

Newsletter of the Weed Society of Victoria Inc. Volume 28 issue 3 2017 eee Scele

Twilight Seminar and AGM

Community Led Weed Management and the Fostering of Partnerships

The Weed Society of Victoria held its 2017 seminar on 26 July at the Agribio Facility, La Trobe University, Bundoora. The afternoon began with a tour of the Agribio Weed Research Facilities, which had us gowning up after passing through the airlock entry into the insectary containment facility where biological control research is undertaken. This is the laboratory and greenhouse space for weed research scientists, Greg Lefoe, Rae Kwong and Jackie Steel.

The Headhouse Glass House contains the only Australian Government accredited quarantine insectary within Victoria, Tasmania and South Australia, the nearest being CSIRO's in Canberra. Rae Kwong took us through the very strict quarantine protocols for containment of insects and disposal of waste required for the host specificity studies undertaken here, which must satisfy the import risk analysis regulations set by the federal Department of Agriculture and Water Resources.

Greg Lefoe discussed his work on silverleaf nightshade, Solanum elaeagnifolium, (also see Greg's PhD article in the previous issue of Weedscene) and the difficulties of narrowing down potential non-target species to test biocontrol agents against, in order to ensure there is no risk to other species and that biocontrol agents can be safely released. The large genus Solanum has many Australian native and horticultural (including food) species, so the project has engaged a Solanum expert to select representatives from Solanum groups to be tested, instead of testing each of the many species.

continued on page 3/...



Agribio Facility, La Trobe University, Bundoora

WSV Directory

Correspondence and enquiries

Weed Society of Victoria Inc. PO Box 122 La Trobe University Bundoora Vic 3083 Telephone 0437 861449 ACNA0011723W ABN 15 496 325 152

Web Site www.wsvic.org.au

Secretary

Rebecca Grant secretary@wsvic.org.au

Weedscene Editor

Ingrid Krockenberger editor@wsvic.org.au

President

Greg Lefoe greg.lefoe@ecodev.vic.gov.au

Vice President

Raelene Kwong rae.kwong@ecodev.vic.gov.au

Immediate Past President

Matt Stephenson matt.stephenson1971@gmail.com

Treasurer

Keith Primrose keithprimrose@hotmail.com

Committee Members

Kate Blood kate.blood@delwp.vic.gov.au

Brett McGennisken brett@habitatcreations.com.au

Jon Nester jon@ausecosolutions.com.au

Co-opted Members

Rebecca James rebecca.james@delwp.vic.gov.au

Greg Wells Wells1@dow.com

CAWS Representatives

Ingrid Krockenberger editor@wsvic.org.au

Brett McGennisken brett@habitatcreations.com.au



WSV Membership Rates 2016–17

Pay for 1, 3 or 5 yearsConcession*\$20Ordinary\$60Corporate\$140

* Students and Pensioners WSV is not registered to collect GST

Contents

BI

C/

IN

NE

TWILIGHT SEMINAR AND AGM

Community Led Weed Management and the Fostering of Partnerships	1
OSECURITY	
National Biosecurity Framework – Invasive Plants and Animals Environmental Biosecurity Forum, Canberra	5 7
WS REPORT	9
VASIVE PLANTS PHD RESEARCH PROJECTS The invasive aquatic macrophyte <i>Sagittaria platyphylla</i> Alismataceae): is it a suitable target for classical biological	
control?	10
WPUBLICATIONS	12

COVER PHOTO: Vinca major (courtesy Rob Richardson)

Joining the Weed Society of Victoria

The benefits of membership to WSV include:

- Weedscene: newsletter packed full of information
- eWeedscene: regular electronic bulletin on weed news and events
- Discounts to WSV seminars, workshops, conferences and other events
- Opportunities to network with others.

To apply for membership, download and print the membership application form from the WSV website, www.wsvic.org.au, complete the details and mail to the WSV Secretary.

Weedscene Newsletter of the Weed Society of Victoria Inc.

- Contributions to Weedscene are welcomed. Please contact the editor for further information.
- Readers are free to circulate and reproduce Weedscene material with acknowledgment of the author and source.
- The views expressed in Weedscene are those of the contributors and are not necessarily shared by the WSV Executive Committee.

Want to receive Weedscene as a PDF? Contact the Secretary.

Society Sponsorship

Annual Sponsorship

- Logo displayed on 'Weedscene' four issues per year
- Logo and sponsor name on the Society's website

\$300

- One promotional article in 'Weedscene' per year (subject to ed. control)
- One free membership per year (optional)

Advertising rates

One sixth page	56 mm wide × 128 mm high	\$50
Quarter page	180 mm wide × 64 mm high	\$75
Half page	180 mm wide × 128 mm high	\$150
Whole page	180 mm wide × 257 mm high	\$300

Design R.G. & F.J. Richardson, PO Box 42, Meredith Vic 3333 www.weedinfo.com.au

- Printing Maroondah Printing, 42 New Street, Ringwood Vic 3134
- Printed on 100% recycled paper

Rae Kwong's work on the invasive aquatic macrophyte, *Sagittaria platyphylla*, (also see Rae's PhD article in this issue of Weedscene) contrasts with Greg's study, in that *Sagittaria* has very few potential non-target species in Australia. With an attitude of making hay while the sun shines, she decided to test 3 biocontrol agents in the same study. This has the advantage of making use of sporadic funding opportunities and applying a multi-pronged attack on *Sagittaria* using fruit-feeding weevils, crown-boring weevils and tuber-boring weevils. The tuber-boring weevils are particularly useful because tubers can persist over time and there is little below-ground translocation of herbicide.

Jackie Steel's study involves squishing sampled larvae onto DNA cards. Her detective work identifies larvae found feeding on *Sagittaria* within the ecological host range. Insects in their larval stage are difficult to identify because they have very few morphological characteristics useful for identification, so DNA barcodes are extracted from the sampled larvae and used to identify potential biocontrol agents. (We hope to publish a Weedscene article on Jackie's PhD work in the near future.)

Also within the Headhouse Glass House facility are the aquatic weed research aquaria, where Daniel Clements is busy with his water drawdown experiments to determine how invasive aquatic weeds can be controlled (also see Daniel's PhD article in issue 3 2015 of Weedscene). He gave a brief talk on the impacts and management issues of invasive water weeds on irrigation channels and irrigation systems, and the locations of aquatic weed infestations in Victoria. He also showed us the old aquarium glasshouse and we all agreed the new facility was much kinder to spine health.

The tour was followed by refreshments and then the Weed Society of Victoria Annual General Meeting. The committee was re-elected unchanged, with the exception of Kate Blood who wishes to remain on the committee but not as a co-opted member. President, Greg Lefoe, discussed lifting our profile and acknowledged the increased activity in our facebook page. There is also a need to revamp our out-dated, clunky webpage, so work will begin in earnest on that, and also a new logo, in the coming year.

Next were the presentations, beginning with Greg's update on Weed Biocontrol and the Atlas of Living Australia presented at the 2016 WSV Conference in Creswick. Greg has created the interactive Biocontrol Hub within the Atlas of Living Australia website. The Biocontrol Hub allows the collection and mapping of citizen science data and is an online resource with information on all current and past biocontrol projects, and with extension materials and advice. Uploaded data is moderated by biocontrol scientists prior to going live. The production version is now almost complete and an app is also near completion.



Gowned up and ready to proceed with the tour of the biocontrol laboratory within the insectary containment facility



Daniel Clements (centre) with Cactus Warriors, Lee Mead and Ian Grenda (left), and Greg Lefoe in the aquatic weeds glasshouse

The Biocontrol Hub overcomes the problem of loss of knowledge and accessible information with the loss of personnel due to short term funding cycles. Information and data will be stored and can be accessed in perpetuity, all in the one location. Brilliant!

Cactus Warrior, Lee Mead, was excited to share news on the next phase in the excellent work of the Tarrangower Cactus Control Group – biological control, as part of integrated weed management of the Weeds of National Significance listed wheel cactus afflicting the landscape around Malden. Lee reported that, after a disappointing start, cochineal bugs collected from South Australia have begun to flourish in the last few months, killing young plants and impacting on fruiting plants. The slow establishment is attributed to the cochineal bug population acclimatising to the different conditions from their source in South Australia.

Lee also reported on a Tarrangower Cactus Control Group project funded by the Norman Wettenhall Foundation to map continued on page 4/... the distribution of wheel cactus plants within Victoria. The 237 newly recorded sites are to be uploaded on the Atlas of Living Australia where the known wheel cactus locations form a line from Mildura to Melbourne, with a few outliers mainly in south Gippsland.

Environmental Volunteer Support Officer with the Yarra Ranges Council, enthusiastic and engaging Jen Ellison, gave a presentation on supporting volunteers in weed removal



Daniel Clements showing invasive aquatic weed specimens



Weed scientists at work in the insectary containment facility laboratory

within the shire. Jen said there are 70+ environmental groups and 1000+ volunteers within the Yarra Ranges, and 600 bushland reserves are managed by the Yarra Ranges Council. Many of the passionate volunteers Jen works with are not associated with Friends Of or Landcare groups and Jen sees this work as filling a gap. Coordination of volunteers, contractors and council workers is needed to ensure there is no duplication of effort, and appropriate training and materials are provided. This is achieved through careful planning, much liaison and Annual Agreed Workplans.

Jen talked about the Gardens for Wildlife program being adopted by the Yarra Ranges Council which will create a wildlife corridor through all land tenures. The program has expanded to 40 participating properties. Participants are given a welcome pack and vouchers for 20 indigenous plants from local nurseries, based on species suited to their local ecological vegetation community.

Jen illustrated the volunteer work with the successful Sycamore Removal Project which removed 500 maples and opportunistically removed an additional 300 holly bushes, producing 500 m³ of mulch, and resulted in 700 natives being planted. Quoting a colleague, Jen said: this is a "perfect example of tenure blind, multi-agency, collaborative land management – ultimate goal!"

Immediate Past President, Matt Stephenson, spoke about similar opportunities within the StopPitt program – integrating volunteers with contractors and landholders, and opportunistic treatment of 30 or so additional weed species whilst treating StopPitt's target species, *Pittosporum undulatum*. Matt reported that the program had treated 100 sites with 13 project partners, removing 120,000 plants on 250 ha since June 2016.

Matt says the benefit of volunteers extends beyond the physical work they provide, giving the example of wordof-mouth contributions from a trusted local to encourage more landholders to participate, resulting in an additional 15,000-20,000 *Pittosporum* plants on 30 ha being removed. This work would otherwise have been prevented due to jaded landholder perceptions of authorities coming in and telling them what to do.

Matt also reported on an informal roadside weed control survey conducted by the Corner Inlet Blackberry Action Group this year. The survey mapped the effectiveness of roadside weed control within a 320 km² area, recording weed volume, kill rate and other factors for 100 m every 5 km. Cost modelling of several hypothetical work programs was also conducted.

The afternoon and evening proved to be very informative and interesting to our small group of attendees. I look forward to the next one.

Biosecurity



National Biosecurity Framework – Invasive Plants and Animals

Australia's federal governance of biosecurity has been undergoing incremental change to develop a more responsive and targeted system, in order to better manage existing and emerging biosecurity issues. Recent changes mean it is timely to look at the framework of Australia's evolving biosecurity system, with a focus on invasive plants and animals.

Australia's biosecurity system was subject to the Nairn Review in 1996 (key recommendation: shared responsibility - recognition of the roles of all stakeholders (governments, industry and community) in the quarantine system) and the Beale Review in 2008 (building on the principle of shared responsibility; a move to the broader concept of biosecurity; to also include pre- and post-border measures, and; directing biosecurity controls to where most effective).

In 2015 a Senate Inquiry was conducted into Australia's environmental biosecurity (though the Australian

Government has not yet responded to the inquiry's recommendations), and the Intergovernmental Agreement on Biosecurity (IGAB) review of Australia's biosecurity system has recently (or will be soon) concluded.

Review recommendations that are being implemented to strengthen Australia's quarantine and biosecurity arrangements include revising legislation, applying a risk– based approach to biosecurity management; improving use of robust science; improving management of biosecurity risk offshore, at the border and onshore; strengthening partnerships with stakeholders, and; improving transparency and timeliness of operations.

The federal agriculture portfolio has lead responsibility for biosecurity. However, there has been increasing attention on environmental biosecurity, rather than biosecurity being mainly a concern about primary production and trade.

DEPARTMENT OF AGRICULTURE AND WATER RESOURCES

Biosecurity

Legislation – the Department of Agriculture and Water Resources administers the *Biosecurity Act 2015*, which replaces the *Quarantine Act 1908*.

(The Department of Environment and Energy also has a regulatory role through the administration of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This enables the Commonwealth to officially list key threatening processes, and to develop and implement threat abatement plans and recovery plans.)

Committees and Partnerships

Intergovernmental Partnerships

- Intergovernmental Agreement on Biosecurity (IGAB)
 - came into effect in 2012; signatories include all states and territories except Tasmania (note: though not included in IGAB, local government has some responsibilities under the national system, such as established pests and diseases, and local emergency response) and includes the following priority areas:
 - biosecurity risk prioritisation and investments;
 - collaborative approach to collecting, collating, analysing and sharing biosecurity information;
 - integrated, collaborative approach to surveillance and diagnostics for optimisation of existing capability and infrastructure;
 - national framework for the management of established pests and diseases of national significance;
 - national biosecurity engagement and communication framework;
 - emergency preparedness and response;
 - biosecurity research, development and extension.
 - National Biosecurity Committee (NBC) (see more below)
 - governing body of IGAB; identifies and implements collaborative projects to meet national priorities; made up of cross-jurisdictional sectoral sub-committees (each with their own specialist task or working groups):
 - → Invasive Plants and Animals Committee (IPAC) (see more below); and

Marine Pest Sectoral Committee (MPSC), Plant Health Committee (PHC), Animal Health Committee (AHC).

- National Environmental Biosecurity Response Agreement (NEBRA)
 - first deliverable under IGAB;
 - the Commonwealth and all states and territories are signatories;
 - emergency response arrangements for responding to biosecurity incidents that primarily have environmental and/or social impacts and where the response is for the public good triggered five times to date;
 - currently undergoing review.
- Memorandum of Understanding with the Australian Customs and Border Protection Service.
- Biosecurity Roundtable is undertaken annually.
- IGAB is undergoing a review process discussion paper released in May 2016, draft report released in December 2016, submissions received until end of February 2017, and final report expected in July 2017.

Industry Consultative Committees

• various agricultural and horticultural groups.

Northern Australia Biosecurity Framework

• established in 1989 in response to new and growing biosecurity risks in northern Australia.

NATIONAL BIOSECURITY COMMITTEE

The National Biosecurity Committee (NBC) has responsibility for the national coordination of biosecurity. NBC Membership comprises mainly senior officers from the Australian, state and territory agriculture agencies and some environment representatives. This structure results in a dominance of the views of agriculture agencies. However, there is recognition that a more balanced approach to biosecurity is needed.

INVASIVE PLANTS AND ANIMALS COMMITTEE

The Invasive Plants and Animals Committee (IPAC) reports to and advises the NBC on national policy and planning for vertebrate pest animals, freshwater invertebrate pests, and weeds. IPAC has key roles in the implementation, evaluation and review of the Australian Pest Animal Strategy and Australian Weeds Strategy; and the development, coordination and delivery of nationally consistent approaches to the management of vertebrate pest animals, freshwater invertebrate pests, and weeds.

IPAC membership comprises representatives from the Australian, state and territory primary industry and environment departments. Observers on the committee include representatives from the Commonwealth Scientific and Industrial Research Organisation, Plant Health Australia, Australian Bureau of Agricultural and Resource Economics and Sciences, the Invasive Animals Cooperative Research Centre and New Zealand.

Technical advisory groups which support IPAC include the Weeds of National Significance (WoNS) Expert Group, the Weed Incursion and Containment Expert Group, the Vertebrate Pests Incursions Expert Group, the Research, Development and Extension Expert Group, the Freshwater Fish Expert Group and the Established Pest Animals of National Significance Task Group.

IPAC meets several times a year. Outcomes of recent meetings include endorsement of the Australian Weeds Strategy, the Australian Pest Animal Strategy, and the Monitoring, Evaluation, Reporting and Improvement framework for the Established Pest Animals and Weeds measure under the Agricultural Competitiveness White Paper; decision to develop a preparedness plan in response to Didymo (diatom that produces nuisance growths in freshwater rivers and streams) detections, and; receiving updates from Australian and state and territory governments on various invasive plant and animal activities such as funding initiatives, weed and pest animal control programs, implementation of new biosecurity legislation and research initiatives.

The source of most of the information in this article is the Australian Government Department of Agriculture and Water Resources webpages on biosecurity (www.agriculture.gov.au/biosecurity). Please note that the website has been updated with additional information since the time of writing.

Environmental Biosecurity Forum, Canberra

by Ingrid Krockenberger

I was fortunate to attend the second Environmental Biosecurity Forum hosted by the Australian Government, held in Canberra in June 2017. The inaugural Environmental Biosecurity meeting was held in November 2016 (see blog post of the Invasive Species Council, at https://invasives. org.au/blog/first-environmental-biosecurity-forum-createshope/), and the next one will be held in Sydney.

This series of meetings occurs in addition to the annual national Biosecurity Roundtable, and is an acknowledgment of the importance of biosecurity in the natural environment and not only or mainly in production systems, as was the emphasis in the past. The purpose of these meetings is to provide biosecurity stakeholders with an opportunity to engage with Australian and state and territory government representatives.

Josephine Laduzko (federal Department of Agriculture and Water Resources) introduced the forum and began the session titled Biosecurity System Overview. She emphasised the complexity of biosecurity management, the need for vigilance (quoting tens of thousands of quarantine infringements, risky mail items and non-compliant cargo consignments detected during 2015–16, as well as numerous emergency responses and confirmed expanded ranges of existing pests) and the need for shared responsibility (among government, industry, farmers and community).

The ever-present issue of resourcing constraints means that agencies must do more with less, and focus on delivering the highest return, in the face of a predicted doubling of trade and passenger movement by 2025, population growth, increased urbanisation, declining biodiversity, and decreased investment in biosecurity. Within the community, there is a general lack of understanding or acknowledgment of biosecurity risks, as well as some deliberate wrong-doing.

On the plus side, Josephine noted that there has been a recent revitalisation of biosecurity governance, citing the recent reviews of the Intergovernmental Agreement on Biosecurity (IGAB), the National Environmental Biosecurity Response Agreement (NEBRA), the Australian Weed Strategy and the Australian Pest Animal Strategy, and the delivery of the Agricultural Competitiveness White Paper (which features a \$200 million commitment to improving biosecurity surveillance and analysis).



While these reviews still require more synthesis to enable implementation, they provide a roadmap for the future, with more emphasis on pre- and post-border control, better coordination and prioritisation of Research & Development and Extension, more focus on risk awareness, preparedness and surveillance, and greater community engagement and participation.

Paul Murphy (Wildlife Trade and Biosecurity Branch) provided the perspective of the federal Department of Environment and Energy (DEE) which has a regulatory role through the administration of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Under the EPBC Act, Key Threatening Processes (KTP) nominations are received under a 5-year review program and, through recommendation by the Department, the federal Minister decides whether a Threat Abatement Plan (TAP) is required. Invasive species policy can be implemented through activities involved with KTPs and TAPs for the protection of nationally important areas. There are also provisions under the EPBC Act to assess the potential impacts of proposed animal imports and make changes to the Live Import List.

Other key biosecurity involvements of the DEE include attendance at National Biosecurity Committee meetings, participation in the review process and input in national plans, and providing advice on environmental matters.

Andrew Cox (Invasive Species Council CEO and former participant in the Weed Society of Victoria committee prior to his move to NSW) provided the non-government environmental stakeholder point-of-view in the Biosecurity System Overview session. He made innovative use of the classic invasion curve to illustrate the importance of early intervention, with emphasis on ideal opportunities provided at each of the invasion phases – pre-border, at-border (introduction), post-border (establishment, proliferation, widespread). Some of the difficulties Andrew highlighted along his invasion curve were that there is no systematic prioritisation of risks, nor pre-emptively listed threats, and that lack of knowledge has been an impediment to the triggering of emergency response under the National Environmental Biosecurity Response Agreement (NEBRA). Also, while there are frameworks of cooperation in biosecurity governance, there is no specific body to coordinate biosecurity (with a 'Chief Biosecurity Officer', for instance).

Andreas Glanznig of the Invasive Animals Cooperative Research Centre (CRC), which ended on 28 June 2017, and the Centre for Invasive Species Solutions (CISS), which began on 3 July 2017, gave a presentation on carrying the learnings and success of the CRC through to the CISS. Key to success is mobilisation of national collaborations, sustained community engagement, and community-led planning and management.

The scope of this new body has broadened to include specific provision for weeds in the near future. [More information on the CISS focus on weeds is in the CAWS report in this issue.] Andreas also mentioned new surveillance tools, such as real-time sampling and analysis of environmental DNA, improved probability modelling to interpret eDNA data, and digital sensing systems.

CSIRO's Andy Sheppard spoke about the National Environment and Community Biosecurity Research, Development and Extension Strategy 2016–19. CSIRO was sub-contracted to prepare the background document to inform the strategy, which is schedule 8 of IGAB. The scope of the strategy includes environmental weeds, and covers what wasn't included the Animal Biosecurity RD&E Strategy and the National Plant Biosecurity RD&E Strategy which are concerned with issues affecting primary production and trade. Recommendations include the need for more strategic planning, coordination and facilitation of RD&E, and the need for a specific coordination committee. (The strategy can be downloaded here: www.agriculture.gov.au/biosecurity/ partnerships/nbc/research-development-extension-strategy)

Karina Keast (Department of Agriculture and Water Resources) discussed the NEBRA review. The National Environmental Biosecurity Response Agreement was the first schedule of the Intergovernmental Agreement on Biosecurity, reflecting its importance. She briefly discussed the activation of response procedure under NEBRA and that NEBRA had been activated 5 times with nationally cost-shared responses. Emerging themes in the NEBRA review process are increased involvement of environmental agencies and nongovernment groups, and the need for enhanced transparency of NEBRA. Rupert Woods (Wildlife Health Australia CEO and Public Officer) gave an inspiring informal contribution from the audience about the work of Wildlife Health Australia. As it is too difficult to obtain funds for a national wildlife health surveillance framework, Wildlife Health Australia has created a national network of government agencies, universities, zoos, private practitioners and wildlife carer groups which report to Wildlife Health Australia, which in turn reports to and takes direction from the Australian Government.

Rupert described how there is clear 'line-of-sight to leadership' for participants and clear directions from the top. It requires careful management of relationships, and is leveraged by the enthusiasm of participants and through its engagement strategy and communications pathway. A focus on marketing in order to benefit from corporations 'buying good-will' has enabled small funding for groups undertaking surveillance.

A couple of interactive sessions included a workshop titled Encouraging Community Reporting facilitated by Karina Keast (Department of Agriculture and Water Resources), and a roundtable discussion titled 'How to Better Communicate and Engage on Environmental Biosecurity' facilitated by Milena Rafic (Department of Environment and Energy). However, I found that spontaneous questions and contributions from the audience were even more informative.

The next meeting will be held in Sydney and will be publicised via the WSV.

Date for your Diary



21st Australasian Weeds Conference 9–12 September 2018 Novotel Manly Pacific Hotel Sydney, NSW

CAWS report

15 June 2017 By Ingrid Krockenberger

The 2017 CAWS Travel Award recipient, Dilani Kasundara Hettiarachchi of Lincoln University New Zealand, was announced at the June meeting. Dilani's research focuses on the suitability as hosts for the thistle leaf beetle, Cassida rubiginosa, of several species of thistle within the Cardueae tribe which are noxious weeds in Australasia. She will be presenting this work at the joint meeting of the International Society of Chemical Ecology and the Asia-Pacific Association of Chemical Ecologists to be held in Kyoto Japan, in August 2017. As noted in the previous CAWS report, only one award was offered this year. The selection committee recommendation was ratified out-of-session in May.

President, Rachel Melland, has continued to work on strengthening CAWS formal and informal relationships at the federal level. She has had discussions with Invasive Plants and Animals Committee (IPAC) member, Dr. Andy Sheppard (Research Director, Managing Invasive Species Impacts; Senior Principal Research Scientist, Biological Invasions; Officer in Charge, CSIRO European Laboratory).

Rachel has also had discussions with Helen Cathles, Chair of the Invasive Animals CRC and co-creator of the new Centre for Invasive Species Solutions (CISS), regarding incorporation of weed research and management into CISS. So far, weeds have only been allocated a small percentage of the initial 5-year \$20 million CISS funding. However, the weeds strategy for CISS will be developed within 3-5 years, in readiness for next 5-year allocation of funding.

On behalf of CAWS, Rachel attended the Red Imported Fire Ant Seminar in Canberra on 21 March 2017, and also signed the petition initiated by the Invasive Species Council, calling for continued funding of the Red Imported Fire Ant control program in Australia (https://invasives.org.au/australias-redfire-ant-emergency-eradication-funding-urgently-needed/).

Rachel will be attending the Environmental Biosecurity Forum in Canberra on 29 June 2017, hosted jointly by the federal Department of Agriculture and Water Resources and federal Department of Environment and Energy. She also encourages people to attend the 26th Asian-Pacific Weed Science Society (APWSS) Conference in Kyoto Japan on 19-22 September 2017. CAWS became an affiliate member of APWSS in December 2015 to demonstrate support for weed science in developing countries. It appears there will be few attendees from Australia and New Zealand but a good number of Australians will be attending the Ecology and



Management of Alien Plant Invasions (EMAPI) Conference in Portugal in September. Also, there was good attendance by Australian weed scientists at the International Herbicide Resistance Conference in USA in May, which may explain lower attendance at APWSSC.

Rachel notes that \$20 million in federal funding for invasive species has been announced, of which \$10 million has already been allocated to projects, over a third being for weed projects. There will be a \$10 million round of funding for invasive species projects next year.

A sub-committee has been formed to continue fine-tuning of the CAWS Constitution wording, in order to comply with the Western Australian Associations Incorporation Act 2015. Revisions will be finalised by September 2017, to be ratified at the AGM.

Discussion on conference sponsorship included the potential restructuring of conference organising responsibility. There is a lack of continuity from one Australasian Weeds Conference (AWC) to the next because there is a rotation through the state societies for responsibility of organising the biennial conference. Each organising committee must develop their own linkages with sponsors, which means that sponsors must develop new relationships every 2 years. The Grains Research and Development Corporation, a major sponsor of the AWC, has expressed a preference for sponsorship applications from a single entity. The notion of forming a conference organising sub-committee within the CAWS executive, to work in conjunction with state organising committees in order to maintain continuity from one conference to the next, had much support. A further advantage would be that copyright ownership of conference proceedings would remain with CAWS, rather than with the state society hosting the conference.

State societies are reminded that membership fees are due in September. Membership numbers are needed by the CAWS Treasurer to calculate fees due. Fees per 50 members will remain the same.

The next ordinary meeting and AGM will be held on 28 September 2017.

Ingrid Krockenberger and Brett McGennisken are your CAWS delegates.

Invasive Plants PhD Research Projects

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

The invasive aquatic macrophyte *Sagittaria platyphylla* (Alismataceae): is it a suitable target for classical biological control?

Sagittaria platyphylla is an aquatic emergent herb indigenous to North and Central America that has become invasive in Australia and South Africa. Initially valued as an aquatic ornamental for use in ponds and aquaria, *S. platyphylla* has become a serious aquatic weed, particularly in shallow water bodies such as irrigation channels, drains, creeks and wetlands where it can rapidly form dense and extensive infestations that impede water flow and displace native species. Classical biological control is considered a desirable option for the management of *S. platyphylla* due to the difficulty and expense of controlling the weed in irrigation systems as well as the need for alternative approaches for use in sensitive aquatic habitats.

Dr Raelene Kwong's supervisors were Dr Peter Green (La Trobe University), Dr Alan Yen (a joint appointee of La Trobe University and Agriculture Victoria) and Dr Linda Broadhurst (CSIRO). The research resulted in collaborations with CSIRO, Rhodes University (South Africa), University of West Alabama and the US Army Corps of Engineers. Rae was awarded her PhD in December 2016.

The overarching goal of the dissertation was to determine if biological control could be a suitable option for the management of *S. platyphylla* in countries where it has become a serious weed, notably Australia and South Africa. I focused on testing genetic and environmental factors that might have contributed to the invasiveness of *S. platyphylla* in invaded ranges. I did not focus on all possible explanations for invasion. Instead, I conducted biogeographical and field based studies to determine whether or not the observed differences in morphological traits and abundance of this species in its native and invasive ranges were due to differences in enemy loads.



Raelene Kwong (left) with Texas Parks and Wildlife ranger, Jacob Green at Caddo Lake in eastern Texas

Firstly, I used AFLP markers to survey genetic diversity and population genetic structure. Then I compared performance data (population size, plant density, morphological traits and sexual reproduction) as well as key environmental factors (water depth and habitat type) to determine if differences in performance between the native and introduced ranges were apparent after controlling for influential abiotic factors.

Field surveys revealed that while populations of *S. platyphylla* in the native range hosted a diverse but modest guild of natural enemies, populations of *S. platyphylla* in the introduced range were host to just a few generalist arthropod herbivores and pathogens.

The most common and abundant of the natural enemies on *S. platyphylla* in the USA was the fruit-feeding weevil, *Listronotus appendiculatus*. In contrast, plants in the introduced range were completely free from fruit herbivory, which may account for the increased performance in sexual reproduction in Australia and South Africa compared to the USA.

A natural enemy exclusion trial was conducted in an experimental study pond in the USA to test the effectiveness of *L. appendiculatus*. A further two *Listronotus* species, *L. sordidus* and *L. frontalis* underwent field and laboratory observations to determine their suitability as biological control agents.



Based on this study, there is strong evidence to suggest that *S. platyphylla* is a suitable candidate for classical biological control in Australia and South Africa. Information obtained through this PhD has enabled a robust case to be made to the Invasive Plants and Animals Committee from which commonwealth approval to target the species for biological control in Australia was granted on 26 November 2015 (www.agriculture.gov.au/SiteCollectionDocuments/pests-diseases-weeds/ weeds/ipac-4-communique.pdf). Meanwhile, continued collaboration between Australia (DEDJTR), South Africa (Rhodes University) and the USA (US Army Corps of Engineers) has enabled the risk assessment phase of biological control to commence, with *L. appendiculatus*, *L. sordidus* and *L. frontalis* prioritised for host range testing.

Rae's *Sagittaria* project was part of a successful funding application under the second round of the Commonwealth Government's 'Rural Research and Development for Profit' program. The program is targeting ten pest weed species that collectively cost the agriculture sector more than \$400 million per year.

Rae has directed us to the Murray Regional Weed Committee and the Riverina Regional Weed Committee website which has a *Sagittaria* resources page covering Biology and Ecology of *Sagittaria*; Management of *Sagittaria* in the Murray-Darling Basin; *Sagittaria* Plans and Strategies, and; *Sagittaria* Extension Resources: www.riverinaweeds.org.au/mdb-aquatic-weeds/sagittaria-resources/ Photo above: Raelene Kwong standing amongst a *Sagittaria* infestation in an irrigation channel in Cobram, Victoria

Photo below: A mating pair of the Sagittaria fruit-feeding weevil, Listronotus appendiculatus



New Publications

For those interested in pest animal management:

Managing Australia's Pest Animals – a guide to strategic planning and effective management

Mike Braysher Published: February 2017 Paperback ISBN: 978-1486304431 Publisher: CSIRO Publishing

Pest animals are but one of many factors that influence the desired outcome from managing natural resource based systems, whether for production or conservation purposes. Others include diseases, weeds, financial resources, weather and fire management. To be effective, an integrated and systematic approach is required, and the principles and strategic approach outlined in this book can also be used to plan and manage the damage due to other factors.

Managing Australia's Pest Animals includes case studies of successful and unsuccessful pest management strategies and covers a range of topics, including the history of pest management, current best practice principles, and guidelines for planning and applying strategic pest management approaches to effectively reduce pest damage. This book is the first clear and comprehensive guide to best practice pest management in Australia and will benefit students and trainers of pest managers, landholders, people involved in natural resource management, and industry and government pest management staff.

This book will be of great benefit to students and trainers of pest managers, landholders, pest management staff, or volunteers working in natural resource management, including private and public land managers, parks and wildlife staff, pest management agencies, local councils, Landcare and catchment management groups and private pest contractors. For those interested in biosecurity solutions:

Invasive Species: Risk Assessment and Management

Editors: Andrew P. Robinson, Terry Walshe, Mark A. Burgman, Mike Nunn Published: July 2017 Paperback ISBN: 978-0521146746 Publisher: Cambridge University Press

With climate change and increasing globalisation of trade and travel, the risks presented by invasive pests and pathogens to natural environments, agriculture and economies have never been greater, and are only increasing with time. Governments world-wide are responding to these increased threats by strengthening quarantine and biosecurity. This book presents a comprehensive review of risk-based techniques that help policy makers and regulators protect national interests from invasive pests and pathogens before, at, and inside national borders. Selected from the research corpus of the Centre of Excellence for Biosecurity Risk Analysis at the University of Melbourne, this book provides solutions that reflect scientific rigour coupled with practical, hands-on applications. Focusing on surveillance, stochastic modelling, intelligence gathering, decision making and risk communication, the contents combine the strengths of risk analysts, mathematicians, economists, biologists and statisticians. The book presents tested scientific solutions to the greatest challenges faced by quarantine and biosecurity policy makers and regulators today.

For those interested in the fascinating, hopeful world of natural defences: Enlisting Bugs and Germs to Protect Our Food and Health

Emily Monosson Published: December 2016 Hardback ISBN: 978-1610917186 Publisher: Island Press, USA

For more than a century, we have relied on chemical cures to keep our bodies free from disease and our farms free from bugs and weeds. We rarely consider human and agricultural health together, but both are based on the same ecology, and both are being threatened by organisms evolved to resist our antibiotics and pesticides.

Fortunately, scientists are finding new solutions that work with, rather than against, nature. Emily Monosson explores science's most innovative strategies, from high-tech gene editing to the ancient practice of faecal transplants. There are viruses that infect and bust apart bacteria; vaccines engineered to better provoke our natural defences; and insect pheromones that throw crop-destroying moths into a misguided sexual frenzy. Some technologies will ultimately fizzle; others may hold the key to abundant food and unprecedented health. Each represents a growing understanding of how to employ ecology for our own protection.

Monosson gives readers a peek into the fascinating and hopeful world of natural defences. Her book is full of optimism, not simply for particular cures, but for a sustainable approach to human welfare that will benefit generations to come.

