

Conference Proceedings – Speaker Transcript

Navigating terminology: When is fire a tool for 'maintaining' vs 'restoring' ecosystems?

Tein McDonald,

Tein McDonald & Associates, Woodburn 2472 teinm@ozemail.com.au

[Link to slides](#)

I've been asked to outline a conceptual framework around the topic of fire and restoration in a biodiversity-conservation context (slide 1). This sort of conceptual framework can help us organise our ideas and discuss them using some common terminology. Now, I'm really interested in restoration philosophy, because it combines three things that I'm really fascinated with, and I think a lot of people are. That is: ecology, how ecosystems work; restoration techniques and approaches; and ethics, how restoration involves compensation for damage, leading to useful outcomes for society.

Now, this is the ecological concept underpinning the use of fire for conservation management (slide 2). Fire can be considered part of an ecosystem whose species have evolved in its presence, and those species now depend on fire, so maintaining fire at the appropriate regimes will be essential to maintaining such ecosystems. So, in a conservation context, fire can be applied for two purposes (slide 3) – for the purpose of maintenance, to trigger normal successional processes, that is appropriate cyclic disturbances; and for restoration, that is to repair damage or degradation, so, in that case, reinstating conditions that enable recovery to occur. Over the next two days, some presentations will be talking on each of these themes, and some will be talking about the culture of burning, or not burning, in some cases, and the how-to of burning.

The difference between restoration and maintenance is whether degradation has occurred (slide 4). Now, by definition, ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed, so, I'm using the term degradation because that is at the lower end of the scale – ranging from degraded, then to damaged, then completely destroyed. So, degradation in the case of our bushland areas can be said to have occurred when native species and their functions have been lost or are in the process of being lost, and the point is that here, they're unlikely to return without some sort of assistance, so some threshold of irreversibility has been passed that can only be overcome by our management interventions, so that's what restoration is in a nutshell.

Now, in sclerophyll bushland, this is the interesting bit, some species may seem absent, but may be present below ground (slide 5). It's important to distinguish between two things – natural senescence and degradation. In natural senescence species are merely absent above the ground, but they're actually still present below the ground or in buds. In a degraded state your seed and bud banks are depleted due to long-term weed domination and long-term fire exclusion, and there can also be damage, of course, from excessive frequency of fire. One of the types of degradation we see in sclerophyll bushland, is the long-term fire exclusion, and that has a lot of implications for management.

What's underlying this, of course, is resilience in fire-adapted ecosystems (slide 6). All ecosystems have resilience because they're adapted, over millennia in many cases, to disturbances. Survivors develop mechanisms to recover after those disturbances and in many cases it gets to the point where those disturbances become part and parcel of the life-cycle of the species involved. In sclerophyll bushland ecosystems, soil, seed banks and bud banks of individual species are adaptations to the presence of fire. But this is the bit I really like, it's also an adaptation to the medium-term absence of fire, because you have in ecosystems processes where plant, and whole suites of plants, take shifts where other longer-lived plants become more dominant for periods of time, and in some cases a whole ecosystem can shift from a sclerophyll one to a more mesic rainforest one. At least the understorey can, and then there's a flux where fire or some other disturbance may again occur, and the species are still available for a recovery to the original sclerophyll ecosystem.

So, of course, in terms of ecosystems, it's not relevant whether or not the mesic species are weeds or natives. In many cases, particularly in urban bushland, we have what we often refer to as mesic shift. Mesic weed species are a moist type of vegetation that is adapted to more moist conditions. This shift is a form of degradation where, perhaps led by some native species, but not necessarily, mesic weed species, can invade a sclerophyll ecosystem, and where that is persistent for very long periods, that can lead to degradation where native species can decline over time.

That is one form of degradation where that barrier or threshold can be overcome by human restoration intervention. Here's an example of a site at Warraroon Reserve, in Lane Cove, Sydney (slide 7), where on the left slide you can see the site. It was actually a drain outlet going into a streamline that was dominated by a long-term population of broad-leaf and small-leaf privet. There was a whole suite of what we call mesic weeds, dominating that site, and going for about 30 metres in either direction. These would then, of course, spread to neighbouring bushland areas, and the site became somewhat incombustible. It was irreversible without human intervention, so a stormwater runoff system was installed, weeds were removed and the site was subject to some trial burning. As you can see, the sclerophyll species in the later slide, the site recovered extremely well as a result of those three interventions. Today, if you go to the site, you would not know there was any degradation.

These mesic vegetation communities near road drains were actually prolific throughout the Sydney area, and particularly in Lane Cove National Park, where after the wildfire in 2004, was it, there were 18 bush regeneration groups established immediately after the fire. These groups recognised that there was a massive opportunity to assist the regeneration or recovery of some of these mesic zones. Here's an example of one (slide 8) at Fidden's Wharf Road, where a site that had been dominated by privet and all sorts of other weeds for decades had actually recovered with native species, so there were quite a lot of *Acacias*, *Dodonaea*, *Zieria* and heaps of grasses and forbs that would be more characteristic of a sclerophyll system actually volunteered after that really high-intensity wildfire. So, not even this mesic vegetation can protect you from an extreme or catastrophic wildfire.

Using fire in fire-adapted communities can stimulate more species to germinate in higher quantities and flush out weed, enabling more efficient treatment. We recognised it would have taken decades to achieve a control of those weed species, and we wouldn't have had the natives in their place had fire not been used. But, weed control is an additional requirement, so it's additionally needed and this is just a close up of one of the sites (slide 10). I looked at the photo and I found there were four native species, 22 individuals of four native species and seven weed species, just in this little patch here. Weeds are resilient to fire as well, of course, they're resilient to pretty-well everything. So, if you don't

actually treat the weeds as well, you're not going to get the result you need, you've got to apply your weed control after a fire.

Now, it's not just resilience to mesic woody species that ecosystems can display. This resilience to nature's vegetation fluxes can also assist recovery from other types of degradation, and here's an example of a degradation type where clearing and grazing was involved (slide 11). For quite some decades, in this case, in Northern New South Wales, the site had been cleared and grazed and the more recent land owners were nature lovers, and decided to conserve the site for biodiversity conservation. They gained a grant and the contractors sprayed what was actually 100% cover *setaria* grass. So all these pasture grasses combined to create this amazing domination of grass on this site. The contractors sprayed it and then in spring it was burnt intentionally as a regeneration burn, and regeneration subsequently occurred, it was quite dramatic. As you can see now, the site has nearly 50 species, 21 native forbs, seven sedges, 8 grasses and two shrubs, and 11 tree species, just naturally regenerated across a site where we assumed planting was required. This is a demonstration of resilience we didn't even suspect.

Now, this recovery would not have happened without the weed follow-up, and, in fact, the very first follow-up after the fire was pretty-well 95% weed. We did find a few native species, sort of, showing themselves in little common ground covers, but *setaria* was like hairs on a dog's back covering the entire half-hectare site, so the site was effectively broad sprayed. Now, if that had not been done, people would have assumed the site had no resilience, and they would have planted, and it was only the second follow-up that the natives started to demonstrate their true resilience. This is where the partnership between regenerators and fire technicians can really come to the fore.

A similar approach has been tried at a nearby property, a much larger property of 2,000 hectares, where there's a 16-hectare *setaria* clearing (slide 12). I think a couple of hectares, now, have been prepared for burning next spring, but a trial area, burnt last Spring, has shown that, already, 22 native species, including three tree species, have recovered over the site, and there are eight weed species, mainly *setaria*, but the coverage of natives is far higher. It could be up to about 70% cover of natives, so, you can see there on the top left-hand photo, that's during the fire, and then the adjoining photo to it is showing the grass cover now. The straw bits are the *setaria* that have just been sprayed a few weeks ago now. This is a closer look, on the bottom left-hand slide, that's a closer look at that grassy sward, and then an even-closer one on the right-hand bottom slide, that shows a swamp box coming up there. So there is a very strong native component in the site. We're hoping to get some excellent outcomes as this site has some funding from the Environmental Trust, Firesticks and IPA, thank you, for three years. The work has been done by the Minyumai rangers, an Indigenous ranger group in Northern New South Wales. They have developed some extremely good technologies for burning at the right temperature, with a great deal of finesse to the fire-break edges, and so they've become much more confident now in conducting these burns.

Here are the Minyumai rangers (slide 13). This is a matter of cultural restoration combined with ecological restoration, so that we have actually NCC's Firesticks Program to thank for this work carried out at Minyumai. Firesticks has been brilliant in engaging with Indigenous people and allowing that group to restore, re-enact their traditional burning skills, and to adapt it with contemporary skills for fire management, combined with bush regeneration skills. So it's a really nice partnership between a number of different spheres.

This work can be most powerful where cultural and ecological restoration can be combined. But cultural restoration is not always ecological restoration, and ecological restoration is not always able to be applied. I recommend if people are interested in these topics of cultural restoration and where restoration can and cannot be applied, I recommend you have a look at the Society for Ecological Restoration's International Primer for Ecological Restoration, because it covers many of these complex topics in great depth. There's a very important relationship between the cultural side, the technical side, and the ecological side. <http://www.ser.org/resources/resources-detail-view/ser-international-primer-on-ecological-restoration>

There are other difficulties as well. What about sites where fire can no longer be applied? Also we have, of course, the problem of climate change. Should we allow a shift in the ecosystem to an alternative locally-occurring fire-sensitive ecosystem, so, something that isn't quite so fire dependent? Would that be still restoration? There will be other speakers talking at this conference on this topic. Strictly speaking, it wouldn't be restoration, however, there is an argument to suggest that if a change is happening in a reference ecosystem, because restoration is all about having a reference ecosystem, then that change has to happen on the reference site. This is where we grapple with that very tricky problem of what happens in restoration when it comes to climate change and a changing habitat. Even in cases that are not ecotonal like that, fire, and a shift to non-fire-adapted species may have to be accepted in some areas where there is no alternative.

Back to the ethical side of the restoration discourse, I am suggesting it would be more compatible with the natural-area-restoration principles if that sort of shift were restricted to areas where the site is naturally ecotonal, and where restoration of a natural flux is truly not feasible. We would like to think that we can retain this ecotone between sclerophyll and rainforest, and have it move backwards and forwards. Another situation is if the original ecosystem isn't rare or highly valued, certainly we would not want that shift to occur in an ecosystem that is highly valued or rare. Another thing that we need to be very aware of is that we need to be careful that any such shifts don't add further degradation pressure to other nearby ecosystems. Mesic species, rainforest species, are highly invasive, they've got a very high migratory resilience capacity. We need to be careful, particularly if we're planting species and species that might be used deliberately in urban areas to protect certain areas and make them less combustible. Those sorts of activities might have a negative impact on adjacent sclerophyll areas. We need to be intelligent about all this, and make our difficult decisions after a great deal of thought.

In summary, we can use fire to maintain ecosystems - that is, to avoid excessive senescence of our fire-adapted ecosystems so that we're avoiding degradation and damage in the first place. Then we can use fire as a tool to assist us to restore ecosystems, so that we can use it to help flush out weed and more effectively and efficiently treat that weed and also to trigger germination of natives. Fire has been shown to be highly efficient in assisting our technologies in bush regeneration. There is also a potential for shift or transformation which we need to be a little bit careful of, and use as a last resort. Then there's this cultural layer, the cultural landscapes, and restoring and transforming cultural practices. I'm suggesting that we're all undergoing a transformation of cultural practices by including fire now as a tool in our management of ecosystems. Thank you very much.

Questions from the audience

Q - Tein, this question may be slightly off subject, but as probably the only speaker here, for this conference, who was at the first conference. Can you give a quick summary of how you see things have changed in this sphere?

TM - No, because I haven't really got a very broad perspective on this. I can say that certainly from our perspective as practitioners, we are no longer working on a fringe. We're no longer fighting quite so much to have ecological burns included and acknowledged. It appears that there's a much greater collaboration between environmental managers and fire authorities. I found that first talk from Stuart Midgley of RFS very inspiring. I think the words were, "I think we can confidently dismantle the distinction between fire for risk management and for restoration", and I thought that was a milestone statement.

Q - What are your thoughts on burning areas that are shifting from Themeda grassland endangered ecological communities to littoral rainforest EECs - not as weed control, but to retain some grasslands?

TM: Oh, gosh, that's one of the very, very difficult decisions that have to be made, and I would imagine it would have to be made in the light of climate change as well, of predicted warming. You're pitting one endangered ecological ecosystem against another, and you need to make a decision in relation to the extent and importance of each of those.

Q - You mentioned about using fire for restoration, and you gave an example of using fire followed by weed control, which then resulted in something like 70% natives. I was just wondering after that, does the weed control then become necessary ongoing?

TM - Yes, that was a 70% cover of natives at that time, within nine months, or something. Now it's three years, that site, and yes weed control has to be continued. The land holder is now involved in undertaking that, so, the site is not completely stabilised against weed yet. That was a very degraded site, it would have been considered a Class 5 in our terminology. Normally, we wouldn't consider going beyond a Class 4, so, yes, ongoing weed control is essential. But, there's 99% cover of natives now. In fact, the nurturing of ecosystems throughout this whole process of climate change is going to be very important, and citizens are going to have to become more and more adept at including weed management in ecosystems as part of their normal work.

Q - Tein, thanks for the presentation, I'm interested that you differentiate between ecological burning and cultural burning, and I would say there'd be some people in this room that would say that before white man came to this country there was only cultural burning and cultural burning was ecological burning. What do you see is the difference between the two?

TM - I think you're probably right, and the difference is becoming less as we learn from each other.

Q - I just wanted to ask what measures you would suggest to avoid further erosion of the site whilst you're treating the weeds and waiting for the natives to re-establish. If we're talking nine months before you've got a 70% cover, after we've done a burn, what else would you suggest? Often the weeds are the pioneering species that hold the soil in place.

TM - Sorry, to clarify - the monitoring took place nine months after, but there was immediate cover of natives and weeds, so, there was plenty of natives to take the place of weeds. It was also a flat site. Erosion potential would need to be taken into account if it was a sloping site.

Q - Tein, do you think there would have been an advantage in weed control and the amount of resources you could apply by weed control before the fire? So that you have less resilience of the weeds potentially by destroying anything that's coming back from root stock, potentially seed regeneration. Would there be more advantages in spraying the weeds before the fire?

TM - Look, if it's woody weeds, probably, but as someone earlier said, access can be improved after a fire. But, it's not the above-ground vegetation that is the issue, it's the soil seed bank, so, spraying before a fire's not going to give an advantage in that respect. However we did spray before the fire in order to make the vegetation more combustible and of course, you can also apply fire sometime after a bush regen project so you've got a four or 10-year-old bush regen project, you might consider using fire at any stage there. Just be careful, weeds will come up.

Q - You mentioned about the shift to fire-sensitive vegetation, but what about the other way, too? The shift to more fire, in situations like where there's bell-miner-associated die-back, where it might be actually in the long term better to manage it as a more sclerophyll system?

TM - Well, part of the bell-miner die-back problem, I think, is considered to be fire exclusion, where you've got mesic species in the understorey, and they're creating a different habitat for birds, so shifting it back towards the more open sclerophyll-forest habitat, although it's still tall, open forest, can improve conditions for recovery of the trees.