Feral Herald

Newsletter of the Invasive Species Council, Australia

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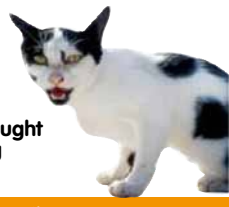

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Feral horse numbers in the Alps have exploded.
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Hawke review warns hefty reforms needed

It's now more than a decade since the Federal Government reformed national quarantine laws, closing the door on the introduction of dangerous new species and limiting imports to only those with a low invasive risk.

To date this system has kept out about 1500 new species with the potential to become weedy.

Now, there are prospects for reforms at a state and territory level, and the chance to plug one of the biggest gaps in environmental laws in Australia.

The recent independent review of the federal *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) by Dr Allan Hawke has recommended substantial reforms, including on invasive species.

Citing ISC's submissions extensively in the review, Dr Hawke recognised that invasive species are one of the top threats to biodiversity, and that "the worst for Australia is yet to come with most invasive species having occupied only a portion of their potential range, and interactions with climate change likely to considerably worsen their impacts".

He found that the several thousand plant species persisting as ornamentals or as naturalised populations in urban areas "represent a vast reservoir of potential future problems" and that their movement within Australia "is effectively unconstrained". State and territory responses are criticised as representing "a substantial failure of state and territory-based environmental regulation".

The Hawke review has recommended that the Council of Australian Governments (COAG) address this problem, and suggested that a national controlled list of invasive species be developed. As ISC advocated, this could be developed under existing provisions in the EPBC Act. And just as the public can nominate native plants and animals for listing as a threatened species, we want to see a public nomination process for controlled exotic species.

A popular garden ornamental plant agapanthus is also an environmental weed that poses significant threats to bushland areas. Photo: flickr.com/photos/skitzitilby

Even more importantly, we believe the COAG process should be used to co-ordinate a nation-wide adoption of "white-list" approaches to invasive species. This would require that the approach used at Australia's borders – requiring risk assessment of new introductions and permitting only low-risk species – also be implemented within Australia. Such a system is essential to implementing governments' commitments to preventing new weed problems.

ISC welcomes other proposed EPBC Act reforms. Having urged the development of a federal capacity for strategic assessments of emerging products and industry trends – such as the use of weedy species for biofuels – we are delighted by the proposal for a foresighting unit within the federal environment department that would identify, and recommend policies to address, emerging threats.

Such a unit, had it existed five years ago, could have averted some of the recent problems with weedy biofuels.

The Hawke review also recognised the risks associated with imports of new variants of existing invasive species and hybrids, again quoting ISC:

"The import of genetically distinct varieties of existing permitted species is a major source of pest and weed risk for Australia as new variants may have new features that significantly increase their pest risk or turn existing non-pest species into invasive risks."

The review says we need a more systematic approach when assessing

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Monkey business in Darwin cause for alarm

A monkey seen crossing the road in Darwin and Asian bees buzzing around Cairns Casino provided the Invasive Species Council's project officer Tim Low with much to discuss on national radio when he was interviewed by Fran Kelly on her Breakfast show recently.

The long-tailed macaque in Darwin was not something to dismiss lightly, Tim said, because this same species of monkey has gone feral on the island of New Guinea and poses a long-term threat to Australia if the small population near Jayapura is not removed.

A study of the Irian Jaya population found that birds of paradise and parrots were scarcer in forests where they roamed. As animals with an extremely wide diet that includes eggs, chicks, lizards, crabs, seeds and fruit, they can be expected to have devastating impacts on New Guinea biodiversity as they have in Mauritius and Palau. The Australian Government should approach Indonesia to encourage their removal and the sterilisation of pet monkeys kept in the province.

Tim also talked about the difficulty the Queensland Government is having controlling the Asian honey bee outbreak around Cairns. More than 60 nests have been found since May 2007, one as far afield as Atherton. If the eradication attempt fails, these bees will have major environmental and economic impacts on Australia. The cost of crop pollination all over Australia will rise.

Under existing arrangements, the Federal Government is responsible for keeping pests out of Australia, but if quarantine fails and a pest gets through, it suddenly becomes the responsibility of whichever state it invades.

This is hardly a sensible arrangement when a pest is of national significance. It is especially unfair for Queensland which, because of its proximity to New Guinea, the South Pacific and Asia, is bearing the brunt of new weeds and pests.

Recent examples have included fire ants, electric ants, black-spined toads, climbing perch, candyleaf, Koster's curse and Asian honey bees. Other states have contributed to the eradication of the two ants, but have been stalling for the past year on contributing anything to the Asian honeybee eradication, despite the serious threat they pose to agriculture and the environment in all mainland states.

Prior to the interview with Tim, Fran asked Tony Burke, the minister responsible for quarantine, for a comment about the bee invasion. Clearly under the illusion that his own department was funding the eradication, the minister emphasised the national threat the bees pose. He was well informed about the threat but seemed unaware that his department was not contributing to the operation.

Because the other states and the Federal Government have offered no financial assistance, and because Biosecurity Queensland has an inadequate budget for all the eradication and control work it must do, the eradication effort may well fail.

Listen

Hear the interview at www.abc.net.au/rn/breakfast/stories/2010/2823056.htm

Long-tailed macaques eat widely, and are known to prey on eggs, chicks, lizards, crabs, seeds and fruit.

Photo: Percita Dittmar (Creative Commons- http://www.flickr.com/people/90851177@N00)

Feral Herald

Editors
Carol Booth and Tim Low.

Layout
John Sampson.

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Invasive Species Council Inc.
ABN 101 522 829

Address: PO Box 166 Fairfield, VIC 3078

Email: isc@invasives.org.au

Website: www.invasives.org.au

Views expressed in this newsletter are not always those of ISC.

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Hawke Review warns ...

from p1

proposed new imports so that we can respond to the potential invasive risks of new variants, and proposes that permitted imports should not include variants or hybrids unless otherwise specified.

There are also recommendations to make the listing of key threatening processes (KTPs) more flexible and to simplify requirements for nomination to allow easier use and greater public participation.

These and many other proposed reforms are well worth fighting for. The government's response to the review is expected within the next few months and a commitment to reform is likely to form part of the ALP's election platform. It is vital that the measures for invasive species be a priority part of any commitments. ISC asks for your support to allow us to lobby strongly for these important reforms.

ISC Policy Officer Carol Booth has met with Federal Environment Minister Peter Garrett and policy advisers to promote these reforms.

More information

> Download our analysis of the proposed reforms from: www.invasives.org.au/page.php?nameIdentifier=federalbiosecurity. The Hawke review can be downloaded from www.environment.gov.au/epbc/review/publications/final-report.html.

invasive species council

South Australia puts an end to trials of weedy biofuel

The South Australian Government has ended trials of the weedy biofuel giant reed (*Arundo donax*) after ISC criticised the high weed risks posed by this plant.

ISC first raised concerns about this weed with the South Australian Research Development Institute in 2007. Then in November last year we made national headlines when ISC project officer Tim Low spoke out about the giant reed trials at a biofuels conference in Canberra.

The Australian newspaper, among others, picked up the story, running with Tim's warning to both the Rural Industries Research Development Corporation and the South Australian Government that "they may be misguided in the belief that with regulation the reed can be grown safely". Both organisations were involved in the trial of giant reed.

"You're talking about high-volume, low-value crops," Tim was quoted as saying.

"To factor into that a high-regulatory regime you are going to need weed officers monitoring, weed teams mopping up infestations, and the economics aren't going to pay for it.

"For biofuels to make a difference to climate change, vast plantings will be needed, and it is naive to believe a weed can be grown on a mass scale without it doing what weeds always do."

The next day Tim was phoned by the head of research at the South Australian Research and Development Institute (SARDI) and told they now share the same weed concerns and will undertake no further research on giant reed. The scientist who ran the giant reed program is no longer employed by SARDI.

Tim drew attention to a webpage on the SARDI website that talked up the potential of giant reed as a biofuel.

ISC project officer Tim Low is dwarfed by Giant Reed in Papua New Guinea.

It was removed shortly afterwards.

ISC congratulates SARDI for ending their research on a plant that was featured in the IUCN list of "100 of the World's Worst Alien Species".

However, we remain concerned that the Rural Industries Research Development Corporation, which funded the SARDI study, has not distanced itself from this plant. It has a webpage dedicated to biofuels that lists giant reed first.

Australian governments are regularly approached by entrepreneurs making optimistic claims about the value of giant reed and seeking concessions to grow it.

In a recent ABC radio interview called "Top End could be 'Saudi Arabia of biofuel'" ENEnergy spokesman Hans Olav Bjorenak discussed plans to grow 300,000 hectares of giant reed in northern Australia.

The Northern Territory Government is, however, moving to declare giant reed a prohibited weed. Queensland is also likely to forbid its cultivation.

ISC congratulates the CSIRO and OECD for running a conference on biofuels at which Tim was invited to speak. The attendees at the Biosecurity in the New Bioeconomy conference have since issued a joint statement saying that sustainable bio-energy feedstocks strategies are unlikely to result from low-value, exotic, fast-growing biofuel crops.

More information

> To read *The Australian*'s coverage of this story go to www.invasives.org.au and follow the links to our media coverage page – Home Page>Newsroom> Media coverage.

> www.csiro.au/events/Biosecurity-Symposia.html

> www.abc.net.au/news/stories/2010/01/13/2791660 .htm

ISC ready to build on strong track record

The ISC Board has decided that the organisation needs to be more strategic and ambitious in dealing with Australia's invasives challenge.

Andrew Cox, previously long-standing CEO of National Parks Association of NSW, has offered his time to ISC as a pro-bono consultant to develop a new five-year plan.

Andrew has been talking to ISC staff and will now conduct targeted surveys with the Board and key experts, including sending out an online survey to all past and present ISC members and supporters.

This is a chance to help ISC be more effective in tackling invasives issues. The feedback and resulting plan will direct scarce ISC resources to the most important areas, identify the best way for ISC to organise and grow, and draw on invasive and advocacy experts to build on our strong track-record and get even bigger results.

If you have a view on the current or future work of ISC, make sure you fill out the upcoming online survey or, if you can't wait, email isc@invasives.org.au. Let us know if you want to talk on the phone and Andrew will give you a call.

FROM THE PRESIDENT

Steve Mathews

Five compelling reasons for you to write a cheque

I recently sent many of you a letter requesting a donation to help us secure reforms that will capitalise on the results of a recent review of federal environment laws.

Please consider the benefits of supporting our endeavour. If you have donated already, thank you! If you haven't here are five good reasons for you to donate today:

1. Dire threats: There are hundreds of emerging or future invasive species not regulated in most Australian states or territories, many can be introduced into new areas without a risk assessment, and invasive threats are largely ignored at the federal level. Federal reform would help Australia tackle these dire threats.

2. Potential for substantial reform: The federal review of environment laws could result in numerous reforms (see the story on page 1).

3. Effective ISC advocacy: ISC's advocacy during the recent review of the EPBC Act secured strong reform recommendations.

4. ISC as the only voice: ISC is the only NGO campaigning for broad federal reforms on invasive species. Invasive species is the most neglected high priority conservation issue within the Australian environmental movement.

5. ISC needs your support: We rely on donations and philanthropic support to function. As a young NGO with limited resources, we need support from the informed community who recognise that invasive species are one of the three greatest threats to biodiversity in Australia.

Write your tax-deductible donation cheque to ISC now or give online securely via our website.

You can read an analysis of the proposed federal reforms and ISC's recommendations on our website on our website, just go to www.invasives.org.au, Our Work>Federal Biosecurity.

Planning for our future

ISC is taking a hard look at where we are and where we need to be to address the biggest of invasive species threats – particularly new and emerging threats (see page 3).

Andrew Cox has come from a decade as CEO of a leading conservation group and has been kind enough to provide his services pro bono to lead ISC in strategic planning.

ISC was set up in 2002 by conservationists who decided that a dedicated NGO was the only way to get a strong advocacy voice on invasive species.

This has proven to be the right decision, but building a new organisation from scratch is a challenging and long-term project. ISC has come a long way, but we still need to grow much more.

One of the big issues for ISC is our relationship with members and supporters. We can't do without you, but we haven't had the resources to reach out to all those who might support our goals and to explore ways in which you can support and participate in campaigns.

We would very much like to hear from you about where you think ISC should travel and how we can obtain the resources to get there.

To do this, ISC will shortly be sending you an online survey via email. Please take the time to complete it. I also encourage you to contact us at any time to tell us your views or to express your interest in being more involved – email isc@invasives.org.au.

Thank you to our philanthropic funders!

ISC is very grateful for financial support during 2009 from the John T Reid Charitable Trusts and the Norman Wettenhall Foundation. These grants have now finished.

We are also very grateful for ongoing funding from The Mullum Trust and the Melbourne Community Foundation this year, as well as from private donors.

And we are very pleased to have just received a grant from the Paddy Pallin Foundation – more about this project next issue.

Less than 5 per cent of philanthropic funding in Australia goes to the environment sector, and only a very small proportion of that goes for work on invasive species.

So, we are highly appreciative of this small band of funders who strive to make a difference by supporting advocacy and educational work on invasive species.

Recent ISC presentations & publications

Presentations

Tim Low. Weedy biofuels: should we be worried? Biosecurity in the new bioeconomy: threats and opportunities. CSIRO & OECD. Canberra: 18-21 November 2009.

Carol Booth. Conservation or con? Hunting & feral animal control. RSPCA Australia Scientific Seminar. Canberra: 23 February 2010.

Tim Low. High risk environmental 'solutions' involving invasive species. Global Biosecurity Conference 2010. Australian Biosecurity CRC for Emerging Infectious Disease, CRC for National Plant Biosecurity, Invasive Animals CRC. Brisbane: 28 February-3 March 2010.

Penny Greenslade. Biosecurity and taxonomic expertise. Global Biosecurity Conference 2010.

Carol Booth. Tall Wheat Grass and other invasive 'solutions'. Global Biosecurity Conference 2010.

Publications

Carol Booth, Geoff Carr, Tim Low. 2009. Weedy pasture plants for salinity control: sowing the seeds of destruction. Invasive Species Council and The Wilderness Society.
http://www.invasives.org.au/page.php?nameIdentifier=weedypastureplantsforsalinitycontrol

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Pacific Conservation Biology 15(4): 235.

ISC. 2009. Invasive species and climate change. Backgrounder. Download from ISC website.
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ISC. 2009. Weeds and climate change. Fact sheet. Download from ISC website.
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ISC. 2009. Invasive animals and climate change. Fact sheet. Download from ISC website.
http://www.invasives.org.au/page.php?nameIdentifier=factsheets

ISC. 2010. Preventing weed invasions: the case for a 'white list' approach. Backgrounder. Download from ISC website.
http://www.invasives.org.au/page.php?nameIdentifier=backgrounders

invasive species council

‘Salinity solutions’ sow seeds of destruction

As US invasive biologist Daniel Simberloff has said, “the problem that seems inadequately treated currently is that a substantial benefit to a few has more political weight than a substantial cost that might be borne forever by all”.

We would add that even a minor private benefit is typically granted more weight than a substantial public cost when it comes to weeds in Australia.

Seed sellers and nurseries are free to sell hundreds of unsafe plant species and landholders are free to plant them, and no one is held responsible when they inevitably escape.

The Invasive Species Council and The Wilderness Society have recently published a report highlighting these deficiencies in weed laws as exemplified by the promotion of invasive pasture species under salinity programs.

Tall Wheat Grass (*Lophopyrum ponticum*) is a highly invasive pasture grass promoted for grazing in saline and non-saline areas. The most popular cultivar was released by the Victorian Government in 1999, without risk assessment, and its cultivation has been subsidised and promoted by governments under the National Action Plan for Salinity and Water Quality.

Tall Wheat Grass is emerging as one of Victoria’s most serious weeds, putting at least 20 threatened species at risk. Of particular concern is its invasion of upper coastal and non-coastal saltmarshes.

A 2001 Victorian Government report recommended it be listed as a threatening process for invasion of saltmarshes, and ISC has just submitted a nomination for it to be listed as a federal key threatening process. Tall Wheat Grass is a threat in other southern states as well.

Short-term profits but long-term costs

On the surface it seems there is a dilemma here between addressing two environmental problems: salinity versus weeds. But Tall Wheat Grass is a much greater threat than salinity is in Victoria, and there are alternative approaches to salinity.

Tall Wheat Grass may help some graziers yield higher profits in the short-term, but the costs of its invasion will be borne far into the future as taxpayers fund programs to save the species and ecological communities at risk.

Governments now espouse support for a risk-based approach to invasive species and prioritisation of prevention as the most effective and cost-effective measure. But there is a huge gap between policy and practice. New species and cultivars continue to be released and promoted without any risk assessment.

These are the deficiencies that ISC is campaigning to have corrected. See front page story.

Tall What Grass invading margins of saltmarsh in the estuary of the Barwon River at Ocean Grove in Victoria. This site is adjacent to Port Phillip Bay and the Bellarine Peninsula Ramsar site. It has probably been planted here (December 2007). Photo: Geoff Carr

From the report

Impacts on saltmarsh: The 2001 risk assessment of Tall Wheat Grass by Weiss and Iaconis noted that it poses a “particular threat to coastal saltmarsh vegetation” and that “on the balance of available qualitative evidence [it] would alone destroy most upper saltmarsh in western Victoria.”

They recommended that invasion of saltmarshes be listed as a threatening process under the Victorian Flora and Fauna Guarantee Act 1988. Almost half the total flora of saltmarshes are exotic weeds.

Limited acknowledgement of weed risk: Despite the harm it is causing, Tall Wheat Grass has been developed, researched, and promoted using public funds by publicly funded agricultural institutions, including the Victorian Department of Primary Industries, Victorian Catchment Management Authorities and salinity research institutes.

In 1999 the Victorian Department of Primary Industries developed and commercially released a new variety of Tall Wheat Grass called Dundas without undertaking a weed risk assessment despite the existing cultivar (‘Tyrell’) behaving as a weed.

Of little benefit: Perennial pastures programs to date have contributed little to solving salinity problems, and are not likely to in future. In most cases the gains for the agricultural sector with new exotic pasture species will be small and incremental, particularly those planted for salinity purposes.

Although a serious problem in Western Australia, on a national scale salinity seriously affects only a small proportion of farmers and agricultural profits (with predicted declines of less than 1.5% over 20 years).

Take action!

> We urge you to read our report — and support our case for reform by emailing the Victorian and federal governments. Use the simple letter-writing tool on our website. Go to www.invasives.org.au and click on the ‘Take Action’ link.

> Download the report *Weedy Pasture Plants for Salinity Control: Sowing the Seeds of Destruction* from our website www.invasives.org.au.

Feral horse numbers in the Australian Alps have tripled in the past six years.

Photo: Bill Kosky

Feral horses run riot in Australian Alps

An explosion in feral horse numbers across the Australian Alps threatens terrible environmental damage to our alpine national parks.

The Invasive Species Council is calling for aerial shooting of feral horses in the Australian Alps after a survey found populations are growing at an estimated 20 per cent a year. Numbers have tripled since 2003 from 2369 to 7679 last year.

Control programs are failing to keep pace with breeding rates, let alone reduce populations.

In Kosciuszko National Park, where 4300 horses were counted, the control program consists of trapping and removing at most 300 horses a year, hardly denting numbers, which seem to be increasing by at least 800 horses a year. Trapping is also very expensive, costing the NSW taxpayer $250,000 a year. This sort of expenditure makes little sense when more than two-thirds of the trapped horses are taken to abattoirs.

In mountainous country, aerial shooting is the only way of killing sufficient numbers of feral horses to control populations. But in NSW aerial shooting was banned in 2000 in response to negative publicity about a control program in Guy Fawkes National Park.

ISC has called on the NSW Government to re-institute aerial shooting as the most effective and humane solution for the feral horse problem. It should be done with rigorous welfare oversight and according to protocols approved by the RSPCA.

ISC also calls on the Victorian Government to substantially reduce feral horse numbers in the Alpine National Park. Currently, the only method being used is roping – under permit horse-riders remove 80-100 horses a year – which is both ineffective and has likely adverse welfare and environmental consequences.

Feral horses cause substantial damage to alpine environments and irreversible losses will occur unless effective control is implemented. Governments are failing in their legislative responsibility to protect native habitats in national parks.

In welcome contrast to both NSW and Victoria, the Queensland Government has continued an aerial shooting program to reduce feral horse numbers in Carnarvon National Park that started in 2007.

There were fewer than 50 horses in 1984, but by 2006 the population had exploded to about 13,000 in and around the national park – causing erosion, spreading weeds, destroying springs, damaging Aboriginal cultural sites, and destroying wildlife habitat. They were eating an estimated 12,400 tonnes of native vegetation each year.

Heritage and welfare

State governments are nervous about aerial shooting control programs because they attract public criticism from 'save the brumby' advocates who argue that feral horses should be protected for heritage reasons, and from people concerned about animal welfare.

From a heritage perspective, the weight accorded to the fact that feral horses have been in the Alps for a century or so seems way out of proportion to the failure to protect natural heritage thousands and millions of years old being destroyed by horses.

Australia is overrun with feral horses – an estimated 300,000-400,000 – apparently the largest wild horse population in the world. Furthermore, there's probably more than 15 times the number of horses in the Alps today than could be found there (at most 500 horses) when Banjo Paterson wrote his famous poem *The Man From Snowy River*.

One of the most troubling features of the debate about feral horses in the Alps has been the way governments have been swayed by inflammatory media coverage of animal welfare issues.

If carried out by skilled operators, aerial

The damage feral horses cause to our environment

Horses are big, hard-hoofed animals that eat very large amounts of vegetation. It is little wonder they cause serious damage in sensitive alpine areas:

- Erosion along extensive networks of trails.
- Damage to bog areas, and drainage along incised tracks.
- Creation of wallows, vegetation destruction and bare patches subject to erosion and weed invasion.
- Removal of large amounts of plant biomass, reducing the populations of some preferred plant species, including rare endemic species. Plants damaged by horses are slow to recover because the summer growing season in the Alps is short.

ISC calls for action

The revelation that feral horse numbers are out of control in the Australian Alps prompted ISC to call for more effective control of feral horses using aerial shooting – including in interviews with Channel 7 and *The Age*. You can download our media release from www.invasives.org.au.

The survey of feral horses was conducted for the Australian Alps Liaison Committee, which is made up of the parks agencies for the national parks in Victoria, NSW and ACT.

It can be downloaded from http://www.australianalps.environment.gov.au/publications/research-reports/feral-horses-aerial-survey.html.

Horse damage to a sphagnum bog, part of an endangered ecological community. Photo: Bill Kosky

shooting can be humane. The RSPCA has no in-principle objection to aerial shooting, but stresses that the outcomes depend utterly on the competence of the shooters.

It would certainly be more humane than the trapping program currently used in Kosciuszko National Park, which causes enormous stress and results in most horses being killed in abattoirs. Suffering also occurs when horse populations exceed the food and water supplies available, or when there is drought, and horses starve.

The other welfare issue that is ignored is that of the native animals whose habitat is destroyed by horses or who have to compete with horses for food and water.

The feral horse issue highlights strong public and media biases with feral animals. This was the introduction to one of many stories in the media protesting horse control (in this case in Carnarvon National Park):

"Exotic birds sing, an emu swishes through the sunburned grasses of the valley, a lizard scurries by and, if you're lucky, from somewhere in the hills above you'll hear the wild horses.

"They gallop freely through the trees that cover the slopes of Mount Moffatt, in central Queensland, ten of them, 20 even, manes flying, nostrils flaring, the rhythmic thrump, thrump, thrump of their hooves explaining why they have been such an inspiration for generations of poets.

– *Daily Mail*, November 2007, 'Massacre at Murder Spring'.

How about, instead, "…if you're lucky, somewhere along your path, you'll see the wild cane toads" or "you'll hear the crashing sound of wild pigs"? Australia's environment suffers because people are drawn to horses and deer more than toads or pigs.

Welfare and conservation are both important, no matter how loved or unloved the animals concerned.

The Australian Alps stretch from Canberra in the Brindabella ranges, south through NSW to Victoria.

Australia's track record on pest eradication

The NSW Game Council recently published a fact sheet trying to justify recreational hunting as conservation.

One of the major conservation bouquets they award themselves is that they were pivotal to "Australia's only proven successful eradication of a feral pest species" – a flock of Canada geese, shot in a nature reserve on the NSW South Coast in 2008. In fact the "flock" was four birds, shot by one person, and it is not Australia's only eradication.

Eradications have been infrequent but not lacking in Australia's history of pest control (see examples to the right).

World-wide during the past three decades there has been an increased willingness to attempt eradications of invasive species, particularly on islands where there are good prospects of preventing re-invasions.

Rodents have been eradicated from at least 330 islands, goats from 128 islands, and cats from 74. In the world's largest eradication in terms of island size, 79,000 goats were removed from Santiago Island (58,465 ha) in the Galapagos Islands) in 4.5 years, at an approximate cost of US$6.1 million.

Governments in Australia too have been increasingly supporting eradication, with current or proposed eradication programs including foxes from Tasmania, red imported fire ants from Queensland, rabbits from Macquarie Island and rats from Lord Howe and other islands. Twenty-eight weeds on the Alert List for Environmental Weeds, declared in 2001, are also targeted for eradication.

Weed eradication is challenging because invasive plants can be difficult to detect at an early stage of invasion, seed banks can be very persistent and long-term funding is required, typically for 10 years or more.

Modelling by Panetta (2007) shows that even if the seed production of *Crupina vulgaris* was reduced by 95% it would take 138 years before the seed bank declined to less than one seed per square metre. This result could be achieved within two years only if 99.9% control was achieved.

ERADICATIONS IN AUSTRALIA

VERTEBRATES	
Grey squirrel (*Sciurus carolinensis*)	From about 40 km² in Adelaide (shooting)
Black rat House mouse Red fox Feral cat Rabbit Goat	From 31 WA islands (baiting) From 4 WA islands (baiting) From 4 WA islands of 798-3281 ha (baiting) From 2 WA islands (baiting & trapping) From 6 WA islands (1080 baiting) From 1 WA island of 4267 ha (aerial shooting)
Cat	From Macquarie Island, 12,800 ha (trapping & shooting)
Pig, goat, cat	From Lord Howe Island, 1455 ha
Rabbit, goat, pig	From Phillip Island: (rabbits by myxoma virus, baiting, trapping, shooting)
Canada geese	4 from NSW in 2008 (shooting)
INVERTEBRATES	
Mediterranean fruit fly (*Ceratitis capitata*)	from small areas in WA and SA
Queensland fruit fly (*Bactrocera tryoni*)	from 125 km² in WA in 1990, cost $8 million
Papaya fruit fly (*Bactrocera papayae*)	from north Queensland in 1999
Philippine fruit fly (*Bactrocera philippinensis*)	from Darwin in 1999
Giant African snail (*Achatina fulica*)	from small areas in Qld
Caribbean black-striped mussel (*Mytilopsis sallei*)	from 12.5 ha in Cullen Bay, Darwin Harbour, cost >$2.2 million (treated with bleach and copper sulfate)
WEEDS	
Kochia (*Bassia scoparia*)	From 3277 ha in WA, took 8 years, cost $500,000
Eupatorium serotinum	From 0.5 ha in SE Qld, took 18 years, cost $10,000
Helenium amarum	From <50 ha in SE Qld, took 39 years, cost $ 73,000
Hieracium pilosella ssp. nigrescen	From 0.005 ha in Tasmania, took 1 year, cost $394
Jatropha curcas	From 0.25 ha in NT, took 5 years, cost $ 4000
Salvinia molesta	From 3.6 ha in NT, took 10 years, cost $ 30,000
Eichhornia crassipes	From 2.4 ha in NT, took 7 years, cost $8800
Acacia karoo	From a small area in Queensland

More information

Cruz F, Carrion V, Campbell KJ, Lavoie C, Donlan CJ. 2009. Bio-Economics of Large-Scale Eradication of Feral Goats From Santiago Island, Galápagos. Journal of Wildlife Management 73(2):191-200.

Panetta FD. 2007. Evaluation of the performance of weed eradication programs: containment and extirpation. Divers. Distrib 13:33–41.

Woldendorp G, Bomford M. 2004. Weed eradication: strategies, timeframes and costs. Canberra, Australia Bureau of Resource Sciences, Department of Agriculture, Fisheries and Forestry.

Commercial killings fail to reduce goat numbers

Goat numbers have risen dramatically in Queensland in recent years despite commercial shooters taking out more than 100,000 animals for the meat trade each year.

Biosecurity Queensland estimates that the state's goat population had passed the one million mark by 2001. This example shows yet again how difficult it is for hunters operating outside control programs to reduce pest animal numbers, even when there is a financial motive.

The NSW Game Council insists that recreational hunters can be relied on to suppress pest animal numbers, when recreational hunters average fewer than one feral animal per hunting day, according to the Council's own figures, a rate well below that of commercial operators.

Reviewing the rise in goat numbers, Biosecurity Queensland reached this conclusion: "it is questionable whether Australian governments should remain passive observers in the commercial use of pest animals or pursue markets more actively and subsidise harvests in unprofitable areas or at unprofitable times".

ISC is wary of this approach because commercial hunters, like recreational hunters, often leave young animals behind to ensure a future harvest.

More information

The study, "Assessing the role of harvesting in feral pig (Sus scrofa) management" can be found in Technical Highlights 2008-9 (pages iv and 65-6) at www.dpi.qld.gov.au/4790_11850.htm

invasive species council

Feline threats: Australia caught cat napping

Cats engender massive contradictions. They are one of the most popular companion animals – Australians share their homes with 3 million – but one of the most reviled invasive animals.

Eighty-four per cent of respondents in a 1997 Victorian survey said feral cats should be eradicated. Cats are one of the most difficult of invaders to control, but laws on ownership are generally very lax, leading to large-scale abandonment and euthanasia of more than 300 each day.

New report highlights challenges

In their just released report for the Invasive Animals CRC, Elizabeth Denny and Chris Dickman highlight that although feral cats are recognised as a key threatening process, there is no nationwide management plan, and very little control occurs – in 2002-03 less than 0.3 million ha (compared to 10.5 million ha for foxes).

This reflects the lack of information about cat abundance and population dynamics, lack of effective methods and resources for control, and "the positioning of cat control as a social phenomenon because of the dual status of cats in Australian society".

Of three categories of cats – domestic, stray and feral – strays exploiting hotspots such as rubbish tips are probably the largest sub-group, and an important source of feral cats.

Cats reach highest densities on islands and in highly modified habitats, preferring open habitats to closed or dense, wet ones. Densities of 0.03-7/km^2 have been found in areas where cats rely mostly or wholly on hunting, but up to 800/km^2 in highly modified habitats where there are reliable food resources.

Very little is known about their population dynamics. Despite relatively low life expectancy and kitten survival rates in feral and stray cats, they have considerable reproduction potential. A population doubling time of just 8.5 months was recorded at one site.

Apart from predation, cats threaten native wildlife by competing for resources – probably most affecting the larger dasyurids (such as quolls) and large raptors – and are a potential disease threat. Of more than 100 pathogens recognised in cats, at least 30 have been recorded in native species, but very little is known about their impacts.

Cat facts

> Domestication of the African wild cat (Felis silvestris lybica) may have occurred about 9500 years ago.

> Australia has an estimated domestic population of 2.65 million and a feral population of 18 million.

> The Threat Abatement Plan lists feral cats as a known or perceived threat to 36 mammal, 35 bird, 7 reptile and 3 amphibian species listed as threatened.

Broadscale cat control is difficult because they occupy most habitats, have relatively low densities, and seldom take baits. Hunting, trapping and shooting are not practicable over large areas.

Current research is focused on developing more species-specific toxins that have less environmental and non-target impacts than the toxins currently approved, baits and/or lures that are consistently attractive to cats, and delivery systems that are more species specific than baits injected with toxins.

Lax cat laws sustain irresponsible cat ownership

A recent article by Louise Greenaway highlights inadequate and highly variable laws on cat ownership in Australia. In NSW, for example, owners are not required to desex or confine cats and can keep as many as they like. Councils have no authority to introduce their own local laws. In contrast the Kangaroo Island Council has enacted by-laws requiring that a cat be desexed and permanently confined to the property of its owner.

There is a case for uniform national regulations, Greenaway says, to minimise the impact that domestic cats have on native species and on feral cat numbers.

She highlights another of the cat contradictions in Australia: "Cats are perhaps the only highly invasive introduced species that is the beneficiary of multi-million-dollar government-funded rescue programs." But an average 15 cats are euthanased per hour.

Domestic cats as killers

Greenaway notes two studies on the rate of domestic cat predation in Australia: one finding that they kill at least 32 vertebrates a year and another 25. A recent study in Dunedin, New Zealand by Yolanda van Heezik and colleagues found that the predation by domestic cats was likely to be affecting bird numbers in urban areas.

Cat owners reported on prey brought back by 144 domestic cats. The average was 13.4 prey items/year. Birds were the most common prey, followed by rodents.

The researchers modelled the impact on three bird species and found that the level of predation "dramatically reduced the likelihood of population persistence" of all three. Urban areas were acting as a population sink.

They pointed out that rat control would have to be done in conjunction with cat control because rats are also a significant predator of bids.

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Abbott proposes green army of weeders

It's unusual (and refreshing) to have a major political speech focus on weeds. Here are some extracts from Tony Abbott's address to the Sydney Institute, 14 January 2010.

Volunteers already play an invaluable role in protecting the Australian landscape from invasive weeds. Here, volunteers with one of Victoria's 'Friends of' groups get down to business. Photo: Leon Costermans

Liberal leaders don't normally seek to make the environment a political battle ground but my initial policy agenda speech is on the environment: first, because it will be a vote-changing issue in this year's election; second, because the environmental debate should be much more than an argument over climate change; and third, because it's a good conservative principle that each generation should aim to leave the planet in better shape than we found it.

My key difference with the contemporary green movement is about how best to preserve the environment, not the importance of the task.

The political left shouldn't be seen as "owning" the environment (it's too important for that) and I am determined to challenge any assumption that it does. Conservative political parties and the conservationist movement both want to preserve what's best in our heritage.

As people familiar with the Australian landscape know, human impact on habitat is putting our native flora and fauna under constant pressure. We can do our best to preserve wilderness areas that are not subject to much human encroachment but, as the march of the cane toad or the bitou bush demonstrates, even the most inaccessible regions are vulnerable to the invasion of introduced species and exotic plants.

Intensive labour is required if weeds and feral animals are to be removed and if national park infrastructure is to be maintained. Notwithstanding the scientific breakthroughs of researchers with the CSIRO and our universities, the dedication of Australia's 4000 land care groups and the professionalism of our farmers and foresters, Australia is losing the battle against environmental degradation. Properly restoring only the most obviously degraded land would require a labour force that just isn't there.

On the Warringah peninsula, for instance, Middle Creek between Oxford Falls and Narrabeen Lagoon flows through an area of extremely degraded bush alongside the Wakehurst Parkway. Nearly a hundred years of exposure to garden run-off, sewerage overflow, and the seeds which birds, animals and passing traffic have deposited has turned the valley floor into a tangle of morning glory, elephant ear, privet bushes and asparagus weed in which a few remnant gums and palms struggle to survive.

Over the past 15 years, the intermittent attention of a Green Corps team, a few Work for the Dole crews, local volunteers and council bush regenerators have largely failed to make a difference. There just hasn't been a sufficiently large, sufficiently motivated and sufficiently sustained workforce to get such a big area of weeds under control. This is just one example of the thousands of locations where riparian vegetation, urban bush and degraded farmland needs the sustained attention of a large labour force in order to be restored to something like original condition.

Over the next few months, along with the Shadow Minister for the Environment, Greg Hunt, I will be talking to organisations such as Conservation Volunteers Australia and Greening Australia (the bodies that formulated and subsequently ran the original Green Corps) about the potential for a much larger and more capable national conservation corps. I have in mind a standing environmental workforce, perhaps 15,000 strong, comprised of short-term trainees plus regular workers and supervisors capable of supplying the skilled, motivated and sustained attention that large-scale environmental remediation needs. This won't be the 10,000 six month traineeships for unemployed people, spread out over three years, that the Rudd Government has announced. It would be a 15,000 strong environmental workforce – a standing green army, if you like, or a land army, if you'd prefer – that's available on an ongoing basis (over and above the existing efforts of councils and national parks) and supplemented by volunteers to tackle the local and regional environmental priorities that most urgently need the sustained application of labour.

This new conservation corps wouldn't be a traineeship programme or an employment programme with mere spin-off benefits for the environment. It would be Australia's first deployment of large numbers of people on behalf of the environment and the first time that we have approached environmental remediation with the same seriousness and level of organisation that we have brought, say, to dealing with bushfires or other local and regional emergencies.

Over the next few months, I will be inviting relevant organisations to put proposals along these lines to the Coalition for possible adoption as policy in the run up to the election. At, say, an average cost per place of $50,000 a year, a 15,000 strong conservation corps would be expensive – although not on the scale of the Rudd Government's unfunded stimulus measures. It would be an order of magnitude altogether greater than previous spending on green jobs that would indicate a new willingness to tackle environmental problems that have been festering for generations. Along with its other new policy proposals, the Coalition will announce the savings and revenue measures from which it will be funded in good time for the election.

Download

The full speech can be downloaded from *The Australian*.

Abalone virus threatens Victorian industry

A fatal virus threatens to wipe out Victoria's wild abalone industry. The Melbourne *Age* reported on 14 February that abalone divers and licence-holders are planning to sue the Victorian Government for alleged negligence in failing to prevent the disease spreading from aquaculture farms.

Abalone Viral Ganglioneuritis is caused by a herpes-like virus, not previously detected in Australia.

It was first reported in December 2005 in aquaculture farms in western Victoria, then spread to south-western coastal areas. It has affected wild abalone along 300km of coastline, and is likely to spread to Port Phillip Bay and the Mornington Peninsula, where there is a substantial wild abalone industry.

The virus can be spread on bait moved by fishermen from affected areas or with diving equipment.

The origins of the virus are unknown and contentious. The disease is similar to one recently recorded in Taiwan, but the Victorian Government says it is unlikely to have spread to Australia because of quarantine measures.

The Victorian Abalone Divers Association place these buoys in the water to mark areas of known virus infections. Photo: courtesy of VADA

Their favoured hypothesis is that it is an endemic disease of wild abalone. There are at least five possible scenarios.

1. The virus is endemic in at least some abalone populations, in some parts of Australia, and has been spread into naïve populations via the collection of farming broodstock.
2. The virus is exotic and crossed species when abalone broodstock in transit from the wild were held in a live holding facility with other seafood species.
3. The virus is exotic and entered the wild abalone population via contamination of sea water with processing wastes from commercial sea food processing plants.
4. The virus is exotic and was imported via imported feed for farmed abalone or ballast water discharge or some other source.
5. Hybridisation of two different abalone species (blacklip-greenlip hybrids) on the farms resulted in hybridisation of two herpes viruses.

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Sambar deer numbers rising

Evidence that Victorian Sambar deer numbers are growing has surfaced with a recent survey of hunters finding that about 34,000 were killed in the state last year.

The figure was about 28,000 two years ago and the website of the Department of Sustainability and Environment, presumably drawing on much older information, says the annual number killed is "in excess of 8500".

The numbers suggest that Sambar numbers have climbed dramatically.

The DSE website says hunting "appears to have little noticeable effect on the success of the species", that Sambar have steadily extended their range into NSW and the ACT, and that their density is increasing.

The telephone survey of hunters that produced the figure of 34,000 Sambar also revealed that hunters killed close to 40,000 deer in total in 2008/09, along with about 222,000 ducks and 189,000 quail.

More than 16,000 hunters held a Game Licence to kill deer.

Sambar deer.

There is no reliable information about Sambar abundance in Victoria (or deer anywhere for that matter).

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Weeds a key threatening process

The Federal Government has for the first time declared some weeds to be a key threatening process.

Escaped garden plants and five northern Australian pasture grasses have both been listed in recent months.

The grasses listed are Gamba Grass (*Andropogon gayanus*), Para Grass (*Urochloa mutica*), Olive Hymenachne (*Hymenachne amplexicaulis*), Mission Grass (*Pennisetum polystachion*) and Annual Mission Grass (*Pennisetum pedicellatum*).

A threat abatement plan will be prepared for the five grasses but not for escaped garden plants.

Broken promise

Less than a quarter of the $15 million funding promised for weed research by the Federal Government has eventuated so far.

The ALP promised this funding as a response to the failure of the Howard Government to maintain funding for the Weeds CRC.

To date just $3.6 million has been spent on weed research projects. But the 2007 ALP policy committed the government to have spent $11 million by 2009-10.

Sometimes it takes a thief to catch a thief

One of the reasons many weeds and pests flourish is because they are free of the pathogens, parasites and competitors that limit their success in their native range.

For entrenched and widely dispersed invasive species, one method of limiting damage is to import their natural enemies. Most of the biological control agents (BCAs) imported into Australia are for weed control but vertebrate and invertebrate pests have also been targeted.

However, releasing exotic species is always a risky endeavour, and these natural enemies of invaders can also cause harm to non-target species. This is because biological control is irreversible, so it is important to take the utmost care to prevent the introduction of harmful organisms yet also facilitate control of serious invaders.

Some advocates of biological control are concerned that increasingly costly and time-consuming assessment requirements will slow down progress in biological control in Australia but other biologists think strict controls are warranted. Apart from potential for harm by BCAs, there could be public/government backlash against biological control when BCAs attack non target organisms (see box).

Following are some comments by entomologist and ISC councillor Penelope Greenslade on the new guidelines by Biosecurity Australia for the importation of biological control agents and a brief overview of some biological control issues in Australia.

New guidelines for the introduction of biological control agents released

Over the past 75 years, hundreds of non-native BCAs have been imported into Australia but only a small number have proved highly beneficial as many have failed to establish and others have failed to control the weed or pest.

Cactoblastis cactorum, Australia's most successful biological control agent, which brought prickly pear under control. Photo source: http://www.ars.usda.gov/is/graphics/photos/sep06/d588-2.htm

To reduce the risk of unpredictable and damaging effects of BCAs, stringent controls are now applied to importations and applications to bring in new BCAs have to be very detailed. However, there are still unexpected and unwanted impacts from a few BCAs indicating that controls could be tighter.

On September 11, 2009, the chief executive of Biosecurity Australia (BA) announced new guidelines for the introduction of BCAs. Previously applications were managed primarily by DEWHA (Department of Environment, Water, Heritage and the Arts).

The new arrangement requires that a standard, but shortened, 'Import Risk Assessment' be carried out by BA on all applications, similar to that prepared for the importation of commodities such as fruits and vegetables. However, applications will still be regulated in a separate process by DEWHA, possibly only as a temporary arrangement.

The new process could be more complex and time consuming, which is likely not to please importers. However, the advisory committee that formulated the new regulations was entirely made up of those institutions (CSIRO, state agriculture departments etc) that have an interest in bringing in more BCAs. This raises a problem as no independent ecologist, taxonomist or conservationist was able to contribute to the regulations.

In detail, the guidelines (www.bisecurityaustralia.gov.au) include some improvements on the previous system. One section stipulates that voucher specimens of new BCAs must be deposited in a recognised institution. However, it falls short in that it does not require all stages (adults, immatures, males, females) of each BCA to be so deposited. Moreover, as is standard for formal taxonomic work, depositions in two institutions should be mandatory for safety and accessibility reasons.

Curiously, the new regulations also allow the importation of undescribed species. In my view this should never be allowed as it is impossible to know if an undescribed species is already in Australia and also impossible to search the literature for any relevant biological data on it. The description of a single new species is often a fairly simple, short process if carried out by a specialist taxonomist for the group involved and a process that should not be circumvented.

The other problem not addressed in the new guidelines is how to determine which non-target species the BCA might also attack. There are a number of examples of organisms jumping hosts, especially when exposed to a new environment. This possibility is difficult to predict but an attempt should be made to address it in all applications.

TABLE 1: BIOLOGICAL CONTROL AGENTS RELEASED 1996-2008 FOR WEEDS

Number of species released	Establishment	Damage to targeted weed
1996-2001: 28 (average 4.7/year)	Unknown/too early: 8 (19%)	Causing some degree of host damage: 12 (28%)
2002-2007: 15 (average 2.5/year)	Failed to establish: 9 (21%)	Causing host damage & released before 2002: 10 (36%)
Total released: 43 species	**Established: 26 (60%)**	

Palmer et al. (2009)

Biological control in Australia

Since 1997 Australia has had 35 active weed biological control programs against 37 weed targets. A review of biological control of

Non-target impacts of biological control agents released since 1996

(1) *Aconophora compressa*, released in 1995 for lantana, also attacked the exotic ornamental fiddlewood (*Citharexylum spinosum*) and some other garden plants in family Verbenaceae (now part of Lamiaceae).

(2) The moth *Neurostrota gunniella*, released in 1989 against *Mimosa pigra*, also attacked *Neptunia major* growing adjacent to mimosa thickets at relatively low intensity.

(3) The moth *Euclasta whalleyi*, released in 1988 against rubber vine (*Cryptostegia grandiflora*), also attacked in a minor way a related native vine when it grew close to rubber vine plants.

Palmer et al. (2009)

weeds by Palmer and others (2009) shows that releases have slowed in recent years. Over 12 years from 1996, 43 agents were released against 20 targets, an average of 3.6 a year. That rate was 4.7 a year for the first six years but dropped to 2.5 a year after 2001.

Only a small proportion of released agents have caused substantial damage to the target weed, although about one-quarter have caused at least some damage. See Table 1 for release, establishment and damage statistics from Palmer et al. (2009). The success rate for BCAs has been low. Of a dozen or so BCAs released on *Mimosa pigra* around Darwin most have established but only one has substantially slowed its spread or vigor (Paynter 2005). Other agents may reduce the spread of Mimosa into new areas. With each BCA release in Australia costing on average $460,000, Paynter recommends more rigorous evaluation of the impacts of BCAs.

Palmer et al. (2009) were also concerned about an increasingly precautionary approach, "which may threaten the attractiveness of biological control", but many would consider this an improvement. Recent assessment requirements may increase the potential processing time of applications for release of test agents from quarantine to two years but testing is normally a lengthy process in any case as the BCA has to be bred through several generations in captivity. The authors also criticised increased costs and requirements for upgrading quarantine facilities to house BCAs for testing in Australia prior to release. Considering the adverse publicity surrounding the accidental escape from CSIRO quarantine facilities a few years ago of several test BCAs, more stringent requirements seem necessary. Notorious escapes were the wheat streak mosaic virus and an exotic rust fungus for broom.

There have been at least three instances of non-target impacts of biological control agents since 1996 (see box). The attack on exotic ornamental fiddlewood trees (*Citharexylum spinosum*) by the lantana bug (*Aconophora compressa*), imported for control of lantana received considerable negative publicity.

McFadyen (2004) notes the increasing concern by some scientists about flow-on effects of biological control agents through food webs (indirect non-target impacts) and Parry (2009) focuses on parasitoids as particularly likely to develop competitive interactions with native parasitoids.

In a review of biological control for vertebrate pests, Saunders and others (2009) note that getting approval for biological control for vertebrate animals is "a long and arduous process", and harder than for plants and insects. In contrast to more than 5000 releases worldwide for the control of pestiferous insects and mites and more than 900 for weed control, there have been just "a handful of proposed releases for control of vertebrate pests". But then there is far less potential for biological control of vertebrates because potential agents are far less likely to be species specific and some vertebrate pests are also livestock.

Saunders et al. (2009) say there are justified concerns about biological control – highlighting the potential for illegal transfers of agents to other countries. Both myxoma and RHD viruses were illegally released into New Zealand, although myxoma failed to establish. New Zealanders are currently investigating a parasitic nematode as a self-disseminating delivery system for fertility control vaccines against brushtail possums, a major pest in that country. If released in New Zealand, there is a risk it could be deliberately or accidentally introduced to Australian possum populations.

There is no doubt that there are some notable biocontrol successes such as skeleton weed, rubber vine and bridal creeper, all Weeds of National Significance. For instance three agents from South Africa have been released against bridal creeper (*Asparagus asparagoides*), and two of them have established widely and demonstrated capacity to significantly reduce population densities.

One recent study found a benefit-cost ratio of 23:1 for biological control of weeds (Page and Lacey, 2006). But of several hundred biocontrol targets over the past 104 years there was only enough data for 29. Of these, just over half (16) provided economic benefits. Numerous failures were not included.

Saunders and colleagues (2009) highlight the major environmental and economic benefits of biological control of rabbits in Australia, including an average annual benefit of at least $130 million for the arid-zone pastoral industry over the past 57 years. Research investment in RHD was about $12 million over eight years, yielding a very high benefit-cost ratio, but benefits are currently being eroded as populations develop resistance.

Currently, new biological control options for rabbits, carp and cane toads are being investigated. One possible new method for difficult-to-control carp and cane toads is the use of 'daughterless technology', which involves a heritable engineered genetic construct that biases offspring sex ratios towards males. One hopes that the genetically engineered individuals will have enough virility to dominate populations once released unlike the well known failure of the same method attempted for blow fly control.

Because of the environmental damage caused by unchecked weeds and the risks of illegal and uncontrolled introductions when legal processes are too onerous, McFadyen recommends there should be an acceptance of some risk with biological control. She concludes that "Australian governments have a responsibility to support and facilitate the safe and legal use of biocontrol to manage widespread invasive weeds." However even with the current application requirements, some risk is already accepted as there is no such thing as a zero risk process.

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Australia, a continent under threat

Australia has the worst animal extinction record in the world, due mainly to invasive species.

With fire ants turning up in Brisbane, foxes in Tasmania, ongoing weed and disease spread, it could get worse. Australia needs a strong community voice to stop that happening.

The Invasive Species Council is the main conservation group pressuring governments to do more about weeds, pests and wildlife diseases.

Help make us stronger. With your membership we can do more.

– Tim Low, a founder of the Invasive Species Council

PS You can now join online. Go to **www.invasives.org.au** and click on the JOIN OR RENEW link.

Tim Low on Australia's Macquarie Island, a World Heritage site now overrun by rabbits.

Invasive Species Council membership application form

☑ **Yes**, I want to help protect Australia's native plants and animals from weed, pest and disease invasions.

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