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AUSTRALIA'S 2019-2020 BUSHFIRES: THE WILDLIFE TOLL

INTERIM REPORT

Foreword by
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In January, as fires still burned, WWF helped inform the world that 1.25 billion animals – mammals, birds and reptiles – were impacted by Australia's bushfire disaster. This early estimate, led by Professor Chris Dickman working with WWF scientists, generated headlines across the globe and helped people grasp the magnitude of the crisis.

WWF, a science-based organisation, felt it was crucial to update this figure. By February, we had commissioned scientists to complete a more detailed and final estimate. Their interim findings, released in this report, are shocking. **Nearly three billion animals were in the path of the flames.**

It's hard to think of another event anywhere in the world in living memory that has killed or displaced that many animals. This ranks as one of the worst wildlife disasters in modern history.

In 2019 and 2020, we saw catastrophic burning throughout many regions of the world. Extreme bushfires are already becoming more frequent and the predictions are they will become even more severe due to climate change. WWF hopes this research will give other countries a window into the future of mega fires and their devastating impact on wildlife.

These interim findings have been revealed in the same month the Australian government released an interim review of Australia's flagship environmental law, the Environment Protection and Biodiversity Conservation (EPBC) Act. Following such a heavy toll on Australia's wildlife, strengthening this law has never been more important. WWF will continue to advocate for policies that benefit both people and nature, restore what has been lost, and ensure we build back a more resilient Australia.

IMPACT ON AUSTRALIAN WILDLIFE

Over 2019-2020, Australia experienced its worst fire season on record in its expansive forest and woodland estate. More than 15,000 fires occurred across all states, resulting in a combined impact area of up to 19 million hectares (Filkov et al. 2020). Particularly devastating impacts to biodiversity and human life occurred in eastern Australia, with around 12.6 million hectares containing primarily forest and woodland burning (Wintle et al. in press). The World Wide Fund for Nature commissioned this report to estimate the number of individual native vertebrates that would have been present within the bushfire impact area to estimate the numbers of individual animals that may have been killed or affected as a result.

Ten scientists from the University of Sydney, Charles Sturt University, BirdLife Australia, University of Newcastle, and University of New South Wales contributed the majority of the work on this project. At least 13 additional scientists provided data and feedback on the study.

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In total, we estimate that—within the forests and woodlands that burned—there would have been **almost 3 billion native vertebrates**. These comprise more than:

- 143 million mammals
- 2.46 billion reptiles
- 180 million birds
- 51 million frogs

Estimates of impacts to reptiles are substantially higher than for the other taxa considered. This is because densities of reptiles can be much higher than what is typical for other taxa, with some species (e.g., small lizards such as skinks) reaching densities of over 1500 individuals per hectare (Henle 1989, 1990). Indeed, among the top 20 most heavily impacted reptile species, 16 are skinks.

METHODS AND LIMITATIONS

We defined the fire impact area to comprise 11.46 million hectares. This area is primarily in the southeast and southwest of Australia, along with 120,000 hectares of rainforest vegetation in northern Australia. This area excludes vegetation types such as savannah in northern Australia that commonly burn, or were deliberately burned by Indigenous Rangers, National Parks Rangers or to deliver carbon farming contracts, thus limiting the study area to fires that were considered largely uncharacteristic in extent and severity.

The methods used to develop the numerical estimates vary between taxon groups, largely due to inconsistency in the data, which was often limited in availability. At a broad level, these were:

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- Mammals: For most groups, a literature review was conducted to collect available data on the densities of different mammal species. These estimates were categorised into 11 species groups and then averaged per group for each of the fire-affected bioregions to develop population counts per hectare within the fire impact area.

- Reptiles: A modelling approach was taken that predicted squamate reptile densities in a given location as a function of broad-scale environmental variables combined with species body size. The model was informed by a global database of reptile densities.

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● <u>Birds</u>: Estimates were derived from BirdLife Australia's Birdata database. Almost 104,000 standardised surveys of bird counts were included in the analysis, stratified by vegetation type and bioregion.

● <u>Frogs</u>: Streams and wetlands were mapped within the fire impact area in Victoria and New South Wales and then the population density was estimated for 65 frog species. Population counts were derived for the fire impact area.

The dearth of relevant data also meant that there are major taxonomic groups that were not included in the analysis (e.g., invertebrates, fish, turtles). All methodological approaches come with limitations that affect the accuracy of the calculations, and as such, approaches were taken that sought to be conservative.

<u>Our data do not represent estimates of mortality</u> because our understanding of the factors influencing mortality of different taxa is also limited. There are several key factors that are likely to affect mortality, including:

Direct factors
● species' ability to flee or shelter from fire;
● varying fire behaviour (e.g., fire intensity, whether canopy was scorched, time of day); and
● availability of suitable habitat, including unburnt refuges.

Indirect factors
● smoke inhalation;
● heat stress;
● dehydration due to drought and low humidity;
● runoff of sediment into waterways; and
● decreased availability of and competition for resources, which may also result in increased predation risk.

The results presented in this interim report are preliminary in nature. We anticipate that the final report will be released by the end of August 2020. Some changes to the data may occur as the methods and results are further refined. The full report will contain complete descriptions of the methods and detailed estimates for some taxa.

CONCLUSION AND RECOMMENDATIONS

Our estimate of nearly 3 billion animals impacted by the bushfires is almost three times as large as the original estimate of over 1 billion animals made by Professor Chris Dickman, Professor in Terrestrial Ecology at the University of Sydney and Fellow of the Australian Academy of Science, in January 2020. At the time, Professor Dickman noted that the estimates were highly conservative, and covered only those areas burnt in NSW and Victoria. The fires continued in the months of February and into early March.

It is important to note that we estimated the number of animals that may have been present within the areas burnt by the 2019-2020 bushfires. Even if resident animals were not killed outright by fires and managed to escape, they will likely have experienced higher subsequent risk of death as a result of injuries or later stress and deprivation as a result of crowding into remaining unburnt habitats.

Some of the factors that limit our ability to accurately estimate the impacts of the bushfires, including mortality, are:

● Limited data on animal densities;
● Limited data on the variable impacts of fire and different species' ability to survive fire (see above); and
● Interaction between impacts of fire and other threats which affect species ability to survive and recover (e.g., predators may be better able to hunt after fire, fires may encourage invasive animals and plants, very low rainfall, or fire may trigger further deliberate habitat destruction by logging or clearing).

On the basis of our assessment and our observations of the limitations of such work, we make recommendations to improve monitoring and management of future bushfires and their impacts on biodiversity:

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● Adequately fund appropriate long-term monitoring research that will address knowledge gaps on wildlife densities and responses to fire;
● Develop standard national methodologies for surveying and modelling animal densities for all taxon groups;
● Improve habitat connectivity to ensure access to fire refuges for mobile species;
● Identify and protect unburnt habitat which is critical habitat for threatened species recovery and build fire recovery into species Recovery Plans under the EPBC Act;
● Establish improved fire prevention and management practices; and
● Establish rapid response teams that will act to mitigate impacts on threatened species and ecosystems when fires occur, including both in situ and ex situ approaches.

MAIN CONTRIBUTORS TO THE REPORT

Lily van Eeden – The University of Sydney; Dale Nimmo – Charles Sturt University; Michael Mahony – University of Newcastle; Kerryn Herman, Glenn Ehmke, Joris Driessen, James O'Connor – BirdLife Australia; Gilad Bino – University of New South Wales; Martin Taylor – WWF-Australia; Chris Dickman – The University of Sydney.

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WHAT WE'RE DOING

WILDLIFE CARE

WWF-Australia is deploying emergency care for wildlife.

WILDLIFE REHABILITATION

Rehabilitating wildlife through food drops, water stations, and supporting care facilities.

IMPACT ASSESSMENT

Assessing the scale of the damage to species and habitat.

SEARCHING FOR KOALAS IN NEED

In partnership with OWAD, we've deployed koala detection dogs who have located surviving koalas.

RESTORING HABITAT

Now that the fires are out, we will help restore homes for wildlife through WWF-Australia's Two Billion Trees plan.

FUTURE-PROOFING AUSTRALIA

WWF-Australia's work will include driving innovative solutions to help mitigate climate change, driving climate preparedness, species adaptation and long- term wildlife and nature conservation efforts towards securing Australia's natural resources for people and nature.

Why we are here
To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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