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Weedscene

Weeds and climate change: The work is just beginning

by Carol Booth, Invasive Species Council

For a country that loses $4 billion a year from weeds (in production and control efforts), the impacts of climate change on invasive plants should be of central concern.

Awareness that weeds are likely to become more prevalent and harmful to the environment and agriculture under climate change is growing. Ross Garnaut flagged it in his climate change report:

> '…the ultimate outcomes are expected to be declines in biodiversity favouring weed and pest species (a few native, most introduced) at the expense of the rich variety that has occurred naturally across Australia.'

But Australians' environmental concerns about climate change are mostly focused on species loss due to higher temperatures and lower rainfall. We have not reached a threshold of awareness high enough to jolt the business-as-usual mentality about invasive plants.

New opportunities for weeds to spread

Concern about the influence of altered temperature and rainfall patterns on species' distributions is highly relevant to weeds. Modelling shows there will be new opportunities for some weeds to establish or spread under climate change.

The Victorian Department of Primary Industries has already identified several weeds from more northern climes likely to benefit in Victoria from climate change, including bladder dock (*Acetosa vesicaria*), basket asparagus (*Asparagus aethiopicus*), cobbler's pegs (*Bidens pilosa*), blue heliotrope (*Heliotropium amplexicaule*), cut-leaf medic (*Medicago laciniata*) and Paddy's lucerne (*Sida rhombifolia*).

Other weeds will contract in range, but this does not mean there will be a 'balancing out' between weedy winners and losers. Climate change will bring more severe storms, floods, fires and droughts – extreme events under which many of our worst weeds, including at least 13 of the 20 Weeds of National Significance (WoNS), have flourished. Extreme events can spread weeds far and wide, and the disturbance created – soil cleared of native vegetation and nutrient flushes – offer ideal conditions for weeds.

Athel pine (*Tamarix aphylla*) is one beneficiary of extreme events Victorians should be on guard against. After severe flooding in the 1970s and 1980s, it spread along 600 km of the Finke River in central Australia, fundamentally altering ecological processes. Its replacement of river red gums means loss of nectar and hollows, and it alters river channels, reduces water tables, and retards grass growth with saline leaf litter. Department of Primary Industries modelling has found a 'dramatic increase' in areas suitable for athel pine in Victoria, with the climate match particularly strong along the Murray River in north-western Victoria.

Athel Pine infestation, Finke River (Photo: Colin Wilson)

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Born of fire

While the range of another WoNS, blackberry (*Rubus fruticosis* agg.) may contract under climate change, more fires are likely to mean more opportunities for it to establish, a scenario all too common for weeds. Increased fire under climate change will exacerbate one of the worst national environmental threats – the spread of flammable exotic pasture grasses, which can transform vast areas of land through a positive feedback loop of fire and invasion. These grasses benefit from the fires they spread, growing more vigorously in the aftermath. While exotic grasses in northern Australia dwarf those in Victoria, with gamba grass (*Andropogon gayanus*) growing more than 4 m tall, the invasion of phalaris (*Phalaris aquatica*) and tall wheat grass (*Lophopyrum ponticum*) in Victoria increases flammability of some ecosystems. Phalaris increases fuel loads about three-fold over that of native kangaroo grass grasslands.

Invasion by weeds can render ecosystems that don't usually burn vulnerable to fire, resulting in the destruction of fire-sensitive vegetation. In Victoria *Tecticornia* (succulent chenopod) dominated shrublands are becoming vulnerable to fire as pasture grasses invade. Escaped garden plants, including fire-adapted Australian natives planted outside their natural range, can greatly increase fire hazards. Botanist Geoff Carr has documented the escape of scores of invasive native (but non-indigenous) species along Victoria's Surf Coast and hinterland, including more than 60 species of wattles (*Acacia*), paperbarks/honey-myrtles (*Melaleuca*), hakea, eucalypts, coast tea-tree, cape wattle (*Albizzia*), and kunzea.

The elevated levels of carbon dioxide driving climate change may also exacerbate weed problems by increasing their growth (where nutrients are not limiting) and undermining the effectiveness of glyphosate, the main herbicide used for environmental weeds. Several experiments conducted overseas have shown that glyphosate is less damaging to weeds grown under elevated carbon dioxide.

Not all weeds will benefit of course. But it's likely that the conditions of change, disturbance, and stress of native plants will lead to a considerably weedier world. Biologists expect that many native plants will succumb to rising temperatures, but hope that hardier native plants will take their place. However, much of the remnant vegetation in Victoria survives as habitat 'islands', surrounded by farmland that cannot be reached by better adapted plants. When native plants die, there is a high risk of weeds from surrounding farmland taking their place.

Man, a weed's best friend

Human actions in response to climate are also likely to favour weeds. When fodder is imported from interstate during droughts or after fires, weed seeds are often introduced. Climate change means that landholders in Victoria should be wary about fodder arriving from New South Wales.

The Invasive Species Council has a particular concern about many weed species proposed for use as biofuels. Trials are underway in South Australia for giant reed (*Arundo donax*), a major riparian weed in the US, which is also weedy in Victoria. We should also

The Murray Darling basin is probably one of the most severely climate-damaged regions in Australia. This artwork, *Wiradjuru/Murray Darling Climate Change Disaster*, was created by artist Naomi Grant for Oxfam Australia's Canvas for Change campaign (Photo: Piotr Fajfer/Oxfam International (http://www.flickr.com/photos/oxfam/3058676922/)).

Increased fires in Victoria could lead to the spread of flammable pasture grasses such as tall wheat grass (Photo: CSIRO).

be worried about the introduction of new pasture and horticultural varieties that are more tolerant of dry conditions. With the current lack of regulation, more vigorous varieties of some of our worst weeds can be freely introduced.

New varieties of existing weeds will contribute to the potential for hybridisation, potentially increasing their ability to adapt to changing conditions. Introducing multiple strains of weeds is a recipe for creating super-invasiveness.

As agriculture moves into new areas, with dreams of opening up water-rich northern Australia, weeds will inevitably follow. And as climate change puts pressure on agricultural profits and government budgets there may be less attention and resources for weed control.

What we can do

Climate change adds far more urgency to the need to control weeds. This means a greater effort to reduce the pool of invasive species, limit propagule pressure, prevent new invasions, control weeds in and around conservation areas and improve the health of ecosystems to prevent weed invasions.

Climate change should be factored into weed risk assessment. We should also better prepare for extreme events by anticipating the associated risks of weed invasion. It is well known, for example, that hastily constructed fire trails can become habitat for weeds introduced by fire trucks.

We'll need to priortise efforts wisely, a task that should be informed by research to better understand the myriad interactions between climate change and invasive species. Which invasive species will constitute the threats of the future and which native species and ecosystems will be under particular threat?

One priority should be a national program to remove sleeper weeds that could flourish under climate change, with targets including garden plants in alpine ski resorts and around the Wet Tropics World Heritage Area. Another high priority is a strategy to control and prevent the spread of invasive flammable grasses.

Governments should require risk assessments of new crops, such as biofuels and hardier pasture plants, and implement controls to prevent the widespread cultivation of potential weeds.

As readers know, it can be hard exciting the public about weed impacts on biodiversity. In contrast to other serious environmental problems, such as land clearing, climate change and dams, there haven't been marches in the streets, huge petitions and election promises about environmental weeds. But with weeds part of the threat posed by climate change, more of a focus is justified. We should be calling upon gardeners to remove weedy plants as part of their moral response to climate change.

Partly because of the lack of awareness about invasive species threats (beyond iconic invaders such as cane toads, foxes and gorse), advocacy for reform on invasive species policies is limited. Of all the mainstream environment NGOs, only the Invasive Species Council has this focus. In these circumstances, people with knowledge and passion for weed issues are essential to the advocacy effort.

Despite reforms in recent years, particularly in federal biosecurity, there is still a large gap between what is needed and what is being done. The bleak reality is that things will continue to get worse before they get better. We need a much greater clamour from those who are aware of invasive threats to biodiversity. The Invasive Species Council invites members of weed societies to help us with that task and hopes we can work together on promoting a policy reform agenda.

If you would like to support the Invasive Species Council or work with us on these issues please visit our website, www.invasives.org.au, or phone us on 03 6227 9547.

Further information

The Invasive Species Council publishes a regular free ebulletin about climate change and invasive species. To subscribe please email your name, address and phone number to doubletrouble@invasives.org.au. You can read earlier versions of this ebulletin at http://doubletroublebulletin.wordpress.com.

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WSV News

WSV Executive Committee 2009

At April's AGM the society welcomed new members to the executive and farewelled others, while some people took on new roles. Kelly Raymond after a number of years of service including two years as President has retired. Jackie Steele has taken on the mantle of Treasurer and Michael Hansford has stayed on for a second year as President. New to the committee and picking up the role of Vice President is Matthew Stephenson, Bass Coast Landcare Network. Also joining the committee are John Burley and David McLaren, DPI, Greg Wells from Dow AgroSciences and James O'Brien from Landmark Operations Ltd. Profiles of some of the new committee members are below.

Matthew Stephenson

Matt is employed as the 'Community Pest Plant and Animal Program Officer' for the Bass Coast Landcare Network. He manages a number of projects related to the strategic integrated control of weeds, foxes, rabbits and other general Landcare focused projects. Matt has been a Landcare Project Officer for nine years and has also been involved with the Victorian Landcare Network, as President for two years and currently as Manager of the Pest Plant and Animal Portfolio.

Matt has been an interested participant at WSV seminars for a number of years and recently decided to join the committee. Matt considers it an important aspect of his job to keep up to speed with the latest and most innovative methods of pest control and would also like to glean ideas and concepts to pass on to the community in his area. Matt acknowledges that it is sometimes difficult to fill these positions and with the support of his employer, he decided to assist this important organisation.

Matt is an avid environmental advocate, enjoys spending time on the family farm in East Gippsland, enjoying the surrounds of his home at Philip Island and all it has to offer and is currently working on a couple of novels he hopes to complete when he takes a break from Landcare into the future. He runs for his guitar at the end of the day, hoping the neighbours are not listening – and likes to keep busy in the indigenous jungle he has created in his backyard. Matt is the proud father of three girls… who show little or no interest in pest plant and animal control!

David McLaren

David completed his undergraduate degree before also completing his PhD on "Insect Damage to Young Plantation Grown Eucalypts in Mount Gambier, South Australia, with Particular Reference to Selected Lepidoptera" at La Trobe University in 1989. David then spent two years working on the impact of microencapsulated insecticides on Honey Bees with the Department of Agriculture before he began work on biological control of weeds at the Keith Turnbull Research Institute in 1986. David is now a Principal Research Scientist who is currently working on a range of unpalatable grasses such as serrated tussock and Chilean needle grass and several new and emerging weeds for the Victorian Department of Primary Industries, Frankston. David specialises in developing integrated weed management solutions for controlling serious agricultural and environmental weeds.

James O'Brien

James' current role at Landmark is as an agronomist in the south west of Victoria – this extends from Port Campbell up to Camperdown and across to Colac, mostly centred around Timboon and Cobden. As such, he is mainly involved with pasture and fodder cropping. Previously, he owned a dairy farm in northern Victoria and prior to that was involved in extension work in Papua New Guinea for five years.

James recently became a member of the Weed Society of Victoria. A lot of his work in pastures and cropping involves the management of weeds, so James saw the WSV as a good means of acquiring knowledge and building contacts in this field. He was then given the opportunity to join the committee which he saw as both an extension of this and also an opportunity to contribute something to the WSV in terms of time, ideas, etc.

James' personal interests are languages, history, motorcycles and kelpie dogs.

John Burley

As the Director, John leads the Invasive Plants and Animals Branch within the Department of Primary Industries and is responsible for provision of policy and investment advice relating to invasive plant and animal management across the State. This includes the development and implementation of an appropriate statewide policy framework for invasive plants and animals and of appropriate key projects within the Department of Primary Industries.

John has been a member of the Weed Society of Victoria since around 1998. He regards the society as playing a very important role in establishing and maintaining important linkages between the various key stakeholders in the weeds industry and helping to ensure that all involved can maintain their technical and professional expertise up to date.

John felt that it was important to join the committee at this time to foster the links between the department and the wider weed community, especially in the lead up to the Australasian Weeds Conference to be held here in 2012.

When not at work, John's interests include theatre, bushwalking, good food and wine and travel, along with his family. He is also an active leader in the scout movement.

Fourth Victorian Weed Conference

The fourth Victorian weeds conference will be held this year in Geelong at the Mercure Hotel from 7–8 October 2009. The conference theme *Plants behaving badly: in agriculture and the environment* will include presentations from two keynote speakers. John Thorp from John Thorp Australia, who will speak on *Where are we going with weeds?* Geoff Carr from Ecology Australia will provide a new look at environmental weeds in Victoria. There are a diverse range of concurrent sessions including: Municipal Matters, Aquatic Weeds, Declared Weeds, Environment, Agriculture and Weed Management. Registrations after 31 August will cost an additional $60, so get in early.

Research

Developing diagnostic tools for weed identification

The Victorian Department of Primary Industries has partnered with the EH Graham Centre for Agricultural Innovation (Charles Sturt University and Department of Primary Industries New South Wales) and the Royal Botanic Gardens Herbarium on a project to develop diagnostic tools for weed identification. Identification of a number of weeds is complex due to morphological similarities amongst closely related taxa and hybridisation within genera. Accurate identification of the species, hybrid, variety or cultivar at hand is important to determine spatial distributions of key taxa, manage biosecurity incursions and ensure compliance with regulation, ensure optimal biological control outcomes and to optimise management activities. While with many weed species it is straightforward, there are a number of genera where identification of plants to the required taxonomic level is difficult. In some cases it is even difficult to distinguish closely related genera without appropriate reproductive material.

The project will develop diagnostic tools for plants which are difficult to identify, such as stipoid grasses, including *Nassella* species, which are Weeds of National Significance. Current identification techniques rely on reproductive characteristics and gross morphological features. Diagnostic tools will be developed in two ways, which are outlined below.

Micromorphological characteristics

A range of leaf micromorphological characteristics will be investigated to determine the utility of these features as identification aids for stipoid grasses. Examination of stomatal configurations and associated cells, and of phytoliths (particles of hydrated silica deposited in intracellular and/or intercellular spaces) by light microscopy will be undertaken on several species of stipoid grasses. These analyses will determine if any aspects of these features vary sufficiently between species to allow for their characterisation as diagnostic tools.

Molecular techniques

Molecular genetic variation (polymorphism) can resolve the identity of biological samples at multiple taxonomic levels and as such, molecular diagnostics are valuable in the identification of plant taxa. Building on initial analyses already undertaken on *Stipa* and *Nassella* samples, sequencing will occur in order to resolve taxonomic relationships and variation between these species. Samples across 4 DNA regions will be sequenced including multiple accessions of the same taxa (e.g. *Austrostipa nitida* nested within two accessions of *Austrostipa scabra* with *Nassella tenuissima*, *Austrostipa scabra*) will be undertaken. Additional species from amongst *Achnatherum*, *Jarava*, *Nassella*, *Piptatherum*, and *Piptochaetium* will also be sequenced to verify the utility of the identification.

The project will contributes to Goal 1 of the Australian Weeds Strategy by developing tools to help prevent the introduction of new weeds, ensure early detection and reduce weed spread to new areas. Funding of more than $90,000 has been contributed by the Australian Weeds Research Centre (AWRC) to the project.

Enhanced weed identification will lead to enhanced knowledge of the distribution and dispersal of weed taxa, resulting in improved weed management. The diagnostic tools are expected to benefit a broad range of end-users ranging from land managers undertaking weed control to biosecurity incursion response personnel and compliance officers seeking to ensure that declared weed species are not traded or planted.

Agriculture

Watching the sleepers

by Dr Jeanine Baker, Invasive Species Section,
Bureau of Rural Sciences, Canberra

Introduction

Since European settlement, around 2700 exotic plants have naturalised in Australia and around 16 per cent of these are currently serious problems for agriculture[1]. Without intervention, others are likely to emerge as major weeds requiring ongoing control at public and private expense. Within this category of emerging weed threats are 'sleeper weeds'. These are described as naturalised exotic plant species that are currently only present in a small area but have the potential to spread widely and have a major negative impact on agricultural and/or natural environments. Some sleeper weeds may never become a serious problem. Others, although present for many years and seemingly harmless, can suddenly respond to changed conditions by spreading and causing serious harm[2].

Ideally, strategic weed management includes eradication of potential weed species before they become major problems. However, with limited resources to invest, sleeper weeds are often assigned to the 'not perceived to be invasive' category and become less of a management priority. Yet they remain important management considerations in terms of which species both *should* be eradicated and *can* be eradicated from Australia, given the influence of climate and land-use change.

In 2006, the Bureau of Rural Sciences (BRS) identified 17 sleeper weeds that could have nationally significant impacts on agriculture if allowed to spread[2]. These 17 plants were naturalised and had been in Australia for anywhere between five and 100 years but because of their weed risk, none of them would be permitted for import today. For each of the 17 species, the area of Australia where there was a potentially suitable climatic environment was assessed using the potential distribution model 'Climate' (now CLIMATCH, publically available from www.brs.gov.au/climatch/). The revenue of agricultural production at risk was calculated, based on the land uses that each weed could affect within climatically suitable regions. This provided a relative measure of the potential benefits of eradication. These sleeper weeds were grouped into categories, with practical recommendations on how to invest weed management funds for each category.

The 2006 BRS study identified Uruguayan rice grass (*Piptochaetium montevidense*) as a sleeper weed that was economically feasible to eradicate and orange hawkweed (*Hieracium aurantiacum*) as a sleeper weed where eradication was not feasible at the time but recommended that it should be retained on appropriate weed lists. We briefly review the current status of these two weeds and comment on the lessons we draw from sleeper weed assessment and management.

Uruguayan rice grass

Uruguayan rice grass (*Piptochaetium montevidense*) had been reported at a site near Cherry Lake, Altona, Victoria[3]. It is now eradicated from Victoria, but what might have happened if it had not been eradicated, given it prefers temperate climatic zones with dryer soil characteristic of large grazing areas of Australia?

Uruguayan rice grass is related to the genus *Nassella,* which includes the Weeds of National Significance Chilean needle grass (*Nassella neesiana*) and serrated tussock (*Nassella trichotoma*), which cost south-eastern Australia's grazing industries more than $40 million a year in lost production and control expenditure[2]. Under current climate conditions, Uruguayan rice grass has been estimated to be able to spread over 637 599 km^2 of land across Victoria and New South Wales, parts of Western Australia, South Australia, and Queensland[2,4]. In 2006, the modelled cost of eradication was around $35 100[2].

Uruguayan rice grass was eradicated from the Altona site, and therefore from Australia, as a result of a fortuitous landfill event (Figure 1) although the small and delimited area of infestation would have assisted managers to ensure containment and eradication. If this weed had not been eradicated and continued to spread until it infested the total area indicated as climatically suitable, all cropping and grazing land and natural habitat within the 637 599 km^2 area predicted as suitable for establishment in Australia would have been at risk of infestation. Thus, the estimated investment of around $35 000 for the eradication of the sleeper population would have been well worth the return.

Figure 1. The 10 m high landfill at Cherry Lake where the Uruguayan rice grass infestation had previously existed (Photo: David McLaren, DPI Victoria)

Orange hawkweed

Orange hawkweed (*Hieracium aurantiacum*), also a temperate weed with the ability to colonise alpine regions, was identified as having a distribution in two states, plus being sold in nurseries in Tasmania, Victoria, New South Wales and Queensland (Figure 2). In 2006, eradication costs were estimated to be around $553 000, with around 269 967 km^2 of Australian grazing land and natural habitat predicted to be at risk of infestation[2]. The conclusion at

the time was that, because of the widespread distribution and commercial sales, eradication was not economically feasible because of the lack of delimitation, but that the weed should remain on appropriate weed lists.

Orange hawkweed has established in subalpine and alpine areas in Victoria and begun to spread from source populations with resultant negative impacts on native biota as well as economic impacts. However, a Tasmanian project has commenced, with the aim of developing a strategic eradication plan for that State. The difficulty in eradicating orange hawkweed has been demonstrated by the attempted eradication of it in a garden bed containing alpine and arid plants at the Ballarat Botanic Gardens. The size of this infestation was about 15 square metres and consisted of 20–50 plants and attempts to eradicate the species remained unsuccessful in 2007[7]. This highlights the problems in eradicating weeds, even when the infestation sites are small, placing emphasis on the need for early detection and management.

Figure 2. Orange hawkweed (Photo: Norman Melvin, USDA)

Conclusions

Local conditions will influence climate change in the future, so applying generalised climate change models to future weed distribution means that actual geographic shifts in distribution of any weed are uncertain. However, the area of greatest threat for temperate weeds is predicted to shift to the south-east of the continent[4]. This will make Victoria more vulnerable to the spread of existing Australian sleeper weeds suited to the altered temperature and rainfall patterns, particularly for species well suited to taking advantage of disturbance following flood or fire events[4]. Using values for the generalised climate change models reported in '*Climate change in Victoria: 2008 summary*'[8], results for computer simulations across the range of possible temperature and rainfall changes reported for 2030 indicate Uruguayan rice grass and orange hawkweed will still be able to spread across most of Victoria for decades to come, particularly with predicted increases in rainfall intensity in summer and autumn.

Uruguayan rice grass has been reported as growing with native grasses in other countries and could have become an environmental weed if it had established in Australia. It has been observed as a component of an overgrazed cattle pasture on the pampas in Argentina where unpalatable grasses dominated and thus could have eventually dominated pastures if unmanaged in Australia[3]. Hawkweeds fill gaps created by disturbances and orange hawkweed would be a likely beneficiary of more frequent fires and heat-waves[5,6]. Even if its future range is kept smaller with successful management strategies, impacts may be worse because the weed forms dense, monotypic stands and out-competes many native species.

So, what lessons can we draw from sleeper weeds? Simply, they are lessons we have already recognised—the need for a commitment of resources for the term of the eradication process, which requires a time-limited plan supported by detailed discounted benefit:cost analysis, especially when the eradication period exceeds 10 or 20 years. We also need to be alert to the appearance of new plants where they have not been detected before and act early when weed infestations are confirmed. Where eradication is not immediately possible, continued management of potential pest species remains the goal, with eradication being reconsidered as new control technologies become available.
In addition to state and local government programs, continued encouragement of community participation in early weed detection and management, supported with the best practice methodology for surveillance and monitoring, remains a lynchpin of successful management. This applies not only to those weeds that have already been identified as 'sleepers' in the state, but for those that will take advantage of future change, whether that change is the result of changing weather patterns or landscape disturbances.

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On the ground

Beechworth Landmate Program

The north-east of Victoria has, over the past 20 years, benefited from the volunteer labour of Landmate crews from Beechworth Prison. The Landmate program is operated by the Department of Sustainability and Environment (DSE), which receives requests for volunteer labour on environmental projects and liaises with prison staff. Ashley Brown is the industry supervisor who works with DSE to identify priorities for the work, undertakes occupational health and safety assessments of work sites and oversees the program within the prison. Ashley has been involved in Landmate programs for many years. 'Beechworth Prison has two crews each comprised of 9 minimum security prisoners and a prison staff member. There are similar programs in other prisons in Victoria, but Beechworth is currently the biggest, although years ago in Gippsland there was a prison which had six gangs.'

'Requests for the involvement of Landmate come from a large range of not-for-profit organisations such as Landcare, DSE, catchment management authorities, Land for Wildlife, Trust for Nature, Pest Plant and Animal Officers from local councils, the Regent Honeyeater revegetation program and Friends Groups to name a few. The Landmate crews are dispatched within an area of approximately 100 km radius of the prison, which covers diverse terrains including Wodonga, Bright, King Valley, Wangaratta and Yackandanda,' said Ashley.

The type of work undertaken by a Landmate crew can involve fencing, cleaning up parks, planting and weeding. 'Of 25 projects currently planned, 16 involve weed management.' The labour and tools provided by Landmate is free and plants and chemicals are supplied by those who request the work.

Landmate crews are able to perform all types of weed management including chemical spraying, cutting and painting, chain sawing woody weeds and hand pulling. 'There is a small operational farm onsite at Beechworth Prison run by inmates and learning about and implementing weed management is an important part of managing it. Members of the crew are also trained at the prison TAFE to use a chainsaw and to safely handle and use chemicals. Recently the Department of Primary Industries ran a course on weed identification and management at the prison,' Ashley reported.

Karen Jones, who worked with Landmate crews during her former role at the Rural City of Wangaratta, described them as being among the hardest working volunteers, who made a huge contribution to the implementation of the council's environmental program.

Ashley said, 'Every job a Landmate crew undertakes is a success with all people involved pleased with the service and its outcomes. Each year, Landmate crews plant approximately 20,000 trees. One of the biggest jobs Landmate crews worked on was in

Landmate crew members in action (Photos: A. Brown, Department of Justice)

Eskdale, a small township in the Mitta Valley approximately 60 kilometres from Albury-Wodonga, where 3–4 kilometres of woody weeds, blackberries and thistles were removed in preparation for revegetation.'

Crew members, when invited by Ashley to comment on what they appreciated about being a part of the Landmate program, said:

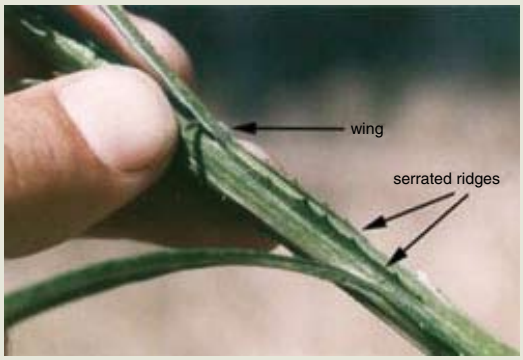
- 'It is good to learn new things and to use machinery.'
- 'I like helping locals and working in parks and along rivers.'
- 'The work gives me pride.'
- 'I enjoy identifying weeds. I didn't realise what a huge problem weeds are for the environment.'
- 'I enjoy using different equipment and learning about occupational health and safety.'
- 'Getting out of prison and helping the community is what it is all about.'

For further information about the work of Landmate, including a flyer, contact DSE in Wodonga.

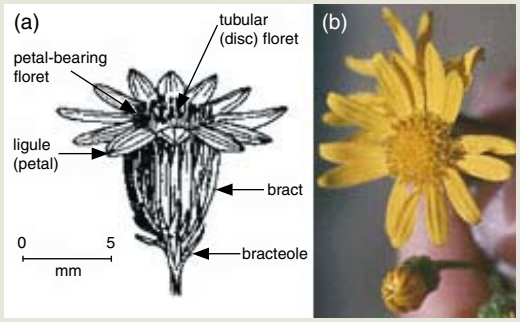
Lisa Minchin

Weed profile

Flowering plant (Photo: George Watts)



Stem showing distinctive wings at the base of the leaf stalk (inclined against and pointing up the stalk) and serrated stem ridges



Flower: (a) showing the floral parts and the overall bell shape, (b) mature flower and flower bud

This article is based on a DPI Landcare Note, see www.dpi.vic.gov.au (Photos © State of Victoria)

African daisy (*Senecio pterophorus*)

Also called winged groundsel; Asteraceae (daisy family). The name African daisy is also used for species of *Osteospermum*. An aggressive weed that establishes after disturbance, particularly fires, clearing and soil degradation. It tolerates a wide range of soil types and occupies areas with 500–1500 mm annual rainfall. In Victoria it is mainly a weed of roadsides, wastelands, denuded and newly sown pastures and forest margins. Plants grow in a variety of situations, from well-drained hillsides to semi-waterlogged areas.

Status

Regionally Prohibited weed for the North Central, Wimmera, Corangamite, Goulburn Broken, North East and West Gippsland CMAs. *Regionally Controlled weed* in the Glenelg-Hopkins, Port Phillip & Westernport (East & West) CMAs. *Restricted* in the Mallee and East Gippsland CMA.

Origin and distribution

Native to South Africa and introduced to South Australia in ship ballast at Port Lincoln in about 1930. From there it spread to the Adelaide Hills and occupied much of the southern Eyre Peninsula and south-east South Australia, in areas with over 500 mm annual rainfall. It was first collected in Victoria in 1908 at Coode Island and in 1909 at North Melbourne, but apparently failed to spread from these introduction points. It did not become notably invasive in Victoria until about 1972 and current infestations are believed to be a result of spread from South Australia. Numerous infestations have been found in Victoria.

Description

An erect herb or shrub generally about 1.5 m high (but up to 3 m), with a perennial crown and a ground cover diameter of 2–2.5 m at two years old; reproducing from seeds. ***Stems*** – several growing from a central crown, grey-green or green, stout, woody when mature, soft and sappy when young; with longitudinal ridges and serrated ridges on the lower sections; stems usually covered with white hairs like cobwebs when young, but becoming smooth and hairless. ***Leaves*** – leathery, upper surface dark green, rough, becoming hairless and often shiny, under side covered with dense white or grey woolly hairs; narrow lance-shaped, 50–120 mm long and 3–25 mm wide (mainly 7–15 mm); margins with 2–8 forwardly directed teeth or without teeth (upper leaves). Towards the top of the plant the leaves are longer and narrower and are more serrated than toothed. The leaf margin is often curled under. ***Flowers*** – yellow, numerous in flattened heads 5–30 cm (mostly 10–20 cm) across, found at the ends of stems; each head consisting of 40–200+ flowers; each flower bell-shaped, 12–5 mm wide, surrounded by 18–22 bracts with hairy brown tips and up to 20 shorter, smaller bracteoles; each flower consisting of 9–13 petal-bearing female florets 4–7 mm long arranged around the outer edge, and 40–95 tubular florets grouped in the central disc. ***Seeds*** – 1.5–2 mm long, oblong to cylindrical, brown or reddish-brown with a pappus of fine hairs to 5 mm long. ***Roots*** – branched, fibrous, shallow, extending mat-like up to 3 m from crown.

Established plants produce new growth from the crown after autumn rains. Seeds germinate mostly in autumn. Stem growth is rapid in late winter and spring. Flowering commences in November and continues until autumn. Seeds mature 2–3 weeks after the flowers open. A mature plant produces about 50,000 seeds per annum. Plants can live for as long as 7–10 years.

Similar species

Most likely to be confused with common native *Senecio linearifolius*, fireweed groundsel, which has cylindrical rather than bell-shaped flowers, leaves that are usually not woolly-white underneath and tends to occur in taller forests.

People

Ern Perkins: Winner, Australian Natural History Medallion 2008

Ern Perkins, long-term resident of Castlemaine, Victoria, has been awarded the Australian Natural History Medallion 2008. This award is presented to amateurs or professionals who make a significant contribution to the knowledge and appreciation of natural history in Australia. Ern was recognised for his research and recording of native flora and fauna. Ern's contribution covers a range of areas.

Roadside Conservation

In the early 1990s, Ern and other volunteers made roadside surveys around Maldon, leading to the Maldon Shire Roadside Report, written by Ern. He then went on to complete surveys for Metcalfe and Newstead shires, and the city of Castlemaine, recording plants and assessing roadside conservation values. On the amalgamation of the shires, Ern produced a summary including significant native vegetation, major weeds, and conservation value for each section of road in the new Mount Alexander shire. He assisted in training roads personnel to increase awareness of roadside conservation.

Ern says that these strategies were successful for some time, but change of personnel and contracting out of services had a negative impact. Now GPS and computers help identify and locate threatened species making protection easier.

Botanical Guardians

For the past 10 years Ern and his wife Lesley have been volunteers in the DSE Botanical Guardians scheme, assessing bushland in north western Victoria, along the Northern Campaspe River, and around Maryborough, Wedderburn and Donald. They survey small blocks of land, recording plants, bird habitat, weeds and threats.

Also as Botanical Guardians, Ern and Lesley carry out plant surveys of cemetery reserves, 150 so far. Ern says cemeteries are often the only places to retain local flora, with the area fenced off for burials usually only a small part of the whole reserve. He and Lesley visit two or three times over the year, preparing plant lists, and 30 metre quadrats. All plants are recorded, including weeds. He says, "It's always exciting to see which plants have survived". Ern sees the biggest threats as cultivation and broad scale herbicide use, followed by heavy grazing.

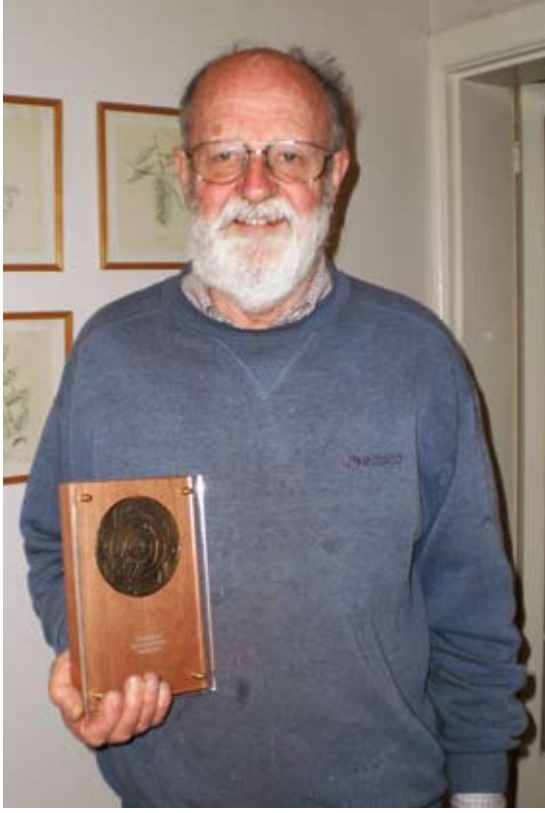
Ern has identified rare and threatened species of plants and potential threats. One example is the southern shepherd's purse, discovered by Von Mueller in the 1890s and missing for a century. It grows on moss mats on Mount Alexander and was being threatened by choughs and 4WD activity. Ern informed DSE and intervention strategies and monitoring have been established.

Fire Impact Monitoring

Ern has been recognised for his work in pre-burn and post-burn monitoring. Previously there had been little research into the effects of fire in box ironbark forest. With a small team of volunteers, Ern set up more than one hundred 20 or 30 metre square quadrats. A plant list is made for each quadrat and the percentage cover estimated, allowing comparison between burnt and unburnt areas. One of the perceived benefits of fuel-reduction burning is that it may enhance plant diversity. Ern's monitoring suggests that in drought conditions recovery after burning appears to not occur or be very slow.

Photopoints

A decade ago Ern initiated the Castlemaine Field Naturalists Club photopoint program. 800 photos were taken, enabling monitoring of vegetation change in local areas.
His photos show that in some areas the understorey has disappeared due to drought and severe grazing. This pictorial record provides clear evidence of the impact of extended drought. Digital cameras allow him to take many photos, while GPS makes it easier to find the precise area again. Ern believes that long-term monitoring has been neglected in the past, because people didn't see the need to maintain records, believing the environment to be static. Now people are encouraged to get involved: to photograph and record plants, birds and other wildlife.



Ern Perkins with his Australian Natural History Medallion (Photo: L. Minchin)

Publications

Ern was also recognised in the award for his contribution to education, and engagement with the community. He has written leaflets on local geology, wattles, mistletoes, ferns, grasses, birds and eucalypts. He has produced and maintained a district plant list, covering a radius of 25 km from Castlemaine.

Ten years ago Ern produced *Is it a native?,* a weed identification CD. The Castlemaine Field Naturalists Club produced 1000 copies, with copies given free to local Landcare groups. This greatly assisted in the protection and regeneration of local species, and continued eradication of weeds.

Bird surveys

Ern and Lesley contribute to the Australian Bird Atlas, regularly surveying 10 sites in the Castlemaine area, recording all the birds seen over 20 minutes. He reports that while the number of magpies, galahs, rosellas and ravens has remained steady, small bushland birds such as Jacky winters and thornbills have decreased. Ern sees this as due to the impact of drought on their food supply and lack of understorey and leaf cover in the trees making smaller birds more vulnerable to predators.

Ern doesn't know what the future will bring. He emphasises how varied bushland is: "It is anything but uniform, varying enormously over very short distances". Factors include tree felling, fire history, rainfall, geology and erosion. In the past few years rainfall has been so erratic that some areas received rain while neighbouring ones got none. If rainfall continues to be low, more plants, including mature trees will die. The work Ern has enjoyed the most is the vegetation surveys of blocks and cemeteries. He wants to investigate what changes are taking place over time. He says it "all forces you to look closely" and that he is "always learning". He is still fully involved, remarking he "doesn't have much spare time".

His passion is the long-term monitoring, with the key issues being the monitoring itself, the storage of information, and access to that information. He is working with the South-east Naturalists Association in planning workshops on this. He sees it as important to involve other people and pass on information and knowledge. Ern sees himself as continuing in his varied roles. "Distribution of plants has been historically poorly recorded, but now we see more groups and individuals doing the counts." We can be thankful that Ern continues to set the path for others to follow.

Barbara Ashworth

Australasian Weeds Conference 2012

The WSV is hosting the 18th Australasian Weeds Conference in Melbourne in 2012. Organising a successful national conference takes time, planning and coordination. There are many opportunities for you to contribute, such as taking on the role of conference secretary or treasurer, or participating in one of a number of committees such as: ♦ Program ♦ Sponsorship ♦ Proceedings ♦ Field trips ♦ Publicity/media ♦ Venue ♦ Displays.

If you are interested in becoming involved or have any questions about the committees or possible roles, please contact Ros Shepherd, WSV Secretary.

Review

EMAIL CIRCULAR: Integrated Pest Management Network (IPMnet)

This is the first in a series of articles which will look at email subscriptions relevant to the field of weeds.

What is it? IPMnet has two key features: IPMnet NEWS is a six-weekly email bulletin published approximately 8 times per year which provides international integrated pest management (IPM) news, research, publications, resources, materials, career positions and events.

IPMnet CALENDAR is an email bulletin which lists weed and pest related conferences and events (symposia, workshops, meetings, training courses) from around the world. It is sent once annually and each edition of IPMnet NEWS provides an "IPMnet CALENDAR Update" that lists only the latest additions and revisions to the previous edition of the IPMnet CALENDAR Latest Complete Version. The calendar is also available on-line at: http://www.pestinfo.org/calendar.php3.

Who is behind it? The Integrated Pest Management (IPM) Network has the catch-phrase: 'Global Principles, Local Practices'. Launched as an electronic bulletin board in late 1993, IPMnet has expanded to provide current international IPM information to researchers, extensionists, technical specialists, producers, administrators, educators, consultants and retailers, i.e. anyone with an interest in the topic. IPMnet is structured to create and facilitate both a worldwide information channel and a resource for strengthening and fostering IPM. The purpose-designed network was originated by a consortium of US landgrant universities established in 1978 to promote research, development and extension of effective, economic and environmentally attuned crop protection practices worldwide. In 2007 well over 5800 user accounts representing at least 150 countries were connected with IPMnet, which makes it the weed related email subscription with arguably the widest reach in the world.

Financial support for the network comes from the US Department of Agriculture's Cooperative State Research, Education and Extension Service; the US Agency for International Development's IPM Collaborative Research Support Program and the Integrated Plant Protection Center at Oregon State University.

Things to consider The frequency of the email makes it a manageable read and, unlike a lot of calendars, you are provided with information about events which will be held in a couple of years' time, which enables you to plan to go to an overseas conference (and perhaps put in for a WSV travel grant).

IPMnet NEWS is reasonably well used by Australian scientists and others and can be a source of nationally relevant information which you may not otherwise be exposed to. For example, the March edition included information about a project being undertaken by Land and Water Australia to identify potential user needs of a 'national information for weeds system' through use of a survey. (Contact C. Auricht, Auricht @landsystems.com).

The range of information relevant to weeds is broad, including information about new online resources, such as "Pesticide Spray Drift", a free, compact on-line course that is said to help individuals to "recognise the potential dangers of drift, the causes of drift and several methods of preventing drift" (http://tinyurl.com/aonjuz) , scholarship opportunities (e.g. Master of Science in Plant Protection in Hungary) and book reviews.

The email version uses 'traditional' plain text, and Courier fixed-space type font. IPMnet NEWS is working towards developing an alternative HTML/PDF format to be introduced sometime in 2009 which will make it much more user friendly. There is no cost to the subscription. When you subscribe you can request copies of back issues. Since IPMnet NEWS is distributed by bulk emailing using 'undisclosed-recipients' you may need to configure your spam filter to allow the periodic emails.

Each email bulletin concludes with: 'For ultimately, adopting or failing to adopt IPM approaches has the potential to impact the majority of humankind', a good reason to join up and learn about the latest in approaches to reduce the impact and spread of weeds and pests.

For further information and to subscribe email the IPMnet NEWS Editor/Coordinator at: IPMnet@science.oregan state.edu