Conservation lessons from species assessments after the 2019-2020 fires

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Introduction

The 2019-2020 fire season in Australia was a landmark event, a visceral harbinger of the consequences of anthropogenic climate change. The scale and severity of the fires that burned that season led to them being widely described as 'devastating for biodiversity' or an 'ecological disaster'. But were these descriptions accurate? For plants there was serious concern that many sensitive species may be pushed beyond their limits and closer to extinction. To address this and identify which species were most likely to be at risk, in most urgent need of assessment and conservation action, a series of initiatives were undertaken at state and national levels. First was the development of a prioritisation framework that could be used to identify which plant species were most likely to be negatively impacted (Auld *et al.* 2022). The framework was then applied alongside other criteria in a national assessment of all endemic plant species (Gallagher *et al.* 2020), which identified 486 species in total requiring urgent assessment. From there the Species Expert Assessment Plan (SEAP), initiated by the Commonwealth government as one of their major biodiversity focussed responses to the fires, tasked our team with assessing 135 of these species from across the country.

The goal of this project (hereafter the SEAP project) was to conduct full threatened species risk assessments with the aim of producing EPBC Act compliant Conservation and Listing Advices for provision to the Commonwealth Threatened Species Scientific Committee (TSSC), and consideration for listing species as threatened with extinction. In order to conduct these assessments we collected data from a range of sources, including federal and state government funded post-fire surveys, existing pre-fire population data and the latest distribution data. For data-deficient species, where time and funding were available, we also conducted our own post-fire surveys to confirm the status of populations. Additionally, and for the first time, Indigenous communities were consulted over the cultural significance of the species being assessed.

At the end of this process, we were able to complete full extinction risk assessments for a total of 118 species (Figure 1). The remaining seventeen were comprised of species with unresolved taxonomy or too little data for completion of a full assessment. Most species were assessed as being eligible for listing as Endangered or Critically Endangered (Figure 1). Several species were not eligible for listing as threatened but some were near threatened and may become eligible in the future. Should these assessments be endorsed by the TSSC, 91 would represent completely new additions to the threatened species list, 20 would represent species moved from a lower threat status to a higher status, and one would represent a change in status from Endangered to Vulnerable.

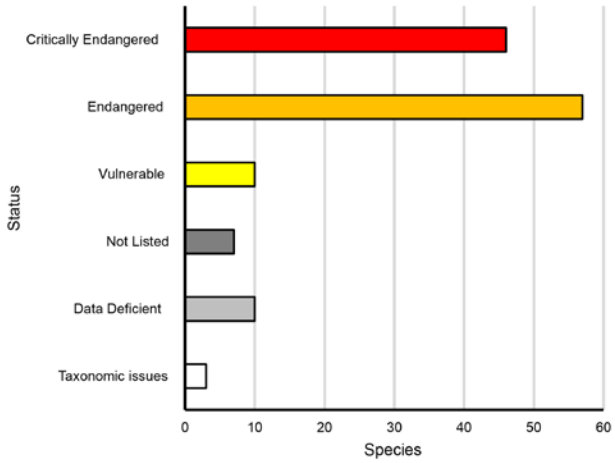

Figure 1: Assessment outcomes for priority plant species (n =135) after the 2019-20 fires. In total 118 species were able to be assessed and identified as being Critically Endangered, Endangered, Vulnerable or not eligible for listing. The remainder were unable to be assessed due to either insufficient data or taxonomic issues.

Lessons learned

General trends

Some interesting trends were observed amongst the species we assessed. Firstly, most species occurred primarily in protected areas. This is not unexpected given where the fires occurred, but it highlights that many well reserved species are still at risk of extinction.

Secondly, the fires themselves, as a singular season or event, were not the major threat to species. The larger fire-related threat was altered fire regimes (e.g. frequent fire, high severity fire). Thirdly, climate change was found to be interacting with or exacerbating most threats, or it was predicted to be in the near future. Finally, across all species the worst impacts were consistently observed when the fires interacted with existing threats like drought and disease (See Case Studies 1, 2 and 3).

Case Study 1: Drought interactions
Hakea dohertyi (Proteaceae)
Assessed as Critically Endangered

- Mostly in dry sclerophyll forest in Kanangra Boyd-National Park, NSW
- **2017-2019 drought**: High adult mortality led to recruitment event prior to fires
- **2019-2020 fires**: severe fire impacted entire range, killed many new recruits, many remaining adult plants and consumed much of the canopy seed bank
- Estimated **50-85% decline**
- Fires compounded existing threat; either fire or drought alone would likely have been tolerable

Case Study 2: Weed interactions
Bursaria calcicola (Pittosporaceae)
Assessed as Critically Endangered

- Restricted to Wombeyan Caves Karst Conservation Reserve, NSW
- **One population** in seven patches
- **2019-2020 fires**: 50-90% of plants burnt, low mortality, resprouting but no recruitment observed
- Fire facilitated severe weed encroachment in burnt areas, dominant vegetation in some places

Case Study 3: High frequency fire
Nematolepis rhytidophylla (Rutaceae)
Assessed as Critically Endangered

- Restricted to South East Forest National Park, NSW
- **2015 HR burn**: Two populations impacted, but post-fire flush of recruitment
- **2019-2020 fires**: 100% of range burnt
  - Large post-fire flush of recruitment at long-unburnt population
  - Limited recruitment at populations burnt in 2015
- Fires resulted in short interval, limited seedbank size and capacity for recovery, population with longer interval had healthy recovery

Positives for plants

Despite the negative connotations of the fires themselves and the findings that 111 species are now facing increased extinction risk, there were positives to come out of the 2019-2020 fire season. In particular, for many species these fires were within tolerable thresholds, and for some species they were actually beneficial. Two examples from outside the SEAP project illustrate this well:

1. *Plinthanthesis rodwayi*, a Critically Endangered wallaby grass, was believed to be restricted to a single mountain top, with the only other known population having gone extinct over a decade ago. Following the 2019-2020 fires this population was rediscovered by Keith McDougall and Damon Oliver (NSW DPE 2023). The fires opened gaps allowing the species to flourish again.
2. *Gentiana bredboensis*, a Critically Endangered herb, which prior to the fires was known from a single population consisting of around 10 plants. Following the fires, the first major recruitment event in 20 years was observed by Threatened Species Project Officer Laura Schweickle (NSW DPE 2021), in the process revealing new information about the species germination requirements and its association with fire.

Other positives include increasingly abundant and accessible data on species distributions, demographics and ecology thanks to projects like NSW Department of Planning and the Environment's Saving Our Species program, the University of New South Wales Big Bushfire Bioblitz (Kirchoff *et al.* 2020) and resources including the Atlas of Living Australia, Austraits and others. Related to this was witnessing the massive number of passionate conservationists, ecologists, botanists, citizen scientists and Indigenous communities invested in plant conservation across the country.

Knowledge gaps

Despite the noted improvements in data availability there are still major knowledge gaps. This is particularly true for species that are cryptic, rare or lack critical data to inform extinction risk assessments. Many of these are unstable or cryptic taxonomic groups like orchids, *Cassinia* or *Hibbertia*, while functional groups such as parasites, epiphytes and cliff specialists suffer from difficult access and detectability. Geographic biases in ecological and distributional data are also persistent, with arid and semi-arid regions typically understudied. Surprisingly, even intact forested regions, such as Wollemi National Park closer to the coast, are also relatively data poor despite their proximity to large population centres.

Threats

By far the most consistent and troublesome threat to all species was climate change. While effects were often indirect, it repeatedly appeared as a major driver of, or complicating factor for, other threats now and into the future (Nolan *et al.* 2021). Climate action, that seeks to phase out fossil fuels and limit global temperature rise, is urgently needed to prevent this from worsening. More broadly there is a general need to increase resourcing of threat management, and to implement and enforce policy mechanisms aimed at preventing further clearing of species and habitats.

Comprehensive species listings

There remain significant shortfalls in extinction risk assessments for Australian plant species (Alfonzetti *et al.* 2020; Gallagher *et al.* 2022). This presents a major hurdle to effective conservation, however, one of the positives of the SEAP project was that it has shown it is possible to assess many species if given proper resourcing and funding. Overall, there is an urgent need for a strategic plan and dedicated funding to make up this shortfall.

To further speed this up, we recommend a combination of regional and taxonomic approaches be taken. By focussing on smaller regions or groups of species, assessors will become more familiar with the idiosyncrasies of ecology, geography and threats in their focus areas. Additionally, this approach should enable stronger relationships with experts, on-ground practitioners, stakeholders and Indigenous groups, all of whom may be more open to sharing knowledge with a familiar face.

Takeaways

In summary, the five key takeaways from this project are:

- Species can cope with extreme fire events if they do not undermine their resilience through interactions with other threats.
- Fire itself is not bad for most species and can be a positive when it is part of a regime within a species' tolerable thresholds.
- Many more species are likely to be threatened with extinction than currently known, but we have the capacity to identify them all given adequate resourcing.
- Threat management requires better resourcing and enforcement.
- There is still time to take the climate change actions needed to improve the chances of species survival in the future.

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