Newsletter of the Weed Society of Victoria Inc.
volume 26 issue 3 2015

Weedscene

Biological Weapons in the War on Weeds

Agents of Change

Invasive plants growing in their non-native range are often able to grow and spread unchecked because their natural enemies are not present in the new region. Their natural enemies include particular insects and pathogens which attack their seeds, leaves, stems or roots.

Biological control of invasive plants is a management approach which makes use of their natural enemies, which are known as biological control (biocontrol) agents. Great care must be taken so that biocontrol agents introduced into a new region do not become pests themselves. Therefore, much research into and testing of potential biological agents must be conducted prior to release into the Australian environment.

Development of biological control has an enviable track record in Australia. There have been significant developments since the first attempts to find biocontrol agents for prickly pear in 1908 and lantana in 1916.

By 2006, an independent economic evaluation* concluded that there was an overall benefit cost ratio of 23:1 for Australia's weed biological control programs. In other words, for every $1 spent on weed biocontrol in Australia, there was a $23 benefit.

However, we have entered an era of dwindling funding for scientific research and that includes work on biological control of invasive plants. So in this issue, we feature biological control of invasive plants and hope that this work can continue to grow and develop, well into the future.

Leaf beetle damage to *Tradescantia fluminensis* (Photo credit: Dr David McLaren, Principal Research Scientist and Research Leader, Weed Sciences, Department of Economic Development, Jobs, Transport and Resources)

* Cited in:
Palmer, W.A., Heard, T.A. and Sheppard, A.W. (2010). A review of Australian classical biological control of weeds programs and research activities over the past 12 years. *Biological Control* **52**(3) 271-287.

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* *Students and Pensioners*

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Contents

COVER PHOTO: *Tradescantia fluminensis* (courtesy Rob Richardson)

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Invasive Plants PhD Research Projects

This is the fourth in our series on invasive plants research projects being undertaken by PhD candidates in Victoria.

Optimising the management of invasive aquatic plants targeted for extirpation from catchments and waterways; utilising alligator weed (*Alternanthera philoxeroides*) as an indicator species

PhD candidate Daniel Clements is supervised by Associate Professors Singarayer Florentine and Jim Sillitoe (Federation University Australia), and Drs Tony Dugdale and David McLaren (Department of Economic Development, Jobs, Transport and Resources – DEDJTR)

Aquatic plants are integral components of freshwater ecosystems and provide essential ecosystem services. When invasive species establish in new environments, there are few natural checks and balances to inhibit their growth and spread. Excess aquatic vegetation can harm aquatic systems if left unchecked; they degrade water quality, slow water velocity, exacerbate siltation or flooding, and reduce species diversity and abundance. Dense infestations impact on recreation, navigation and hydroelectric generation, exacerbate the spread of insect borne diseases and compromise agricultural productivity by impeding water delivery.

Funding for this project is provided through a Federation University Australia scholarship and associated research funded by Department of Economic Development, Jobs, Transport and Resources.

Daniel Clements assessing an infestation of floating alligator weed (*Alternanthera philoxeroides*) for potential downstream dispersal (Photo: Tony Dugdale, DEDJTR).

This research project aims to develop management strategies for one of the world's most invasive aquatic weed species, alligator weed (*Alternanthera philoxeroides*), by developing methods to manage viable fragment production post herbicide application and improving the effectiveness of detection in early stages of invasion.

The application of the herbicides glyphosate, metsulfuron-methyl and imazapyr, and the effectiveness of incorporating plant growth regulators are evaluated. High altitude aerial imagery (orthophotos) and unmanned aerial vehicle technology to detect alligator weed in waterways and catchments are also evaluated in this project.

Prevention and early intervention are recognised as the most cost effective means to manage invasive species. Current research has been limited to evaluating the efficacy of control at a local scale without regard to the effects of management strategies on dispersal throughout catchments, limiting extirpation attempts. Control of viable fragment production, in addition to control of above- and below-ground biomass, is required for effective control of alligator weed at a catchment scale.

Improved detection and surveillance strategies are also required because a key impediment to extirpation is the ability to detect infestations so that control can be enacted. Detection techniques currently utilised for alligator weed involve on-ground human surveillance.

Findings will have broader implications for the management of key invasive aquatic weeds under control efforts worldwide, including water hyacinth (*Eichhornia crassipes*) and salvinia (*Salvinia molesta*).

Recent publications by Daniel Clements:

Clements, D., Dugdale, T.M. and Butler, K.L. (2012). Using plant growth regulators to limit herbicide-induced stem fragmentation of aquatic alligatorweed (*Alternanthera philoxeroides*). *Weed Technology* **26**(1): 89-94

Clements, D., Dugdale, T.M., Butler, K.L. and Hunt, T.D. (2014). Management of aquatic alligator weed (*Alternanthera philoxeroides*) in an early stage of invasion. *Management of Biological Invasions* **5**(4): 327-339

Clements, D., Dugdale, T., Hunt, T., Fitch, R., Hung, C., Sukkarieh, S. and Xu, Z. (2014). Detection of alligator weed using an unmanned aerial vehicle. *Plant Protection Quarterly* **29**(3): 84-89

Biological Control Agents of Weeds in Victoria

Meet the Tiny Biocontrol Heroes

Blackberry
***Rubus fruticosus* agg.**
Leaf rust fungus
Phragmidium violaceum

Leaf defoliator. Widely established on several blackberry species.

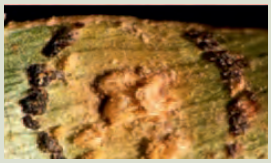
Boneseed
Chrysanthemoides monilifera
Leaf buckle mite *Aceria* sp.

Released, establishment uncertain.

Bridal Creeper
Asparagus aspargoides
Bridal creeper leaf hopper *Zygina* sp.

Sucks contents from leaf cells. Established.

Bridal creeper rust
Puccinia myrsiphylli



Attacks stems and leaves, causes early leaf drop. Established.

English broom
Cytisus scoparius
Twig mining moth
Leucoptera spartifoliella

Larvae feed on woody tissue. Established.

Seed beetle
Bruchidius villosus

Larvae feed on seeds in developing pods, reducing seed production. Establishment limited.

Psyllid
Arytainilla spartiophila

Adults and nymphs suck sap from plant cells. Established.

Common heliotrope
Heliotropium europaeum
Flea beetle
Longitarsus albineus

Destroys roots. Established.

Rust fungus
Uromyces heliotropii

Infects leaves and stems. Established.

Gorse
Ulex europaeus
Seed weevil
Exapion ulicis

Destroys developing seed. Established statewide; active only during one flowering season.

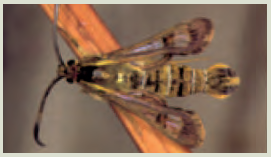
Spider mite
Tetranychus lintearius

Pierces gorse spines sucking out cell nutrients. Widely established and redistributed.

Soft shoot moth
Agonopterix ulicitella

Released, establishment uncertain.

Dock
***Rumex* spp.**
Clearwing moth
Pyropteron doryliformis



Larvae bore into roots; capable of destroying plants. Established.

Horehound
Marrubium vulgare
Plume moth
Wheeleria spilodactylus

Feeds on leaves and growing tips. Widely established.

Clearwing moth
Chamaesphecia mysiniformis

Larvae feed on roots, disrupting vascular flow. Limited distribution.

Paterson's curse
Echium plantagineum
Leaf mining moth
Dialectica scalariella

Mines leaves, causing a blistered effect. Established statewide.

Flea beetle *Longitarsus echii*

Mines and destroys roots in late spring. Widely established.

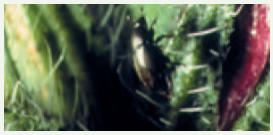
Crown weevil
Mogulones larvatus

Destroys central crown. Widely established.

Root weevil
Mogulones geographicus

Destroys roots. Established but distribution limited.

Seed/pollen beetle
Meligethes planiusculus



Destroys developing seed. Widely established.

Prickly pear *Opuntia stricta*
Cochineal scale insect
Dactylopius opuntiae

Destroys all aerial parts. Established.

Cactoblastis moth
Cactoblastis cactorum

Feeds on aerial parts. Established.

Ragwort ***Senecio jacobaea***
Flea beetles
Longitarsus flavicornis
Longitarsus jacobaeae

Larvae feed on roots, weakening plant. Established.

Crown boring moth
Cochylis atricapitana

Bores into crown and stems. Widely established.

Cinnabar moth
Tyria jacobaeae

Larval feeding causes defoliation. Establishment uncertain.

Plume moth
Platyptilia isodactyla

Bores into crown and stems. Established and spreading.

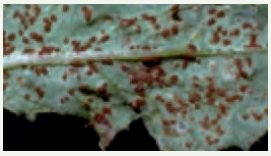
Skeleton weed
Chondrilla juncea
Gall midge
Cystiphora schmidti

Galls on leaves and stems. Established.

Gall mite ***Eriophyes chondrillae***

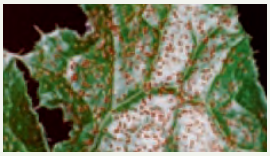
Galls the flower buds. Established.

Rust fungus
Puccinia chondrillina



Infects leaves and stems. Established.

Slender thistle ***Carduus pycnocephalus & C. tenuiflorus***
Rust fungus
Puccinia cardui-pycnocephali



Infects leaves and stems. Widely established.

Scotch and Illyrian thistles
Onopordum acanthium & O. Illyricum
Stem boring weevil
Lixus cardui

Destroys stems, which stunts growth. Widely established.

Seed weevil ***Larinus latus***

Destroys developing seed. Widely established.

Spear thistle ***Cirsium vulgare***
Receptacle weevil
Rhinocyllus conicus

Destroys developing seed. Limited distribution.

Gall fly ***Urophora stylata***

Reduces seed production. Widely established.

Variegated thistle
Silybum marianum
Receptacle weevil
Rhinocyllus conicus

Destroys developing seed. Established, distribution limited.

Tiger pear ***Opuntia aurantiaca***
Cochineal
Dactylopius austrinus

Destroys all aerial parts. Established well, slow spreading.

St John's wort
Hypericum perforatum
Leaf beetles: ***Chrysolina hyperici & C. quadrigemina***

Feeds on leaves and shoots. Widely established in Victoria.

Aphid ***Aphis chloris***

A sap sucking aphid. Well established, localised impact.

Gall midge
Zeuxidiplosis giardia

Gall forming midge. Widely established, limited impact.

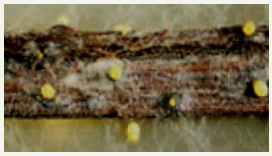
Mite
Aculus hyperici

Sucks sap, stunts growth, reduces plant vigour and seed production; is able to kill plants. Widely established.

Tutsan
Hypericum androsaemum
Rust fungus
Melampsora hypericorum

Defoliates plant. Established.

Fungus
Phomopsis emecis



Attacks foliage. Established.

Red apio
Apion miniatum

Attacks stems of plant. Widely released, not yet established.

Source: Agriculture Victoria & Keith Turnbull Research Institute (2004). Under control: pest plant and animal management news – No. 27. (Supplement – Biological Control of Weeds in Victoria). Keith Turnbull Research Institute for Integrated Pest Management, Agriculture Victoria, Frankston, Victoria.

Australian Biological Control of Weeds (1997–2009)

Palmer, W.A., Heard, T.A. and Sheppard, A.W. (2010). A review of Australian classical biological control of weeds programs and research activities over the past 12 years. *Biological Control* 52(3) 271-287

This article provides a brief overview of the review paper shown above, which covers significant developments in biological control of weeds in Australia during the period from 1997 to 2009. During this period, the average number of personnel working on Australian biocontrol projects is 12 scientists and 20 technicians, with an investment of approximately $10–12 M per annum on weed biocontrol programs, plus about the same amount again on infrastructure support.

The review discusses some of the policy, legislative, funding and infrastructure frameworks that have influenced developments in weed biocontrol during the 12 year period. The review also lists new releases of biocontrol agents for 19 target weeds during that period and gives updates on the performance of biocontrol agents for 35 target weeds.

Framework for Development in Biological Control

Legislation and Policy

- designation of Weeds of National Significance in 1999 – Australia's 20 worst weeds were targeted for funding, with resourcing of weed biological control efforts;
- formalised approval process for weed species as targets for biological control prior to release of an agent – target weed proposals are submitted through the Australian Weed Committee to assess conflict of interest, with final approval by the Natural Resource Management Standing Committee;
- biocontrol agents are approved for release by Australian Quarantine Inspection Service under the *Quarantine Act* 1908, with Ministerial approval for new arthropod agents;
- review of *Environmental Protection and Biodiversity Conservation Act* 1999 and drafting of biosecurity legislation were underway at the time;
- *Biological Control Act* 1984 (which deals with conflicts of interest associated with biocontrol and gives legal protection to public agencies making releases) has become ineffective and fallen into disuse since it was last invoked in 1996 when rabbit calicivirus had escaped semi-quarantine – new legislation is needed to provide more effective legal process for biocontrol.

Cooperative Research Centres (CRC)

- weed biocontrol in Australia has been associated with the CRC for Weed Management Systems (1995–2001), the CRC for Australian Weed Management (2001–2008) and the CRC for Tropical Pest Management (1991–1998);
- key biological control issues were addressed, including host-specificity testing; selection, testing and evaluation of agents; ecological basis for agent selection and establishment of agents; and evaluation of impacts.

Overseas Field Stations and Exploration

- a critical component of weed biocontrol is exploration within native range – achieved through sending scientists overseas in collaboration with local scientists and research agencies (e.g. collaboration with Argentinean Universities and the USDA South American Biological Control Laboratory) and utilising Australian (CSIRO facilities at Montpellier in France and at Veracruz in Mexico) or other agencies' overseas facilities;
- international cooperation continues to be a feature, including Brisbane-based USDA-ARS Australian Biological Control Laboratory which searches for potential agents for American pests of Australian or South-East Asian origin; joint international projects; and Australian projects also benefiting developing countries.

Facility Infrastructure

- there has been increasing use of quarantine facilities within Australia to undertake host-specificity testing due to requirements under the *Wildlife Protection Act* (1982) and costs of maintaining staff and facilities overseas;
- the article lists facilities in use and in planned-use around Australia during that time and describes some of the updated quarantine and building code requirements for quarantine facilities within Australia.

Scientific Developments

Plant Biogeography

- useful insights for biological control can be gained through knowledge of the biogeographic origins of target weeds – populations of target weeds originating from different locations may have unique and specific co-evolved natural enemies;
- studies in genetic diversity are used to determine biogeographic origin, e.g. patterns of DNA sequence variation and polymorphic chloroplast microsatellites.

Agent Selection

- the article cites review and research articles published during that period, which describe Australia's significant progress in the science of agent selection.

Taxonomic Barcoding

- accurate taxonomic ID using DNA barcodes assists with issues such as: lack of taxonomic expertise; reluctance to allow unknown or partially identified organisms into the country; contamination and quality control.

Climate Assessment

- climate matching can be useful in exploration for potential biocontrol agents; selection of plant species for host-specificity testing; and the selection of areas in which to release approved agents;
- the article lists climate modelling software which came into use during that period;
- predicting the effects of climate change on both target weeds and biocontrol agents will be a further use of climate modelling programs.

Host-Specificity Testing

- significant improvements in host-testing techniques are noted, using relatedness of target weeds to potential non-target hosts.

Laboratory Cultures

- challenges for biocontrol practitioners include loss of genetic diversity while biocontrol agents are held in culture, particularly while in quarantine, leading to problems such as laboratory adaptation and inbreeding depression;
- best practices must be determined for the collection, breeding and genetic management of insects being reared for release and establishment as biocontrol agents.

Integrating Biological Control with Other Weed Management Approaches

- biological control can integrate well with other control options and should lead to significant cost reductions (e.g. experiment on treatment techniques for *Mimosa pigra*).

Non-target Impacts

- the review cited a 2006 article which identified 17 biocontrol agents (of the 164 released in Australia) with the potential to utilise 30 non-target native species, requiring urgent attention for several species;
- the cited article prompted studies on several of the biocontrol agents identified; two studies found that only non-target plants in close proximity to the target weed were affected, and at relatively low intensity.

Contemporary Weed Biological Control Programs

The review lists new releases of biocontrol agents for 19 target weeds during that period and gives updates on the performance of biocontrol agents for 35 target weeds. During the period, excellent successes were reported for rubber vine and bridal creeper using plant pathogens, and good levels of control for Paterson's curse, *Sida acuta*, groundsel bush, parthenium weed, docks, mesquite and mimosa are noted.

In the Media

Mapping the Global Spread of Weeds

The journal *Nature* announced in December last year that all research papers would be made free to read (www.nature.com/news). ABC Science may have picked up on that, to report on an article published in *Nature* on mapping the global spread of weeds. The study is the most comprehensive analysis so far of global distributions of naturalised alien plant species. Despite a shorter period of European colonisation, Australasia has a higher number of extra-continental plant species than North America (adjusted for area). Temperate Asia and Europe are the major donors of naturalised plant species. http://www.abc.net.au/science/articles/2015/08/20/4296253.htm

In Praise of Invasive Species

British science journalist and author Fred Pearce was interviewed by ABC RN's Future Tense about his thought-provoking, if not controversial, book 'The New Wild: Why Invasive Species Will Be Nature's Salvation' (see publisher's description in New Publications). The author discusses implications of the idea that invasive species are nature's response to human damage to the environment. Link to audio: www.abc.net.au/radionational/programs/futuretense/in-praise-of-invasive-species/6668836

Landline: Weeding Out

ABC's Landline went to the remote Kimberley region of Western Australia to report on an eradication program of rubber vine and biological control of stinking passion flower. Distribution of rubber vine is sufficiently low for eradication to be possible, utilising helicopter detection followed by hand removal. A CSIRO team is negotiating funding for the next phase of research into biocontrol of stinking passion flower. Video access: www.abc.net.au/landline/content/2015/s4267598.htm

Second Great Britain Invasive Non-native Species Strategy

The first was published in 2008. The recently-released second strategy responds to a scheduled review in 2013. It provides key actions to address hierarchical objectives prioritising prevention, early detection and rapid response, and long-term management and control, through a framework of coordination and cooperation. See: www.gov.uk/government/publications/the-great-britain-invasive-non-native-species-strategy

One of the achievements of the first Invasive Non-native Species Strategy was the establishment of the Non-Native Species Secretariat website: www.nonnativespecies.org/home/index.cfm

Digital Technology – Weed Detection

A Perth-based PhD candidate is developing image recognition software with potential for weed detection in agriculture. The program recognises plant species via scanned leaves using mathematical algorithms and artificial intelligence technology, which could be used in robotic agriculture to differentiate between weeds and other plants in crops, and to detect herbicide damage. Audio access: www.abc.net.au/news/2015-08-21/plant-recognition-technology/6715766

Biological Control Amid Human-Induced Global Change

The spread of invasive plants is one aspect of human-induced change that defines the Anthropocene era. Developing biological control programs is one way we respond to it. In the Tansley Review* cited below, successes and limitations of biological control of invasive plants are reviewed in the context of global environmental change. This article outlines some of the topics covered in the Tansley Review.

Seastedt, T.R. (2015). Biological control of invasive plant species: a reassessment for the Anthropocene. *New Phytologist* 205: 490–502*

The scientific framework for biological control is provided by a huge literature on population ecology, focusing on predator-prey and pathogen-host studies. The objective of biological control is finding 'injury guilds' that sufficiently reduce target plant fitness so that its continued presence is no longer an ecological or economic concern. The effectiveness of biocontrol is dependent on location and the ecosystem characteristics that exist there. Factors influencing the effectiveness of herbivore or pathogen biocontrol agents include the presence or absence of predators of the biocontrol agent and the extent to which co-evolved interactions between the target weed and biocontrol agent in their native habitat exist in the new environment.

The inherent uncertainties involved in inserting species into new environments are further compounded by rapid environmental change. Despite these uncertainties, biological control could play a larger role in mitigation and adaptation strategies used to maintain biological diversity, and food and fibre production.

Predicting Outcomes

Biological Control Agents and Population Dynamics

- biocontrol agents can harm individual plant fitness while failing to reduce overall target plant densities or seed production per unit area – this can be due to compensatory responses, such as increased survivorship following reduced seed production.

Biological Control Agents and Community and Ecosystem Dynamics

- target weed populations exist within habitats that affect plant performance and reproductive output – context specific factors include seed predation; suitable sites and resources for seedling survival; plant and soil microbial communities which may affect competition and herbivory; climate and disturbance regimes;
- extent of control is dependent on how well biocontrol agents function and interact with host plants in introduced environments;
- changes in these environments are anticipated due to changing climate.

Improving the Efficacy of Biological Control Agents

- modelling is increasingly being used to predict outcomes and evaluate biological control efforts;
- testing of agents before release reduces undesirable outcomes and increases the probability of control;
- particular traits which lead to improved agent selection have been identified in both the biocontrol agents and target species;
- antagonistic, additive or multiplicative effects can occur when multiple species of biocontrol agents are used on target plants, as well as higher risk of unintended consequences; introducing biocontrol species that attack the same part of the plant at the same time should be avoided;
- example of knapweed in North America: releases of many biocontrol agents were undertaken over a long period, resulting in many unintended consequences without solving the initial problem; eventually, a cumulative effect was observed and suppressed fitness reduced the abundance of the weed in its introduced community, which caused the unintended consequences to also decline;
- concerns that remain: revegetation is often required so that one weed is not replaced by another; appropriate management techniques, such as changing grazing regime, may not be deemed acceptable by stakeholders.

Rapid Evolution Contributes to How Target Plants Respond to Biological Control Agents

- growth traits and competitive interactions of target plants can differ markedly in the introduced habitat, compared to their native habitat – processes involved remain poorly understood;
- natural selection appears to occur very rapidly in both target plants and biocontrol agents – rapid evolution of control agents can be caused by altered characteristics of target plants and other species already present, and other differences in the introduced environment;
- evaluation of the evolutionary potential of biocontrol organisms before their release is advocated.

Global Environmental Change Drivers Alter Abiotic and Biotic Controls

- new challenges for biological control programs are created by global change drivers, such as elevated carbon dioxide, climate change and nitrogen deposition, which may alter ecological interactions among biocontrol organisms and their hosts – biocontrol performance may be increased or decreased;
- some biocontrol agents may be capable of increasing the number of generations produced per year as the growing season lengthens;
- differing responses to changing climate may alter synchrony between biocontrol agents and host plants;
- many invasive plants show large positive responses to increased carbon dioxide concentration which can also result in increases in water use efficiency, influencing responses to altered amounts and seasonality of rainfall;
- increased plant-available nitrogen due to human activities influences herbivory as plants become better feed sources;
- changes in disturbance regimes, such as fire intervals and extreme weather events, can favour invasive species.

Social Dimensions of Biological Control

Communications of Scientists with Managers: Monitoring the Outcomes

- monitoring of biological control outcomes is often neglected and underutilised but would make interesting citizen science projects;
- land managers often know where invasive plant species occur, but seem less aware of the presence and status of biocontrol agents on these species;
- given the scientific and economic benefits of biological control, its application is proceeding more slowly than expected;
- information transfer could be greatly improved by having scientists embedded in management programs.

Invasive Species as 'Wicked Problems'

- 'wicked problem' – impacts of environmental problems that vary with location and across socio-economic, cultural and ecological domains, affecting stakeholders differently – solutions to these problems may also produce 'wicked problems';
- strong advocates of biocontrol may prefer alternatives to herbicides, while some conservationists oppose the introduction of additional, non-native species to control invasive plants;
- the scientific community continues to differ on the relative benefits and threats posed by biocontrol agents – a risk management framework has been developed that found greater than 99% of more than 500 agents had no significant adverse effects and recent improved safety procedures would result in even fewer unintended consequences from deliberate releases in the future; there is also the view that the risk of agents spreading beyond their intended range is not routinely assessed, and that rapid evolution might produce unanticipated host shifts or other non-target effects;
- the ecosystem services provided by introduced plant species must also be considered, in the context of continued human change to the planet.

The Future for Biological Control of Plant Invasions

- procedures for identifying suitable invasive plants for biological control efforts are improving;
- the track record of the current releases of biocontrol agents on invasive plants is very good;
- expect surprises – major restructuring of ecological communities can result from the addition of a non-coevolved plant species even in the absence of other environmental changes: changes will produce new invasive plant distributions and novel ecosystems;
- triage practices will be required of land-managers and conservationists to deal with rapid environmental change – losses are inevitable;
- species migrations and deliberate movement of species to areas not previously occupied by those species may be the only solutions for the persistence of some plant species, with implications for 'native' and 'non-native' status;
- biocontrol programs will continue to be a species-by-species effort, and will remain cost-effective and sustainable tools to maintain or enhance ecosystem services and conservation values.

* *New Phytologist* publishes Tansley Reviews by invitation only, to provide an authoritative overview of a topic whilst being reasonably accessible to a non-specialist. They are available online free of charge. Article access: http://onlinelibrary.wiley.com/doi/10.1111/nph.13065/full

WSV News

6th Biennial Conference 2016

'Celebrating 50 Years of Invasive Species Management in Victoria – Our Past, Present and Future'

The committee has confirmed next year's 6th biennial conference will be held at the Novatel Forest Resort, Creswick; 7–9 June 2016.

The conference is dedicated to the 50th birthday celebrations of the society. The conference theme is past, present and future – history of invasive species management in Victoria, current work, and applying lessons of the past to plan for the future.

The program will consist of a welcoming pre-conference canapes meet and greet, conference dinner, two presentation days and a field trip on the third day.

This information and any updates, including the registration release, AGM papers and committee nominations will be provided on the NRMjobs website. We hope you can join us and we look forward to seeing you there!

For any conference enquiries, please email the secretary via secretary@wsvic.org.au.

Online banking upgrade for WSV

The WSV is very pleased to announce that our banking has now been upgraded to an online account. In her time as Treasurer, Isabella Amouzandeh has battled the paperwork and bought WSV into the online banking era.

This will mean that credit card payments, in particular, will be a much faster and easier process. Credit card payments will still be processed by the Secretary, but will reduce banking administration previously required by the WSV Secretary, Treasurer and the bank. Credit card payments will also produce an instant receipt and automatically email it to the customer. Direct debits and cheques will also continue to be accepted. We hope our members will enjoy the benefits from this new process.

Membership renewals

Those members who are due for a yearly renewal will receive their renewal via email soon, if not already. A reminder that those who made a multiyear payment last year will not be requiring renewal. If you're not sure, please enquire with the Secretary via secretary@wsvic.org.au

Register in the APWSS Directory of Weed Scientists in the Asia Pacific Region

The APWSS Directory was launched earlier this year to create a database of Weed Scientists working in the Asia Pacific region. The purpose of this initiative is to bring the region's scientists closer together for possible collaboration in research and development. All scientists are encouraged to register themselves in this directory to engage more effectively with other scientist.

Please visit the website (www.apwss.org) and register by clicking on APWSS Directory tab or use the following link (http://www.apwss.org/register/user/register).

Please encourage your colleagues to register in the APWSS Directory.

Rebecca Grant, Secretary

Dates for your Diary

November 2015

Workshop on the Evaluation and Regulation of the Use of Biological Control Agents in the EPPO Region
Budapest, Hungary, 23–24 November
http://archives.eppo.int/MEETINGS/2015_conferences/biocontrol

February 2016

Annual Meeting of the WSSA
San Juan Puerto Rico, 8–11 February
http://wssa.net/meeting/2016-meeting

Species on the Move International Conference
(species redistribution in a changing climate – the organisers are inviting suggestions for themes)
Hobart Tasmania, 9–12 February
www.speciesonthemove.com

27th German Conference on Weed Biology and Weed Control
Braunschweig, Germany, 23–25 February. www.unkrauttagung.de

June 2016

Knowledge Nexus: applying transdisciplinary and systems approaches for sustainable weed management. Alberta Canada, 6–10 June. http://andinaalberta.weebly.com

Celebrating 50 Years of Invasive Species Management in Victoria – Our Past, Present and Future
Weed Society of Victoria, Creswick Victoria, 7–9 June. www.wsvic.org.au/

7th International Weed Science Congress
IWSS, Prague Czech Republic, 19–25 June. www.iwsc2016.org/

11th International Symposium on Adjuvants for Agrochemicals
'Creating, Bridging and Sharing the Values of Adjuvant Technology'
Monterey, USA, 20–24 June
http://events.isaa-online.org/page/269/welcome-to-isaa-2016.html

September 2016

20th Australasian Weeds Conference
CAWS, Perth, Western Australia, 11–15 September. www.20awc.org.au/

CAWS Reports

June 2015

An additional obstacle to ratifying amendments to the CAWS constitution had come to light before the 18 June meeting. Due to an oversight, invoices for membership dues had not been issued for the last financial year, meaning that technically each society's membership to CAWS had lapsed. Therefore, the recent special general meeting that supported changes to the constitution was not valid.

Once again, this has been exposed through an anonymous complaint to Consumer Protection in WA Dept. of Commerce through the WA *Associations Incorporations Act 1987*, instead of simply bringing the oversight to the committee's attention directly. These actions have been quite disheartening for many committee members because procedural issues such as these are most easily rectified internally.

Action has been taken to ensure that all membership fees have been paid in time for the AGM in September. Any previous committee decisions during the timeframe of unpaid memberships can be retrospectively validated at this meeting.

The organising committee of the 20th Australasian Weeds Conference (AWC) in September 2016 in Perth are seeking expressions of interest by potential attendees, sponsors and exhibiters. Please see www.20awc.org.au/ Follow on Facebook at https://www.facebook.com/20AWC?fref=ts

The criteria for awarding CAWS Conference travel awards has been under review. This has been a difficult process because a survey conducted by the CAWS committee at the last AWC demonstrated strongly differing opinions, especially regarding eligibility of CAWS committee members. The other issues were the wording to define eligible applicants, and considerations of merit of applications versus an equitable distribution of successful applicants across Australasia.

Ultimately the CAWS committee decided that committee members are eligible for travel awards. It was also decided that the requirement for on-ground action be removed and merit would be the primary factor for selection, with consideration also given to location of the applicant.

The next CAWS meeting will be the AGM on 10 September 2015. Andrew Cox and Ingrid Krockenberger are your CAWS delegates.

Ingrid Krockenberger

September 2015

The 10th September teleconference included the AGM where the CAWS office bearers were elected as follows:

President: Rachel Melland *Secretary*: Kerry Harrington
Vice President: Hillary Cherry *Treasurer*: Alex Douglas

At this AGM, out-going President, Anna-Marie Penna reported:
On the 'good news' front, the final Senate inquiry report on environmental biosecurity was released in mid-May and the report was unanimously supported by all parties and CAWS is quoted a number of times. One of the 26 recommendations related to improved regulation on the sale of weedy plants while another related to internet sales of seeds:

- *Recommendation 18*: The committee recommends that the Commonwealth Government work with state and territory governments, and the horticulture industry, on establishing standardised labelling, weed identification, and sales tracking protocols across the industry.
- *Recommendation 15*: The committee recommends that the Department of Agriculture undertake enforcement activities against internet retailers and marketplaces that repeatedly breach Australia's plant and seed import requirements and work with these businesses to ensure warnings are displayed when customers attempt to purchase prohibited plants and seeds. The full report is available at: http://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Communications/biosecurity/Report.

This outcome is a credit to those involved in the submission process and goes towards enhancing the recognition of CAWS in providing advice on weed awareness and management issues at the Federal Government level.

Of particular interest to members is the new criteria for Travel Award Regulations. This will see a broader definition of who is eligible for the Australasian Weeds Conference Travel Award. Please check the website in the coming months and consider making an application to attend the 20th AWC to be held in Perth, 11–15 September 2016. Applications are to be submitted to the CAWS secretary by 1 March 2016. Further details via www.caws.org.au/awards.php.

This meeting was attended by your CAWS delegate Ingrid Krockenberger and proxy delegate Rebecca Grant. The next CAWS teleconference is scheduled for 17 December 2015.

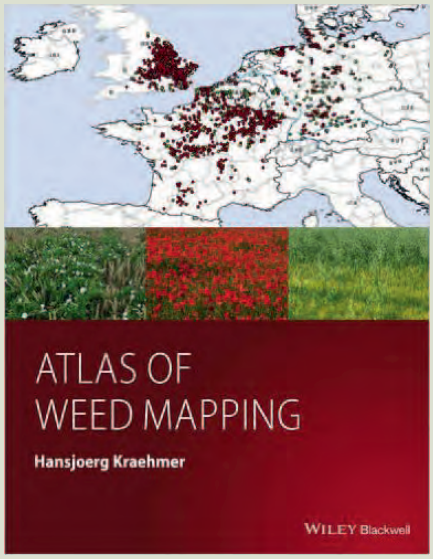
Rebecca Grant

New Publications

For those interested in the distribution of weeds throughout the world:

Atlas of Weed Mapping

Hansjoerg Kraehmer



Published: March 2016
Hardback ISBN: 978-111872073-8
Publisher: John Wiley & Sons Inc.

Atlas of Weed Mapping presents an introductory overview on the occurrence of the most common weeds of the world. The book notably includes:

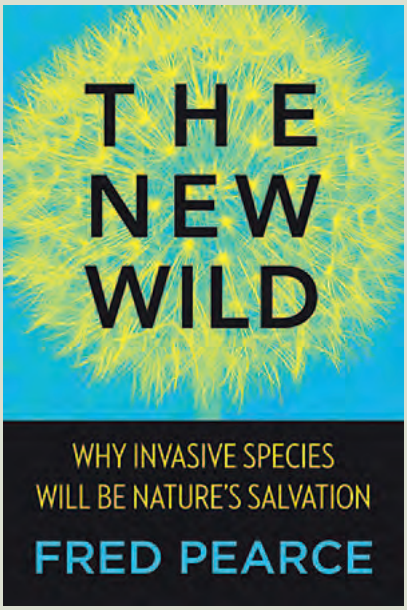
- Description of cropping practices and explanations for the global distribution of weeds
- Invasive plant mapping
- Aquatics and wetland plants with histological plant details
- Theoretical and practical aspects of weed mapping
- Aspects on the documentation of herbicide resistance
- Biodiversity, rare weeds and the dominance of the most common weeds

Fully illustrated with more than 800 coloured figures and a number of tables, this new characterisation of anthropogenic vegetation will be interesting for readers of a great number of disciplines such as agriculture, botany, ecology, geobotany and plant community research. More than a hundred experts have contributed data to this unique compilation.

For those interested in an alternative view on invasive species:

The New Wild: Why Invasive Species Will Be Nature's Salvation

Fred Pearce



Published: April 2016
Hardback ISBN: 978-080703368-5
Publisher: Beacon Press

For a long time, veteran environmental journalist Fred Pearce thought in stark terms about invasive species: they were the evil interlopers spoiling pristine 'natural' ecosystems. Most conservationists and environmentalists share this view. But what if the traditional view of ecology is wrong—what if true environmentalists should be applauding the invaders?

In The New Wild, Pearce goes on a journey across six continents to rediscover what conservation in the twenty-first century should be about. Pearce explores ecosystems from remote Pacific islands to the United Kingdom, from San Francisco Bay to the Great Lakes, as he digs into questionable estimates of the cost of invader species and reveals the outdated intellectual sources of our ideas about the balance of nature. Pearce acknowledges that there are horror stories about alien species disrupting ecosystems, but most of the time, the tens of thousands of introduced species usually swiftly die out or settle down and become model eco-citizens. The case for keeping out alien species, he finds, looks increasingly flawed.

As Pearce argues, mainstream environmentalists are right that we need a rewilding of the earth, but they are wrong if they imagine that we can achieve that by reengineering ecosystems. Humans have changed the planet too much, and nature never goes backward. But a growing group of scientists is taking a fresh look at how species interact in the wild. According to these new ecologists, we should applaud the dynamism of alien species and the novel ecosystems they create.

In an era of climate change and widespread ecological damage, it is absolutely crucial that we find ways to help nature regenerate. Embracing the new ecology, Pearce shows us, is our best chance. To be an environmentalist in the twenty-first century means celebrating nature's wildness and capacity for change.

2015/2016 Falls Creek Hawkweed Volunteer Program

Participating in volunteer hawkweed surveys is a great way to help protect the Victorian Alps. Week-long sessions, from late December to late January.
Phone 131963 or email Hawkweed@parks.vic.gov.au