Early Invader Update
Friends of WESI: Weeds at the Early Stage of Invasion Project

Feature issue, 14 February 2020 #18

Feature on weed management and fire

There has been great interest in the bushfire-weed information sources we have been sharing. This supplement to our summer update is focussed on sharing more of those information sources to help biodiversity managers impacted by fire focus on making a smooth recovery.

Figure 1: Burning of Phalaris (*Phalaris aquatica*) for promotion of native grassland species, Victoria Mine, Beaufort.

Credit: R. Quick (2018).

Fire and weeds

Whether it's a bushfire, grassfire, fuel reduction activity or ecological burn (Figure 1), fire provides an opportunity to interrupt the life cycle of many environmental weeds.

There is a brief window of opportunity after fire to have a big impact on many weeds including some early invaders.

Influence of fire on weeds, and weeds on fire

Weeds can play a role in bushfire situations including:

- Can increase the fuel load (Figure 2) and make for a more intense and severe fire, causing not only a higher threat to life and property but also slower recovery for indigenous species.
- Weeds may be fire-responsive, meaning that they come back with a vengeance post-fire, e.g., mass germination of hard-coated seeds.
- Weeds can maintain establishment in unburnt patches within the fire area where they can set seed and spread into the burnt areas.
- Can be inadvertently spread by firefighting vehicles, machinery and clothing of personnel if good hygiene practices aren't in place.
- Heavy rain after fires can lead to flash flooding and wash of weed seeds down slopes and watercourses.

Benefits of fire for weed management

- It provides an opportunity to tackle emerging weed seedlings post-fire (when it is safe to enter the burnt area) to prevent them reaching maturity and setting seed.
- Provides access to mature plants that remain in unburnt patches. These can be treated prior to seeding in the burnt area to prevent them from spreading there or causing reinvasion.
- Some species aren't tolerant of fire and a fire will wipe them out!

Figure 2: Buffel Grass (*Cenchrus ciliaris*) adds to the intensity of a fire in Spinifex country in Alinytjara Wilurara NRM Region, SA.

Credit: J. Stelmann (DEWNR 2011).

Tools to help

Immediately after an unexpected fire, it can be hard to know where to start especially when juggling recovery of infrastructure, wildlife, and looking after people and impacted communities. Pre-planning contingencies has benefits.

The following documents are some of the tools available that can help. It is not an exhaustive list and many agencies including interstate and overseas are always adding new material that can be relevant here.

You might like to start with the decision-making framework (Figure 3 and enlarged in the "Early invader manual") to guide you through the process of dealing with these threats.

Both the manual and the set of six supporting guides can be downloaded from our webpage. https://www.environment.vic.gov.au/invasive-plants-and-animals/early-invaders.

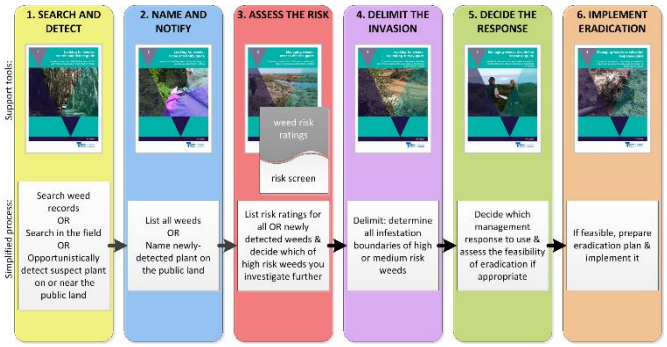
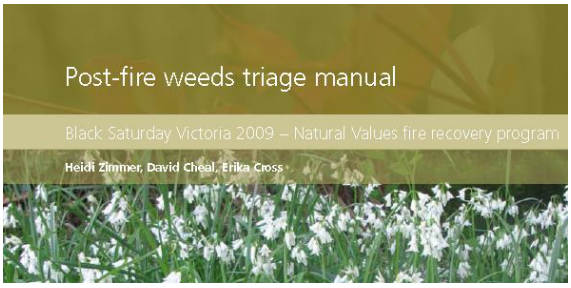
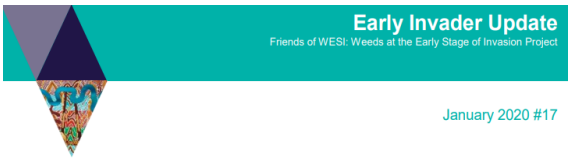


Figure 3: Decision Making Framework.

Credit: Figure 2 in the "Early invader manual".

Click on the titles of the documents in the table below to go to the web links if available.

Fire and weed resources

	Reference	Information
	• Zimmer, H., Cheal, D., and Cross, E. (2012) Post-fire weeds triage manual: Black Saturday Victoria 2009 – Natural values fire recovery program. Department of Sustainability and Environment, Heidelberg, Victoria. ISBN 978-1-74287-422-7 (online).	Using the triage manual begins with a list of weed species present in the impacted area before the fire. If a list does not exist, the "Early invader manual" has useful tips on how to bring one together.
	• Blood, K., James, R., Panetta, F. D., Sheehan, M., Adair, R., and Gold, B. (2018) Early invader manual: managing early invader environmental weeds in Victoria. Department of Environment, Land, Water and Planning, Victoria. ISBN 978-1-76077-317-5 (Print); ISBN 978-1-76077-318-2 (pdf/online/MS word).	A logical process to help you through early invader weed management. It includes lots of useful tips and templates. A perfect trio with the post-fire weeds triage manual (above) and the environmental weed advisory list (on the next page).
	• Early invader update, issue #17 and back issues.	WESI's newsletter went out containing fire recovery information on 8 January 2020.

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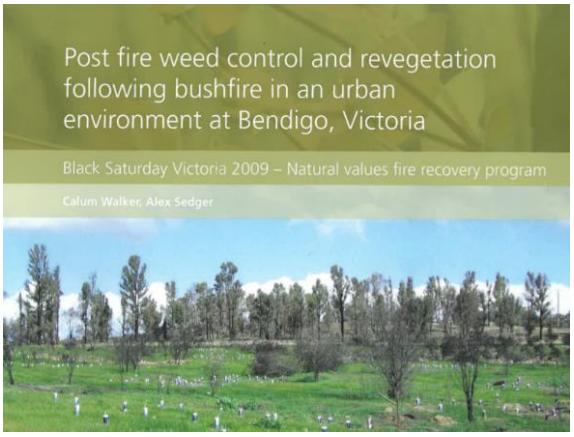
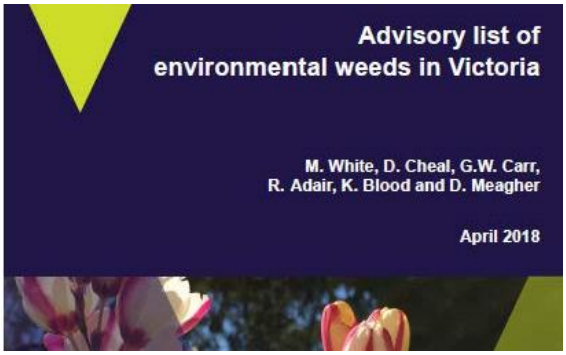
	Reference	Information
	• Walker, C. J. and Sedger, A. H. (2012) Post fire weed control and revegetation following bushfire in an urban environment at Bendigo, Victoria: Black Saturday Victoria 2009 - Natural values fire recovery program. Department of Sustainability and Environment, East Melbourne, Victoria. ISBN 978-1-74287-483-8 (print).	A great case study by the Department of Environment, Land, Water and Planning (DELWP) about weed management after a fire at Bendigo in 2009. Available as PDF from the newsletter authors or on Tarnook (see below). This link only works if you are logged into Tarnook.
	• White, M., Cheal, D., Carr, G. W., Adair, R., Blood, K. and Meagher, D. (2018) Advisory list of environmental weeds in Victoria. Arthur Rylah Institute for Environmental Research Technical Report Series No. 287. Department of Environment, Land, Water and Planning, Heidelberg, Victoria. ISBN 978-1-76077-001-3 (pdf/online).	A list of 1,780 environmental weeds in Victoria with risk ranking scores and risk ratings (very high to potential risk) to assist prioritisation and allocation of weed management resources.
	• DELWP staff may be able to access internal reports including from the HawkEye project from circa 2013 about interactions between weeds and fire or contact the report authors via the Customer Contact Centre 136 186.	DELWP's Arthur Rylah Institute (ARI) also has a number of publicly available biodiversity-fire related documents including the "Post-fire weeds triage manual" (see above in this table) developed in 2009.
Tarnook, FireWeb and EM-COP	• Tarnook.ffm.vic.gov.au (the new fire management system that has replaced FFMVic's Fireweb) breadcrumb trail: >library>fires>invasive species.	DELWP staff and many emergency services in Victoria may be able to access various reports through the libraries in this system.
Post-fire invasive plants triage Steve Taylor (Project Ranger-in-charge) & Harley Baker (Project Ranger) ACT Parks & Conservation Service – Invasive Plants Program Biosecurity & Rural Services Environment, Planning & Sustainable Development **Introduction** There are two parts to post-fire invasive plants triage: 1) Severe disturbance assessment mapping (developed by ACT Parks) 2) Post-fire weeds triage decision key (developed by Parks Victoria, Zimmer et al 2012	• Taylor, S. and Baker, H. (2020) Post-fire invasive plants triage. ACT Parks & Conservation Service – Invasive Plants Program, Environment, Planning & Sustainable Development. • Severe disturbance mapping to help locate areas at risk of environmental weed invasion.	ACT are doing great work integrating triage with mobile weed mapping and linking to iNaturalist projects (see below). Steve Taylor @steve.taylor.818 has a great Facebook feed including many invasive species posts.

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	Reference	Information
	• University of NSW – Environment Recovery Project – Australian Bushfires iNaturalist project	Harnessing Citizen Science to record observations of environmental recovery after the 2019-2020 bushfires in eastern Australia including invasive plants.
	• Graham, M., McShea, K., Taylor, K., Foreman, K., and Cramp, J. (2017) Managing fire on your property. The interaction between fire and weeds: A booklet for NSW landholders. Hotspots Fire Project, jointly delivered by the Nature Conservation Council of NSW and the NSW Rural Fire Service.	This booklet translates the science from the Hotspots scientific review of the interaction between fire and weeds in the native vegetation of NSW.
	• Graham, M. and Taylor, K. (2018) Fire, weeds and the native vegetation of New South Wales. Hotspots Fire Project jointly delivered by the Nature Conservation Council of NSW and the NSW Rural Fire Service.	This review considers literature relevant to the interactions of fire with weeds in all vegetation communities across New South Wales, with a specific focus on a limited subset of significant weeds.
	• DENR (2007 circa) Ecological fire management strategy: Broom and Gorse (*Genista monspessulana*, *Cytisus scoparius & Ulex europeaus*). Department of Environment and Natural Resources, SA.	A useful example of a weed-specific guide relevant for fire.
	• Melland, R. L. (2007) Management of Boneseed (*Chrysanthemoides monilifera* ssp. *monilifera*) (L.) T. Norl. using fire, herbicides and other techniques in Australian woodlands (PhD Thesis). University of Adelaide, South Australia.	Web search for detailed research specific for weed species e.g. Boneseed. Research such as this is sometimes translated into community-accessible publications.

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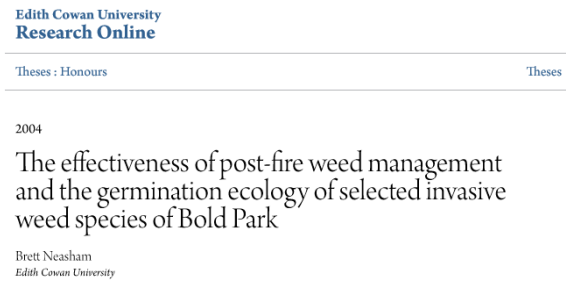
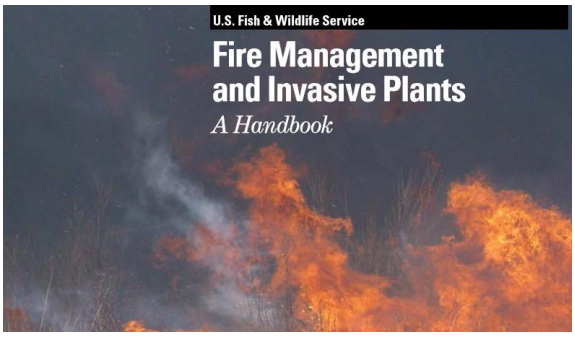
	• Sheehan, M. R. and Potter, S. (2017) Managing Opuntioid Cacti in Australia: Best practice control manual for *Austrocylindropuntia*, *Cylindropuntia* and *Opuntia* species. Department of Primary Industries and Regional Development (WA), Perth. ISBN 978 0 9923083 7 7 (book), ISBN 978 0 9923083 6 0 (pdf version).	Post-fire management of weeds, or groups of weeds, is included in a number of management manuals including the Weeds of National Significance manuals such as this example for Opuntioid cacti. Many of these are available online.
	• Neasham, B. (2004) The effectiveness of post-fire weed management and the germination ecology of selected invasive weed species of Bold Park (Honours Theses). Edith Cowan University, and The Botanic Gardens & Parks Authority, Western Australia.	Web search for research on the fire response and management of weeds in specific geographic areas. This is an example of a report that can be helpful for nearby or equivalent vegetation communities or weeds.
	• Brooks, M. and Lusk, M. (2008) Fire management and invasive plants: a handbook. United States Fish and Wildlife Service, Arlington Virginia, USA.	Many overseas areas have similar fire management situations e.g. USA, Canada, Portugal, Greece, Spain, France, South Africa. Web searching agencies in these parts of the world can be a great source of relevant information such as this example from the USA.
Social media platforms including: Twitter, Facebook, Instagram, DELWP Yammer	• Many researchers, fire management agencies and field practitioners are active. • Aliens-L listserver can draw in people from overseas who may have weed/fire information to share.	Facebook groups (some private) include: FFMVic firefighters; Bush Revegetation and Regeneration; Early Invader Weeds Victoria; The Weed Society of Victoria Inc.
General fire recovery some including weed information	• A guide to engaging in disaster recovery • Bushfire Recovery Victoria • Agriculture Victoria • VicEmergency relief and recovery • Landcare after the fires • Landcare after the fires - weeds • SWIFFT fires & biodiversity • Bushfire recovery SA • Managing weed spread after fire Tas	There is an increasing amount of information available online. Here are just a few examples. Check interstate, local government areas, utility managers and natural resource management agencies too.

Preventing weed spread during fire activities

DELWP North Altona has washdown trailers (Figure 4) available for cleaning vehicles and equipment near the fire line or at base camp. They can be used anywhere in the State. Contact Altona North for details and other vehicle and equipment washdown options.

Figure 4: Mobile washdown trailer available from DELWP Altona for deployment anywhere in Victoria.

Credit: Kate Blood, DELWP (2015).

When conducting your post-fire weed activities be sure the area is safe to enter, before commencing surveys and treatment. Check equipment and clothing to prevent carrying weed seeds and soil-borne pathogens into new areas.

Another note is to be cautious when feeding wildlife in burnt areas. Depositing hay or fodder contaminated with invasive plants can introduce new weed species to a landscape. Selecting 'cleaner' hay or fodder is a better option if available. Concentrating wildlife around feed stations can prove counterproductive as it is also a place where predators can congregate.

Some words of wisdom from NSW

Dr Keith McDougall shared some words of wisdom with us in late January 2020. Keith has many skills and interests including alpine, fire and invasive species ecology — a perfect combination for managing weeds in the Australian alps.

A paper that Keith and Dr Neville Walsh prepared after the 2003 fires mentions "an increase in weed richness after the fire but also includes glimmers of hope about native species that can appear after fire (and the increase in weed richness was mostly short-lived; except for ox-eye daisy). We commonly found species that had been rare before the fire and one species that hadn't been seen in the Alps before; all have since largely disappeared".

Ox-eye Daisy (*Leucanthemum vulgare*) is an invasive perennial forb from Europe and West Asia (Figure 5). It forms a persistent seed bank and has underground stems (rhizomes). It spreads easily, invades undisturbed areas and is difficult to kill.

Once a fire has passed through an infested area, it has a competitive advantage over the indigenous vegetation and quickly occupies bare-ground post-fire.

The Australian Seedbank Partnership, Keith says, "talks about some of the other native species discoveries made at the time. I still live in hope of finding *Irenepharsus magicus* [Illawarra Irene] in NSW - perhaps after the current fire. So, good to be out there looking for new weeds and weeds that take advantage of the fire, but it can be a great opportunity to make new discoveries of native species while doing that".

Figure 5: Ox-eye Daisy (*Leucanthemum vulgare*) in Kosciuszko National Park NSW. Site in photo was burnt in 2007, but otherwise undisturbed.

Credit: Elouise Peach (via Keith McDougall), Office of Environment and Heritage, NSW.

Keith's other message is "to be safe. It may be another month before I can get into my field sites. The fires were so fierce that many trees up here have become unstable – branches and trunks keep falling near where I live."

In the last issue of the "Early Invader Update" (#17, January 2020), we shared a quote from an article by Keith McDougall about Ox-eye Daisy in Kosciuszko National Park. We think it captures the WESI approach nicely:

"*Our greatest regret is not commencing control until Ox-eye Daisy was a problem. If the species had been treated when it was known only from small patches close to Nungar Creek in the 1990s, it would not have expanded to its current extent. The clear message from*

this is: remove non-native plant species when they are rare because, although most might never amount to much, some will and the consequences and cost of management are then huge".

…And from Victoria:

Parks Victoria's Keith Primrose: "Yes, ox-eye is a major concern for us, among others. We are currently involved in a variety of response/recovery planning processes to work out what to do and how to resource it. It's really challenging as the situation is complex and still evolving."

Ox-eye Daisy is only one of many invasive species spreading in areas impacted by fires.

Finally

The WESI team would like to acknowledge the bushfires still burning in Australia, the communities impacted, and the tireless efforts of firefighters. Thanks to everyone who contributed to this issue and who are willing to share experiences and knowledge with others.

Please share with us any other great bushfire-weed references, social media feeds or links so we can pass them through our networks.

Fell free to share this update through your networks.

Your friendly WESI Project Team,
Bianca (aka Goldie, on right) and Kate (left)

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Til next time!

https://www.environment.vic.gov.au/invasive-plants-and-animals/early-invaders

Social media Bianca Goldweeds and @weedyk8 and @EarlyInvaderWeeds

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