division of Wildlife Research in 1961 and the Division of Wildlife and Ecology in 1986. By then, the 'third era' in its evolution had been ushered in by Brian Walker, who has been chief since 1984.

'What has happened in the past 15–20 years, accelerating in the past 10, has been a move towards an understanding of the ecology of systems rather than simply of individual species,' says Steve Morton, leader of the division's Sustainable Landscapes Program. 'It's becoming clear that to manage for conservation and pest control you actually need to manage the system, not just the species.'

The division now has some 250 staff, with laboratories in Perth, Darwin, Alice Springs and Atherton and headquarters at Gungahlin on the outskirts of Canberra. Its research revolves around four broad themes: applied resource ecology, managing vertebrate pests, conserving biodiversity, and exploring the options and pathways of future development.

There have been inevitable growing pains, such as when the ranks were swelled by the absorption of the Rangelands Research Unit and by staff from the divisions of Water and Land Resources, and Forest Research. In recent years, too, some of the most senior and authoritative of its wildlife biologists have retired, losses that were compounded in 1994 by the untimely death of Graeme Caughley, a brilliant wildlife ecologist at the peak of his career.

Robert Lambeck (standing) from CSIRO, and Julian Seddon from the NSW National Parks and Wildlife Service observe bird life in a remnant woodland of the Lachlan Catchment in New South Wales. The information they're collecting should help in drawing up guidelines for the effective management of such remnants.

Ambulance-chasing?

There has also been a dramatic change in the way that science is both funded and conducted. Gone is the Frith era, where scientists were largely free to pursue their own interests, generating as they did a substantial body of basic knowledge about

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David Grice records vegetation composition and coverage along a transect in a remnant patch on farmland in New South Wales. The data will be combined with many other data points collected from the wider region that will eventually allow scientists to estimate the nature of the vegetation cover before European settlement. Mike Austen is the scientist leading the work.

Australian wildlife biology and ecology. These days, the division is required by government to obtain about 30% of its funding from outside sources, which has resulted in a dramatic shift towards applied research.

Not everyone has been happy with the changes. Some say that the division has become an 'ambulance-chaser', pursuing funding opportunities regardless of their relevance to the core work of the division. It's a claim rejected by assistant chief Allen Kearns.

'We live in a dynamic world where things are changing rapidly,' he says. 'But anyone who is chasing money or chasing ambulances has really got the wrong strategy. Our strategy is one of ensuring broad uptake of the knowledge that we have now or have gained in the past and can obtain in the future. And money will always follow useful and relevantly applied knowledge.'

This gives rise to claims that the division is trading on its intellectual capital, and degrading it in the process. Not entirely so, says Morton.

'I think that's too gloomy. The trend is certainly in the direction of frantic activity to obtain sufficient external funds. But I also think that the people who are unhappiest are those who are living through the change. People who are coming in fresh will just assume that this is the way things are and will go ahead and make their intellectual contribution. They'll be far more adept at it.'

Tyndale-Biscoe has been critical of the direction in which ecological research has been heading. In particular, the trend towards increasing applied research has worried him.

'I always call basic research the motor of the division,' he says. 'If you don't have a motor, you can have all sorts of wonderfully comfortable seats and steering wheels and headlamps and things, but it's not going to go anywhere. Without basic research, we'll run out of people who can see the landscape with new eyes, because they haven't let their imaginations run free.'

But when he attended a recent divisional meeting, he was pleasantly surprised.

'I went there with some prejudice,' he says. 'But some of the younger scientists really gave some excellent papers, which showed that there are good minds still working in the division, and they're obviously getting some opportunities to work on interesting problems. So I'm actually fairly optimistic.'

Part of the new approach, says Morton, has been the reintroduction of human beings into ecology.

'When I began my ecological education, the thing to do was to go to the most pristine system,' he says. 'That was where you worked; humans were a nuisance.'

But now ecologists worldwide are realising that people are an intricate part of the ecological system; excluding them is to deny the profound influence of humanity in almost every part of the biosphere.

'This division has re-adjusted to that reality rather more quickly than most, because we began with an emphasis on pests, with a clear understanding that there is a direct connection with human society,' Morton says.

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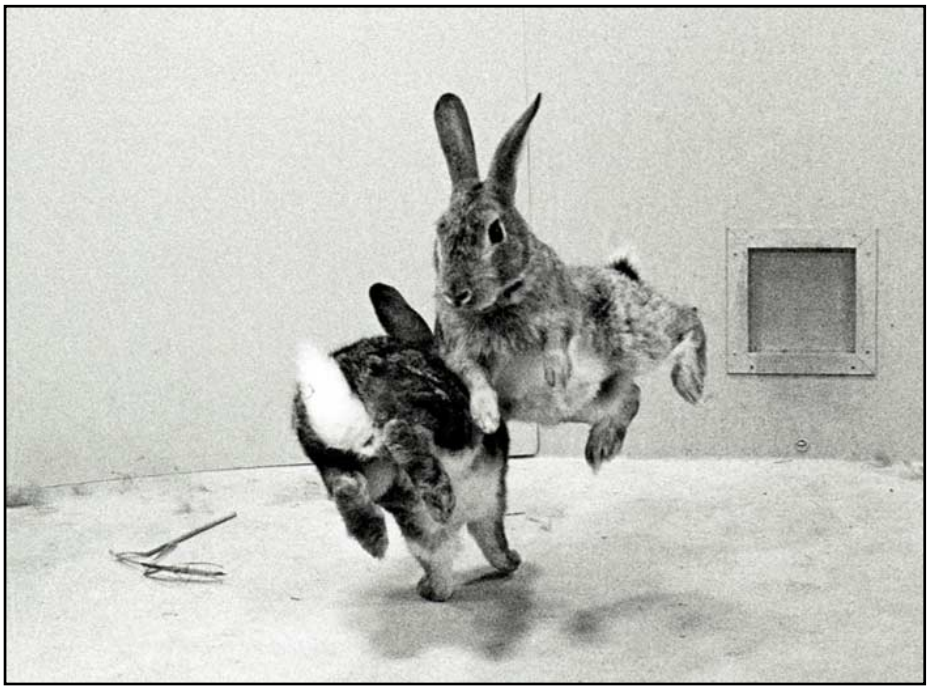
Above: Wildlife researcher Bill Poole, centre, stands proudly with his 'roo catching team in the kangaroo yards of Gungahlin Homestead, headquarters to CSIRO Wildlife and Ecology (then known as the Division of Wildlife Research). Kangaroo research held a prominent place in the division's research portfolio in the 1960s and '70s. Standing to Bill's left is Vic Kowalski, kneeling is Peter Flegg. To the right is Norm Simms (standing) and Jim Merchant (kneeling).

Below: Rabbit behaviour was an important part of the division's work in the early days. Roman Mykytowycz began work in this area in the 1950s. His methodologies of experimentation became an international model during the 1960s and beyond. The rabbits pictured here are displaying aggressive behaviour in one of his enclosure experiments.



The focal species concept

One of the clearest expressions of this new approach to ecology is seen in the work of Lambeck and his colleagues in the Western Australian wheatbelt. Led by Denis Saunders at the time, the WA branch of the division had been studying fragmented habitat in the wheat belt for many years. Farmers in the region were well aware of the environmental problems they faced, and they increasingly turned to CSIRO for advice on how to retain what biodiversity was left. But the advice on offer was only meagre.

'We could say that bigger remnants were better than smaller remnants and that wider corridors were better than narrow corridors,' Lambeck says. 'But when a farmer asked me "well, how much bigger should my remnants be and how much wider should my corridors be?" we couldn't say much more than "as big as you can or as wide as you can".'

Lambeck realised that a simple approach was needed whereby farmers could be provided with 'best bet' quantitative answers to their questions. It was now also well understood that conservation plans aimed at saving species would be ineffective unless the processes that threatened the species – such as fragmentation, nutrient loss, salinisation – were addressed. In developing what he calls a 'focal species' approach, Lambeck started to draw together two divergent threads of divisional research: basic information on species, and the emerging focus on ecosystem processes.

'We had to find a limited set of species whose needs encompassed those of other species,' he says. 'What I've tried to do is to ask "what are the threats that are causing species loss?" and then for each of those threats, "which species are at risk?" And then if you manage and design the landscape for the species most sensitive to each threat, then you should, theoretically, protect all the other things that are less sensitive.'

Recently, Lambeck applied his methodology in the Wallatin Creek subcatchment near Kellerberrin. He found that 61 of the 113 mapped habitat patches in the region did not meet the minimum size required by the most area-limited focal bird species (which included the sitella and jacky winter in woodland, the shy hylacola in shrubland / mallee and the field wren in shrub / heathland). To expand the 61 patches to meet the minimum sizes would require the revegetation of 4.3% of the catchment. When combined with the existing vegetation, the total area required to meet the habitat needs of these species was 11.7% of the subcatchment.

These are the sorts of numbers that farmers want; they provide clear and achievable restoration objectives. But Lambeck admits that they are based on a range of assumptions, many of which are untested.

'It's easy to get the data you need to generate a landscape design,' he says. 'But it's hard to get data that say we're really confident that this design is going to work.'

Other cautions must be applied to such figures. The methodology needs to be broadened to ensure that the sum of the sub-populations in each patch gives rise to

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a viable population across the broader landscape. Lambeck also points out that some ecological processes – such as fire – might operate at larger scales and therefore require larger patch sizes than do the focal species themselves. But one of the spin-offs of the focal species work has been the ready identification of new research areas.

'By taking an applied approach, I've identified a whole raft of 'pure science' questions that really do need to be tackled,' he says.

The focal species concept has been quick to catch on in the west. In collaboration with the WA Department of Conservation and Land Management, Lambeck has employed the technique to enhance the public reserve system in the Dongolocking region. He is also working with Greening Australia (WA) to apply the approach to various catchments in the wheatbelt, as well as looking for ways to provide general guidelines for catchments in similar biophysical zones.

The stakeholder factor

The concept has also crossed the Nullarbor. Canberra-based David Freudenberger is one of a team consulting with stakeholders to develop a focal species methodology for central New South Wales and the ACT region. He's comfortable with the need to consider the human factor in his work.

'I think it has enriched our science. It has enriched who we are and what we do by extending us,' he says. 'The days of going out there and doing science in isolation are long gone and I have no regrets about that.'

But not all scientists are equipped with the skills needed to work with non-scientists. Morton is currently consulting with a wide range of agencies – other divisions of CSIRO, the Murray-Darling Basin Commission, state government agencies and landcare groups – with the aim of making 'a grand-scale attempt to do an integrated and holistic restoration of a sub-catchment'.

'It's a very demanding process,' he says. 'We can't just arrive on the scene and tell people we're going to do this work in your catchment, aren't you lucky? It's a long relationship-building process. But if we're fair dinkum about engaging science with society in landscape restoration and management, I think that's what is required. Yes, it's a very substantial change and a real challenge. But if we don't do that I think we deal ourselves out of the game. That's where the future is.'

Farmers John and Betty Riley (left) speak with Wildlife and Ecology scientists (from centre to right) David Freudenberger, Nick Abel, David Grice and John Ive. The Rileys run the property 'Wendouree', near Parkes in central-western New South Wales, an area visited by Wildlife and Ecology scientists in 1988. Their aim was not to lecture farmers about how to work their properties, but to listen to their problems and their perceptions of the landscape.

A wide range of other work in the division also demonstrates the engagement of the scientist with society. For example, the landscape function analysis concept pioneered by David Tongway and John Ludwig in the rangelands has not only increased our understanding of ecological processes, it is also serving as a practical tool for assessing the success of landscape restoration efforts (see *Ecos* 95). Similarly, Nick Abel and his colleagues are building on many years of research on land-use planning to explore options with pastoralists, miners, Aborigines and conservation groups for sustainable agriculture in the Western Division of NSW. Mike Austin is applying his long experience in mapping vegetation to determine original (pre-European) vegetation distribution to assist land managers and conservation groups prioritise their revegetation and restoration efforts.

Society can learn from ecology

Ecologists surely have much to learn about society, but society can also draw lessons from ecology.

'Ecology is all about linkages,' says Barney Foran, leader of the division's Resource Futures Program. His team uses modelling and scenario-building techniques to assess how policy decisions made now might cause environmental – and hence social – changes down the track.

'We have learned a significant amount about the workings of complex adaptive systems from our ecological work,' he says. 'This insight helps us to develop realistic models and scenarios for what might happen down the track given a range of policy decisions.'

Studies by CSIRO Wildlife and Ecology and other research institutions have repeatedly demonstrated the value of remnant vegetation in conserving biodiversity in agricultural landscapes. Farmers are increasingly accepting this message, but are now asking how big the remnants and corridors need to be to function properly. The focal species methodology is helping to provide answers.

The Resource Futures Program arose out of a perception that ecologists involved in ecological restoration were doing little more than applying band-aids to environmental sores.

'We decided we had to get proactive so that we could start influencing policy and direction rather than being paramedics trying to stem the bleeding,' Foran says.

Support for the Resource Futures Program within the division is widespread; it is seen as an important way in which ecological knowledge can be fed into the decision-making process. Who knows, it might even help the development of far-sighted social and environmental policies that give sustainability a genuine chance of success.

'I left the private sector and came to CSIRO because I felt that ecology was the science of relevance for the future,' Kearns says. 'And I still believe that. But the challenge is to increase the uptake of knowledge at all levels, from school kids in the community right through to the decision makers in Parliament House.'

Because of its size (for an ecological research institute it's big, even though it's one of CSIRO's smaller divisions), its national scope, and because it retains the capacity to mix basic and applied research, CSIRO Wildlife and Ecology is well-placed to make a substantial contribution to that process.

'The division is in a state of healthy renewal,' Kearns says. 'In the future we will be involved in areas of significant outcomes for Australia, projects that should change the way Australians think about their landscape and their natural resources. That's the kind of vision we are working towards.'

More about the division

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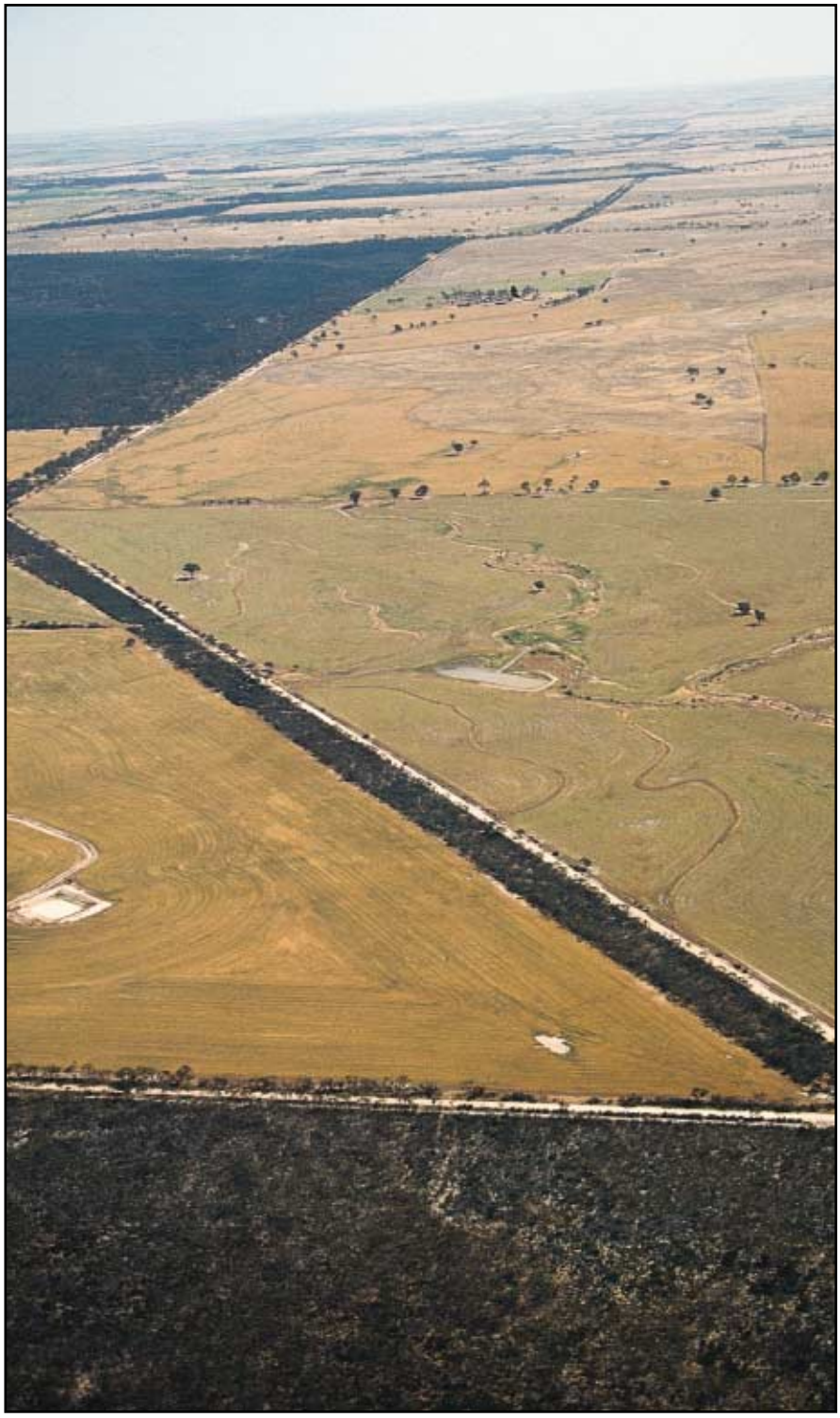

Abstract: CSIRO Wildlife and Ecology began in 1949 as the Wildlife Survey Section with the goal of finding new and improved methods of controlling rabbit numbers. It achieved early success with the introduction of the myxoma virus. The research emphasis soon shifted to the study of native fauna, and then to understanding the ecology of systems, rather than individual species. A more recent change, from 'pure' to applied research, has followed the need to secure external funding. Some believe this has degraded the division by trading on its intellectual capital, but others see the shift as an opportunity to translate research findings into practical management outcomes. A wide range of the division's projects now demonstrate a greater engagement of the scientist with society. A consequence of this has been the identification of new issues requiring basic research.

Keywords: CSIRO Wildlife and Ecology, research, ecology, conservation, fragmented habitats, Resource Futures Program.