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What did we learn about biodiversity management, policy and operations from the 2019–20 wildfires?

Kelly de Bie, Kaye Currey and Libby Rumpff

Summary

- This chapter reports on the results of structured interviews with 32 government agency officers (across all fire-affected jurisdictions) who had responsibilities for fire management or biodiversity conservation and were active in the response to the 2019–20 wildfires. Our focus was on identifying what worked and what didn't work for the protection of biodiversity, with these lessons categorised in relation to issues before and during fire.
- *Preparedness*: Interviewees considered that significant conservation assets were more likely to be protected during fires if their locations were mapped and there were pre-existing and readily accessible plans that served to inform their protection. Some interviewees reported that management actions undertaken prior to wildfire (e.g. planned burning around their perimeter) also helped.
- *Operations*: Interviewees reported that conservation assets were more likely to be appropriately considered and protected during wildfire operations if biodiversity agency representatives were embedded in the emergency management structure (e.g. in incident management teams). This allowed for ready access to, and dissemination of, biodiversity data, prioritisation of natural assets, and connections to a broader network of biodiversity respondents. Interviewees also noted that conservation assets were more likely to be protected if there was advocacy from the managing agency or community groups (e.g. for iconic species), and if there were few competing assets for protection (e.g. where there was lower risk to human life and property). Conversely, interviewees noted that biodiversity protection during fire operations was compromised or constrained where locational data or prioritisation were inadequate, and because protection of biodiversity was almost always subordinate to protection of human life and property. Furthermore, the scale and severity of the 2019–20 wildfires overwhelmed much planning for biodiversity protection.

- If we can learn from what worked, and what did not work, in terms of preparedness and operations in the 2019–20 wildfires, biodiversity could be better protected in future large fire events.

Introduction

The scale, intensity and duration of Australia's 2019–20 fire season tested, and often overwhelmed, the capacity of fire management systems. The operational fire response focused mostly on human life and property, with less attention during fire operations to the protection of biodiversity. Actions for biodiversity mostly occurred in the post-fire period, with significant and coordinated investment into biodiversity recovery, particularly triage of animals, supplementary feeding and targeted herbivore and predator control. While some iconic species and locations were the focus of rapid and successful response efforts, many species and ecological communities were severely impacted (Chapters 4–16; Ward *et al*. 2020; Wintle *et al*. 2020). However, the fate of biodiversity in these wildfires was highly influenced by management action or inaction, taken before and during the fires. In this chapter we report on interviews undertaken with staff in government conservation and fire management agencies, reflecting on their involvement and focusing particularly on the lessons they learnt from this experience. In particular, we sought to identify and report on factors that helped conserve biodiversity in the fires as well as what did not work. This chapter complements Chapter 30, which summarises the more formal assessments on these fires by government inquiries. Some aspects described in this chapter are considered in more detail in de Bie *et al*. (2021). Note that interviewee responses have been anonymised for this chapter.

The 2019–20 fire response involved many agencies and organisations, and extensive professional and volunteer personnel across much of Australia, presenting a crucial opportunity to obtain valuable and unique insights into the management of biodiversity during the fires. Here, we report results from a set of semi-structured, online interviews with state agency biodiversity and fire operations staff, seeking to understand and explore their practices and experiences during the 2019–20 fire season (de Bie *et al*. 2021). Our focus for this research is on the periods before and during the 2019–20 wildfires, rather than on recovery actions taken after fire. Our study also considers state and territory government agencies, who have primary responsibilities for fire management. Hence, we do not consider the roles played by (and lessons that can be learnt from) Indigenous groups or conservation non-government organisations (NGOs), although we acknowledge their important roles. Furthermore, we mostly consider here policy and operational management, but again recognise that other aspects, such as legislation, resourcing and accountability, may also influence the extent to which biodiversity was protected during these fires.

Thirty-two interviews were conducted, representing 13 land management agencies across the six target states and one territory. The majority (81%) of interviewees had substantive roles with a biodiversity focus, but 57% of these also held a fire operations role during the 2019–20 fire event. Using a thematic analysis approach, we identified and interpreted key themes to understand what worked well in terms of preparedness and fire operations with respect to outcomes for biodiversity, as well as identifying key gaps to be addressed. As large-scale fires become more frequent with a changing climate (van Oldenborgh *et al*. 2021), it is critical to learn from the 2019–20 events to avoid a repeat of the large scale biodiversity impacts and to ensure the persistence of Australia's conservation assets into the future.

In the following section, we distil some of the key messages given by interviewees, in some cases using direct quotes. These are indexed to interview records (e.g. I.02) described in de Bie *et al*. (2021).

Findings

Preparedness: pre-fire planning for conservation assets

What worked?

The majority of agencies had some form of pre-fire planning, data and tools that were utilised during the wildfire event to support decision making. However, only two state agencies had specific emergency planning for threatened species or communities that outlined targeted actions to be undertaken during a fire; one of those species was the Wollemi pine (*Wollemia nobilis*) (see Chapters 9, 27). In the case of the eastern bristlebird (*Dasyornis brachypterus*) (see Chapter 15), individual birds were extracted from areas ahead of the fire front, aided by translocation planning and existing permits and resources. These few examples were successfully executed because of the presence of 'shovel ready' plans, developed before the event (Table 29.1).

Most interviewees (62%) reflected that having existing data and information products to guide decisions during the event was useful, but to varying degrees. Useful products include GIS layers and mapping that identified locations of conservation assets, as well as providing guidance on suitable suppression activities.

> *They are static maps, which are updated periodically. But on top of that, we have those GIS layers which can be pulled up at any time by fire management staff and by values officers to inform response. …. So, I think we're well positioned, in that when it comes to the point of an operation, there's reasonably good available information about where we need to be careful. (I.02)*

One agency had extensive pre-fire modelling in the form of habitat distribution models. These models helped to identify vulnerable conservation assets, and their locations, during fire. This was viewed as instrumental in helping to determine which species were highly vulnerable during the fires and informed decisions around priorities for action.

Table 29.1. Summary of existing pre-fire planning tools, their benefits, limitations, and suggested improvements.

Existing pre-fire planning tools	• Risk/bushfire management plans (prescribed burning plans) • GIS layers and mapping • Spatial modelling (e.g. habitat distribution models) • Pre-fire targeted actions (e.g. planned translocations) • Species specific fire management plans • Strategic management plans (e.g. recovery plans)
Benefits of existing pre-fire planning tools	• Provides species location data • Provides guidance regarding suitable fire suppression activities • Can initiate 'shovel ready' actions during fire • Can assist with prioritising assets for protection • Can identify possible pre-fire actions to spread risk
Limitations of existing pre-fire planning tools	• Can be lacking guidance on operational actions for protection • Little prioritisation of what assets to protect when so many may be threatened • Data may not be current

continued

Table 29.1. Continued

Improving pre-fire planning	**Adequate data and prioritisation** • Ensure priority lists are regularly updated and data layers available for all species or assets of interest (priorities). • Ensure data layers are consistent among agencies, collated and up to date. • Have a consolidated approach at a state level regarding development and maintenance of spatial layers and data. • Bring all corporate data into central, interoperable databases to avoid information being kept on individual computers or systems. • Develop habitat distribution models (noting there is limited information on population sizes for most species). **Targeted fire management plans** • Develop specific fire response plans, at species or landscape scale, that map the values and identify actions that are needed. • Employ scenario and contingency planning to identify potential actions and capacity/resources required for implementation. • Include conservation assets requirements in prescribed burning management plans so they can be used in fire events. • Adopt a nil-tenure approach to inclusion of conservation assets in strategic planning (i.e. not just those on conservation estates). **Risk/vulnerability assessments** • Develop risk management frameworks, or include conservation assets in existing risk management frameworks, including scenario analysis. • Develop landscape-scale plans that assess threats (including fire) and include spatial location of conservation assets. • Undertake meta-population analyses to identify areas that provide important refugia. • Parameterise species fire regime tolerances to establish priorities. • Review existing and new information to assess threats, and incorporate into management plans and prioritisation.
Constraints to improving pre-fire planning	• Lack of resources to acquire data (i.e. numerous assets) • Complexity of decision making regarding prioritisation (i.e. what species and actions to prioritise in what contexts)

For some agencies, mapping products were integrated with management plans. For example, the operational arm of one agency had worked closely with their biodiversity counterparts in developing strategic bushfire mitigation plans. This enabled the creation of guidelines that provided information on conservation assets, such as breeding times for key threatened species. Similarly, another agency had developed mapping of fire sensitive conservation assets and identified which of those assets were most critical to protect from fire suppression activities such as control lines and the fire itself.

> *We provide (fire agency) with a whole heap of mapping of fire sensitive values … so they're sort of aware of what's in the path of the fire or potentially threatened, but we provide a lot of advice on things that might be in that landscape, what are the most critical things to protect. (I.19)*

What didn't work?

Although interviewees recognised the usefulness of existing planning during the fires, many also indicated that they did not consider it as being 'fit for purpose'. There was

recognition that the scale and intensity of the 2019–20 wildfires were unprecedented, overwhelming some existing pre-fire planning.

> *It would really start to hit home that these fires were more intense, they were much more extensive … from a biodiversity perspective we felt that the standard processes weren't sufficient to understand what we needed to do, and that we needed to scale up our response and understand the impacts of the bushfire. (I.21)*

The two most common concerns related to preplanning for emergency response actions for conservation assets were a lack of information on appropriate actions and no prioritisation of conservation assets (Table 29.1).

> *We do lots of fire planning, and we know where things are in the landscape. But I think what we didn't have is more specific consideration of those high-value, threatened species and other biodiversity values, to say, 'What do we do in this scenario?' (I.22)*

Existing plans were noted as having no or limited guidance on what assets to prioritise. This resulted in planners or biodiversity staff having to conduct 'on the fly' prioritisations during the fires with whatever information was available. Where particular conservation assets were identified as priorities, a lack of clarity around how and why they had been prioritised was noted.

> *It's something that we developed on the run during the fire – we prioritised the conservation assets. We need to have a plan in place for that and what we can actually do, if anything. (I.01)*

Other key issues include the availability of data and knowledge for conservation assets. This includes a general lack of knowledge on the fire requirements and appropriate fire regimes for many species and ecological communities that can lead to distorted priorities during a fire event. A lack of fit for purpose data was noted as a constraint, with data useful for informing species management plans not necessarily useful to inform actions during fire operations. Existing prescribed burning plans were primarily focused on vegetation communities or ecosystems and while spatial layers for flora exist, there was much less information on fauna, and species of concern may not be identified in planning and operations.

> *Our fire regime system is based off ecosystems, that's the primary driver in terms of how we determine our fire management zones and we don't complicate that too much with particular species management. (I.13)*

A lack of knowledge and data that are needed to inform prioritisation and risk management processes was viewed as a substantial impediment to improving pre-fire planning. State databases are not regularly updated and so using these data to inform priorities was described as problematic. A 'hybrid' approach that combines formal predictive data with updated field data, expert advice or citizen science data was recommended by some interviewees. There was recognition of a lack of capacity and resources to address this gap, given the large number of threatened or potentially threatened species and ecological communities.

> *We were overwhelmed by the sheer number of things that are a priority, or that we say (are) from our priority spatial overlays. (I.11)*

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Fire operations: protection of conservation assets during the 2019–20 fires

What worked?

Having biodiversity representatives in the emergency management structure was viewed as instrumental in ensuring conservation assets were adequately considered during decision making. A few agencies created dedicated 'natural values officers' or 'natural values teams'. These roles were able to work within incident management teams to access available data and make it usable and relevant, access a network of experts or other resources, advocate for conservation assets and advise on the impact of firefighting actions. Most natural values officers were situated in incident management teams, but one agency also had a natural values officer actively working with fire teams on the ground to assist with the protection of key conservation assets. Victoria established a state-wide wildlife controller who worked at the state level, rather than the incident level. One interviewee believed that this provided much needed access to the highly structured emergency management system.

> *Once you had someone in there with a coloured vest on, access became much easier. Not to say it necessarily translated into things happening on the ground, but it certainly was critical. (I.20)*

Interviewees spoke of the ability of biodiversity representatives to 'bridge the gap' between land management and fire operations agencies, as well as being able to bring in high-level expertise. Advocating the protection of conservation assets and negotiating for resources were critical elements. Common to all the forms of biodiversity representation in the emergency management structure was the importance of the contribution of local knowledge that is often not captured in plans or mapping.

Prioritising and achieving protection were considered easier if an asset was located at a single defined site, with a restricted distribution (e.g. Wollemi pine, Table 29.2; Chapter 9). Interviewees felt that conservation assets were given greater consideration if the fire was located in national parks and the fire was primarily the responsibility of the land manager or parks agency. There were a few instances mentioned in which targeted actions were undertaken to protect broader areas, such as areas containing feeding habitat for a threatened species, or areas containing valued flora or ecological communities. For example, the

Table 29.2. Aspects that contributed to the targeted protection of assets during the 2019–20 fires.

	Wollemi pine	Bristlebird	Namadji NP
Existence of pre-fire planning	✓	✓	×
Biodiversity representative in incident management team	✓	✓	✓
Advocacy and support	✓	✓	✓
External resources	✓	✓	✓
Additional funding	✓	✓	×
Conservation tenure	✓	✓	✓
Single location	✓	✓	✓
Ecological knowledge and data	✓	✓	✓

southern section of Namadji National Park was of high value, due to being the only remaining unburnt area since the fires in 2003. When Namadji became threatened by the Orroral Valley fire, bulldozers were used to establish containment lines that successfully prevented the fire spreading into this area, preserving this important ecological community (Table 29.2; Chapter 23).

A conservation asset was more likely to be protected during the fires if it was iconic or had a pre-existing high profile, so that there was a greater knowledge of exact locations and the threats, and a higher level of community interest and political will. A few interviewees noted that more consideration was given to protection of conservation assets in areas where there was less risk to life and property. This provided opportunities for the protection of conservation assets, as resources were more readily available and there was time and space to act.

If it were a bristle worm, we would've got nothing done. (I.25)

Advocacy by highly passionate, knowledgeable individuals or stakeholder groups was able to influence the protection of particular conservation assets. Most of the assets that were discussed in the context of having been the focus of targeted actions were threatened species, but in a few instances, targeted protection actions were undertaken if the conservation asset was considered rare or unique to a particular region. Advocacy for the protection of conservation assets often occurred within incident management teams, but it was also recognised that highly passionate and knowledgeable individuals or stakeholder groups were able to influence the protection of particular species. Important elements of advocacy were that the person was motivated enough to push for action and knew who to contact to exert influence.

It comes down to one person having the passion or the drive or whatever. Without that, then the fire can be fought very differently, so it's up to single individuals and A, the relationships you develop with your colleagues, and B, how hard you're prepared to push. (I.28)

Having funding and resources available, for both pre-fire planning and during fire actions, was recognised as a vital. Pre-fire, investment in research and planning for priority conservation assets was important, to ensure suitable data and planning were available. There were two cases where the existence of a translocation plan (Chapter 27) and a detailed fire management plan (Chapter 9) enabled successful action during fire. During fire, external resources that would not compromise the firefighting effort were able to be accessed on some occasions, facilitating targeted action for priority conservation assets. This included staff from other departments, contractors, or personnel from other organisations such as zoos (see Chapters 15, 27) (Fig. 29.1).

If that money wouldn't have been provided, I guess we could have still got some things done, but it would have been more difficult, and there are some things that might not have actually occurred because they literally take money to pay people to do things (I.23)

A few interviewees were aware of guidelines around the use of retardants during planned burns, primarily near water bodies. One participant reported that they had to come up with some rules regarding retardant use during the fire. In general, interviewees

Fig. 29.1. Emergency extraction of individuals from the last known Victorian population of the endangered eastern bristlebird was facilitated by having pre-existing translocation planning to guide action, collaboration between multiple agencies, and adequate resourcing. (Photo: Mark Antos)

advised that they considered the impact of retardants and gels, but there were constraints on the knowledge about their potential detrimental impacts. Two interviewees discussed the complexity of decision making around the use of retardants and having to consider trade-offs and a 'hierarchy' of risks – for example, considering the risk of using retardants in a catchment area containing threatened species, or not using it and risking the entire catchment being burnt.

What didn't work?

A major challenge recognised by many interviewees was the unprecedented nature of the fires. The scale, intensity and often highly unpredictable behaviour of the fires had significant consequences for whether conservation assets could be considered for protection, and fire conditions often precluded the ability to plan or implement actions. There was an example where water bombers had been approved to lay lines of retardants to protect patches of a threatened ecological community and threatened flora, but by the time the machines were mobilised the fire had already burnt through the areas.

> *It was unbelievable and it was interesting because it was fire behaviour that nobody expected, it sort of defied all the predictions quite possibly because of three years of dryness and the way the wind behaves under those different topographic features it just blew out well beyond anything we expected or could have predicted. (I.32)*

Interviewees were very aware that life and property are established priorities, but the scale of the fires and limited capacity and resources further constrained the ability to be able to protect conservation assets.

> *We're just not set up for these big landscape style fires, so we have scrambled. (I.12)*

There was a high level of uncertainty as to whether resources would be available. Six interviewees spoke of having to negotiate within the incident control centre for resources, primarily aircraft. Even if aircraft had been allocated for protection of a conservation asset, it would be diverted if properties became threatened. In another instance an interviewee spoke of having to 'beg' for a highly qualified person to be included in the incident management team to do a values assessment. One interviewee felt that the lack of capacity meant that there was no action taken for many fires that caused the loss of conservation assets until fires approached property.

> *Resources were running around doing a whole bunch of other stuff, protecting people's houses and making sure people weren't in their houses, evacuating and things like that. So there were limited opportunity in that kind of situation to get in and protect some of those sites that we knew about even. (I.15)*

A broader issue raised by a few interviewees was the need to expand the focus of always protecting life and property, to consider the equivalency of value of some natural values compared to property. One interviewee recounted a situation in which the decision needed to be made as to which direction a fire would be encouraged to go using back burning techniques. Based on existing frameworks, the decision was made to protect a small number of sheds, at the expense of 5000 ha of national park.

> *There's definitely a mindset shift that has to happen across the board about value. A decision has to be made about whether we're going to value environmental and cultural assets in the same way that we value built assets. (I.32)*

The majority of interviewees noted shortcomings with operationalising information, due to data accessibility, relevance and currency. Data were often difficult to interpret by operations personnel, or the information was too complex and not designed for emergency management use. The ability to find and collate existing data was an issue, as it was often dispersed among databases, localities (e.g. regions) and individuals. Available data were sometimes not accessed by operational staff. One interviewee believed that the available maps and strategies were 'scantly' used in incident management teams. An interviewee who worked as a planning officer during the fires was unaware of a biodiversity risk layer that had been created by their own agency and only 'stumbled' across it. There were also concerns that data systems were not interoperable, which led to delays in information being accessed and processed.

> *Everyone's got their own system in terms of information management … We have our own fire management system, [the fire agency] have their fire management system, they're doing a major review of theirs and we're looking at how they can incorporate our data more effectively. (I.13)*

Where information was available and accessible, there were two issues with the degree to which incident management team personnel were able to use the data in an emergency setting. Information was noted as being too broad and providing insufficient detail as to why or how to protect the asset, or available information was not current or dynamic. Biodiversity database records are often the basis for the mapping and GIS layers used in incident management teams, but the databases are not regularly updated. Some plans

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containing operational guidelines or fire management strategies existed only as static maps that were not regularly updated before the fire, and not able to be updated during the fire.

> *The other real issue for me is the accessibility and the awareness of those (fire management) strategies … they are online, but just in a PDF version, so we didn't have live data that we could input into incident action plans. (I.05)*

An overarching challenge for the inclusion of conservation assets within incident management planning was that prioritisation of conservation assets was undertaken by biodiversity departments, outside of the emergency management structure. For example, one department recognised the need for, and instituted, an intensive prioritisation process, but this process was not part of the formal decision-making structure for allocation of resources. This information was only able to be incorporated into the emergency management context when a biodiversity representative was situated in the incident management team.

A lack of personnel with biodiversity experience was noted as a common constraint. Personnel from parks agencies who may populate key roles are not always available or rostered on, and there was a limited number of adequately trained natural values officers. Protection of conservation assets was strongly influenced by who was present in the incident management teams, both at a senior level and also at local levels when access to local knowledge of key conservation assets was needed.

> *Because people often don't know that [conservation assets] are there. In the way that Incident Management Teams work, if you're in a normal firefighting mode, you're in these 12-hour cycles of people swapping over all the time. And people will come from out of area … So knowledge is a big one. (I.09)*

In most instances, the inclusion of a natural values officer in the incident management team was done for the first time in an emergency event setting, and there was some confusion about exactly what role they were or should be performing. One participant spoke of having to negotiate during the fire about having a natural values officer in the incident management team. In another instance interstate personnel were brought in to fill key officer roles, but they had no background with the role or the values of the area. There was a perceived difference in how incident controllers accessed advice from natural values officers. Some would actively seek advice regarding conservation asset considerations, while in other jurisdictions the onus was on the natural values officer to take the advice to the relevant incident management team personnel.

> *Because it is an advisory role, that's where some of that improvement can happen around how do we ensure at least that there is a clearer line of sight between the natural values officers giving the advice and the Incident Controller manager making those decisions. (I.15)*

Many interviewees discussed how the relationship between biodiversity management agencies and fire agencies influenced the consideration of conservation assets. Some interviewees were very positive about interagency cooperation and willingness to assist in protecting conservation assets. However, other interviewees noted there were cultural differences between land manager and non-land manager agencies, which were demonstrated by a lack

of interest in, or awareness of, the need to protect conservation assets. It was felt that both on-ground fire fighters and non-land manager operational personnel in incident control centres or incident management teams often did not have an appreciation of the importance of conservation assets, or there was a lack of training in how to protect these assets.

> *It's a tricky one because people who are in that operational role, are very hands-on people and [some] don't necessarily want to understand all of the detail around what plant is that, and where does that live, and have an appreciation of the importance of the biodiversity and other values that are there. (I.22)*

Conclusions

Based on the lessons learned during the 2019–20 wildfires, preparedness is vital for biodiversity protection in future wildfires. Being prepared involves improvements in biodiversity data availability, prioritisation of conservation assets, fire management planning to identify suitable actions during fires, and spreading risks (e.g. through translocations).

Few conservation assets were a focus of emergency fire management response in the 2019–20 fire season. When they were, several key factors contributed to their protection of these particular assets during fires (Table 29.2), such as an established priority, being highly localised and clearly circumscribed, and in conservation reserves. A key lesson from the experience of those involved in managing the 2019–20 wildfires was that the protection of biodiversity was more likely to be achieved when relevant biodiversity expertise was embedded in fire operational command structures. The review reported here demonstrates that the fate of biodiversity during wildfires may be contingent on many knowledge, policy and management factors, and that there are clear lessons that need to be learned to help improve the fate of biodiversity in future wildfires and ensure that losses of the scale in the 2019–20 wildfires are less likely to be repeated.

Recommendations

Preparedness

- Data to underpin the development of prioritisation frameworks and management plans must be collected and collated, and available in an interoperable database. This may include data on the status of species or ecological communities, the ecological needs of the species (especially their responses to fire, and to fire regimes), and the consequences of actions (including costs). A planning process that seeks to identify critical places for high priority protection would be likely to guide data collection efforts by revealing critical knowledge gaps about the distribution of priority species and ecosystems. Conservation assets need to be better defined, delineated and prioritised. These may be species that are most vulnerable and in need of protection, but may also include places of high endemism, critical habitat for multiple species, or climate refuges.
- Pre-fire planning should include targeted fire management plans for key conservation assets to assist with decision making during a fire. To be 'shovel ready', plans need to clearly identify actions, but also identify the components (e.g. skilled personnel, equipment, permits, resources) needed to assist with the rapid implementation of the plan in an emergency setting. Ideally, a combination of landscape planning and species or asset specific (targeted) plans will be required.

- Development of management plans should involve the exploration of different scenarios, to help determine the potential benefits, risks and feasibility of acting in different conditions. Importantly, it can assist in the development of different contingency management options for fire events. Contingency plans may be developed for different fire conditions, and/or for different resource availability conditions.
- A risk-based approach to acting before fire, to reduce the need to act during a fire event, was widely recognised. This may include translocations and establishing seed banks, and identifying locations for containment lines that would be enacted before a fire if a bad fire season was predicted.

Fire operations

- Conservation assets need to be better incorporated and prioritised in decision making during fire control operations. There needs to be more recognition of the value of conservation assets relative to other assets for protection during fire control, such that protection of biodiversity is not automatically considered subordinate to that of other values.
- Biodiversity representation, preferably with local knowledge, needs to be formally included in the emergency management structure, and has multiple benefits. The vulnerability and management needs of conservation assets can be clearly communicated within incident management teams to be considered for protection. Representatives can also play a role in networking with experts and other departments or organisations to provide further information, and to support and provide advice on the risks of fire-fighting actions to conservation assets.
- To be useful in supporting emergency response efforts, staff must be able to interrogate data to rapidly determine what is most important, rather than be faced with a maze of many overlapping and unprioritised assets. Data need to be current and dynamic, relevant to the decisions at hand, and located in centralised databases. Incident controllers need to be made aware of available datasets and have the training necessary to provide the skills to interpret and use the data.
- Training of fire operations staff needs to include an understanding of the value of conservation assets, and the fire control actions that may protect or jeopardise their persistence. Training should also be conducted for staff from other departments or external organisations (e.g. zoos) so that they can be ready for deployment during fires for targeted actions for conservation assets, such as species translocations
- Where required, these improvements in planning and management need to be strengthened by a supporting legislative framework.

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