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Short webinars for environmental policy-makers and practitioners

Pretty Powerful - the weed invasion in a park near you!

The following questions were asked during our live webinar with Angela Brandt and Duane Peltzer but due to time restrictions, we were unable to answer these in the session.

Regarding radiata pine as a wilding species - the reproductive biology needs to be considered. It has persistent sealed cones that only open when exposed to intense heat or fire, so it less likely to result in wildings, even though there is a huge amount of it planted for commercial forestry. It is a fire-adapted species! Other conifer species such as Contorta pine (*Pinus contorta*), Douglas-fir, and Ponderosa pine, do not have the persistent sealed cones, so have a far higher chance of resulting in wilding issues. Please comment.

DP: Great question. There's a few points in here. Yes, radiata is invasive in some areas (many of which are listed in Bellingham et al. 2023 Biol Invasions <https://doi.org/10.1007/s10530-022-02892-6>.) Many of these invasions are of concern because they're into naturally rare/uncommon ecosystems. That said there are standards for plantations to limit the spread from plantings of all conifer species, and these are being updated currently. Radiata cones do require sufficient heat to open, but some of Sarah Wyse's work (now U of Canterbury) shows dry, hot days suffice rather than fire. You're right that 'wilding conifers' lump species with very different biologies, so have different risks... so lodgepole pine we know grows very fast (faster than in the home range), reproduces early (from 3-4 yrs often), and has relatively light-far dispersing seeds. Some 'slower' species like Douglas fir are still a concern because they're widespread and shade-tolerant (unlike most other conifers).

Is there a wilding Pine levy charged to commercial foresters for the ongoing control of pines that escape? Otherwise we all pay for the environmental impacts and the forestry industry profits don't reflect the true cost of doing business...

DP: There's no levy in place. That said, commercial operators have to meet strict standards. Many also do wilding conifer control around their operations and boundaries. There's also a range of other plantings done for soil conservation, shelter and the like that contain the same species but didn't have such strict regulations in place when they were established. The national wilding conifer strategy is a good place to look for more information, and shared responsibility for managing wildings (it can be downloaded from <https://www.mpi.govt.nz/biosecurity/exotic-pests-and-diseases-in-new-zealand/long-term-biosecurity-management-programmes/wilding-conifers/>). See also the nice summary in the PCE report on weeds in 2021 (<https://pce.parliament.nz/publications/space-invaders-managing-weeds-that-threaten-native-ecosystems/>).

In the maps of naturalised plants and weeds by region, do you think the distribution primarily represents actual distribution or weed mapping effort?

DP: now this is a tough question, but best guess is it's a bit of both! Mapping efforts really vary by region and through time, and there's no national standards for collecting this information. Despite this unevenness in the information, there's little doubt there's more naturalisations near major urban centres, and Auckland north!

AJB: To add to Duane's points, there is clear evidence of gaps, both in where plant occurrences tend to be recorded (often easier access or where other work happens to be located) and which species (not all of the naturalised plant species have records we could automatically download from GBIF, and sometimes the 'obvious common species' are under-recorded because they don't catch the eye as much as a 'new' sighting). There's work underway, led by multiple agencies including MPI and regional councils, to improve data integration and mobilisation to enable better sharing of the data we have, which would also help us better identify where those key gaps are.

Does Manaaki Whenua complete matauranga for understanding how pest species impact on iwi and hapu values?

DP: not quite sure the nature of the question here, but I'll give two brief responses. As researchers we're very interested in the perceptions and impacts of weeds on communities, including on iwi and hapū 'values'... But little to no work has been done on this. Another issue is there's little work including Māori in plant biosecurity generally, so this is an area that requires greater attention (see PCE weeds report 2021, too, for discussion of this topic).

Not a question more of a request. If you are interested in the next steps for Weedbusters please contact Illona. So I can add you to a list of interested people. If you can mention what types of things you are interested in. E.g controls methods. illona.keenan@wcc.govt.nz.

DP: thanks Illona!

Research gaps need to include things like Ferns - as they are tricky. People able to easily identify. hard to control.

DP: good point. Ferns on the menu for consideration but haven't done work on these to date.

Wellington is very interested in the impact on removal of animal pests. In response to predator free Wellington. Please help.

DP: impact of pest management on forthcoming weeds? This is something we haven't worked on, but keen to pursue. Our potential MBIE bid is meant to include ecosanctuaries, and the effects of pest removal on weeds so watch this space!

At what point do the plants get on the pest plant list? and how are they prohibited from being sold?

DP: They're added to the National Pest Plant accord usually by regional councils or central government, who then prohibit their sale and distribution, but anyone can suggest changes to this list (<https://www.mpi.govt.nz/biosecurity/how-to-find-report-and-prevent-pests-and-diseases/partnerships-programmes-and-accords/national-pest-plant-accord-for-preventing-the-sale-of-invasive-weeds-in-nz/>).

AJB: Regions will also prepare Regional Pest Management Plans, and the management programmes for these can include prohibition of sale/trade within that region (Auckland's current RPMP is an example). Most RPMPs will be current for several years yet, but the process for updating a few of them will be getting underway within a couple of years or so.

Is there a place where Douglas fir does not invade? We are seeing it is on par with Contorta.

DP: Douglas fir is a major concern because it does have very wide environmental tolerance, and is far more shade tolerant than other wilding conifers like pines. There are some potential future maps of distributions in an open access paper by Tom Etherington here for all the different wilding species (Etherington, T.R., Peltzer, D.A., Wyse, S.V. 2022. Predicted climate-change impacts on the distributions of suitable climates for exotic conifers in New Zealand. NZJE 46: 3473 <https://dx.doi.org/10.20417/nzjecol.46.14>). It also seems to use some of the same mycorrhizal fungi on roots as beech, so that might help it establish in forest gaps. All this points to spending effort preventing and containing douglas fir as early as possible.

Commercial forest levy I believe could have some very damaging unintended consequences. It would need to be very well thought out and executed. We have having good successes getting commercial forests to take responsibility for their direct wilding spread. This way individual forests are incentivised to plan to mitigate wilding spread in future too. A general forestry levy may shift responsibility of mitigation of wilding spread away from the forest managers.

DP: good point. A levy is not seriously being considered to the best of my knowledge. Currently there are many standards commercial forest operations meet, some of which are in place to prevent new wildings and deal with spread from existing operations. The main strength of the current approach (outlined in the national wilding conifer strategy) is to co-ordinate and fund management across different organisations and landowners.

Radiata is a massive invasive weed issue for us in Central Otago and we spend hundreds of thousands on controlling Radiata specifically.

DP: Thanks for that. It'd be interesting to know if you're getting reinvasion happening in some locations?

Is the use of non-native species for erosion control mainly on private land? Why are native species not preferred for erosion control?

AJB: Historically, non-native plants were certainly favoured for plantings for erosion control, I think regardless of land tenure. There has been a shift toward using native species much more often for many types of uses, but I expect there can be limitations, including having enough source material for plantings, and how quickly different species grow or what services they can provide (including erosion control). For example, planting of willows along some waterways is still done for erosion control purposes (I believe the examples I know of are on private land). There is some active research underway that could address some of these potential limitations (like how to effectively plant native vegetation from seed) and a growing industry for providing native plants, but there are still gaps.

How can citizen science contribute to weed control in NZ?

AJB: Excellent question. There's been a good deal of discussion across the biosecurity system about the role each New Zealander could play in surveillance for weeds, but there's still a gap in understanding how to do this most effectively in practice. Reporting observations of weeds, especially sightings of apparently 'new' weeds (e.g. by calling MPI or reporting on iNaturalist [see more on this in answer to another question below]), is one way everyone can contribute. But we know that some weeds are harder to identify than others and potentially require additional training. What I'm not sure has been discussed as much is the potential for citizen science to contribute insights on weed control methods - the trial-and-error that so many community volunteers do on a regular basis and monitoring what happens afterward (how often are follow-up treatments needed, what happens to the other vegetation, etc). I know there are some partnerships between community groups and certain agencies, including LINZ, to collect data on weeds, too, but I don't know all the details for these.

I understand that with increasing anthropogenic disturbance, there is an increase in proportion of non-native species. Is there any upcoming ideas to reduce this type of disturbance surrounding places like forestry blocks in order to control the wildings?

DP: wilding pines and plenty of other weed species do thrive on disturbance. There have been some efforts to leave buffers or plant non-spreading species to contain or minimise spread. There's also a wilding risk calculator that takes into account surrounding land use, so plantings next to disturbed, open vegetation would be riskier or need more management to control spread than plantings next to less disturbed or invasion-resistant vegetation like improved pasture. There's a free summary of much of this here: Dickie, I.A., Sprague, R., Peltzer, D.A., Green, J., Orwin, K, Sapsford, S. 2022. Beyond control: Applying ecological research to improve long-term outcomes of wilding conifer management. NZJE 46:3475. <https://dx.doi.org/10.20417/nzjecol.46.23>

Given the scale of the future coming weed invasions, and the complexity and trajectories that are already in-train, is control really realistic? Or is some type of mindset change about living with weeds going to be forced upon us?

AJB: Unfortunately, a 'weed-free NZ' won't be possible - and this is especially true given that "weed" is about place as much as it's about species, so some valued non-native plants will always be present as seed sources for the possible weed in another place. And species that are problematic weeds in one place may be beneficial or benign elsewhere. So yes, we do face some tough choices about weeds and how we plan to manage them. But having clear ideas about what we want for our natural environment and landscapes as well as a good understanding about how each potential weed species could affect those environments and our other values, should help us make more informed choices. This underlies some of the work we're keen to do in our new research programmes, including our potential MBIE bid.

Does Landcare have any ideas on how to deal with fly tipping of green waste? Are there any recommendation beyond the obvious fines and imprisonment?

AJB: That's not something we've looked into specifically, but it is related to an area of work we're hoping to do in one of our new research programmes, around what motivates people to take actions to reduce weed invasion, particularly of new weeds (which can establish through improper disposal of green waste).

I feel like our biggest challenge in weed management is the social and political. Any proposals for research on these elements? Without a strategic long-term commitment across boundaries it feels difficult to make true progress.

AJB: We agree that involving people is essential to effectively managing weeds. We're keen to explore much more about people's perceptions about weeds and motivations for managing them, and how we can integrate these social aspects more fully into weed management and biosecurity as a whole.

Are there cost curves for managing established weeds (other than for wildings)? It seems the assumption is a big hit of money for a few years then significantly less for maintenance - but is that accurate?

AJB: Control for many weeds hasn't been costed out as thoroughly as wilding conifers, and I expect the nature of that curve can depend on the aim of a programme of control (e.g. eradication vs containment) and how that is implemented, as well as the environmental context (including what sources of reinvasion are present). I can envision a scenario where a constant input of resourcing is needed for a particular weed at a particular site, if reinvasion from nearby populations or recruitment from the seed bank is expected into the foreseeable future, and if no new control option becomes available. An examination of costings for biocontrol in NZ was recently published, too:

<https://link.springer.com/article/10.1007/s10526-023-10225-2>.

Where do I find research on effective methods of control for a particular weed, especially time of year for maximum impact? There are general guidelines on Weedbusters and anecdotal observations, but I want species-specific control methods.

AJB: Operational information like that is a gap and was noted in the 2021 PCE weeds report. I'm hopeful that the efforts underway by multiple agencies to improve data integration and sharing will extend to the control methods for particular weeds as well. In the meantime, there is work happening to update the Weedbusters site and provide opportunities for sharing information amongst people managing weeds on the ground (such as through weed cafes that Illona mentioned in another question).

How do we take a more integrated approach - managing multiple risks - conifers and pines also bring significant wildfire risk, for example?

DP: now this is a great question, and I can only give a partial or incomplete answer here! One way we've tried is to bundle different 'services' or 'risks' and look for trade-offs. Another is to use a framework that includes several components like Ecological Integrity, that combines different information or state compared to an undisturbed or native-dominated baseline. This is the reality for most landowners, so important to work on I reckon. Very happy to follow up on this with you or point you to others who tackle this if you like!

What is the best way of making records of unusual weeds that we may find in the wild so that they reach the right person? I use inaturalist but not sure if that gets seen by anyone who might want to know

AJB: If a plant (or creature) really does seem new and potentially problematic, you can report it directly to MPI (<https://www.mpi.govt.nz/biosecurity/how-to-find-report-and-prevent-pests-and-diseases/report-a-pest-or-disease/>). But it is great to post your observations in iNaturalist, too, and the community there can help you decide if it's something that should be reported to MPI. There are a few projects on the site that can help flag your observation as something potentially problematic (e.g. <https://www.inaturalist.org/projects/emergent-weeds-nz>, <https://www.inaturalist.org/projects/find-a-pest-observations>, <https://www.inaturalist.org/projects/new-zealand-discoveries>). And research grade observations will feed through directly into GBIF, which is being considered as a platform to help improve data sharing across the biosecurity system. There is additional work underway to see how NZ could make better use of these observations to alert us to potentially new weeds (like the Smart Weed Alert Tool that was mentioned in another question above). Observations of certain species are also synced to other tools being developed to help various groups with their weed control efforts, such as EcoNet's CAMS tool (<https://econet.nz/>).