

PROJECT PHOENIX



# BUSHFIRE IMPACTS

## ArcGIS RESOURCES



PROJECT SUMMARY

JUNE 2021

*Across all of our Project Phoenix activities and actions we pay respect to the Traditional Owners and Custodians of the lands and waters on which we work. We honour the resilience and continuing connection to country, culture and community of all Aboriginal and Torres Strait Islander people across Australia. We recognise the decisions we make today will impact the lives of generations to come.*

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Project Phoenix  
Greening Australia (National Office)  
Level 3, 349 Collins Street  
Melbourne VIC 3000  
Tel: 1300 886 589  
Email: phoenix@greeningaustralia.org.au  
Website: www.greeningaustralia.org.au

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Authors: Rowan Wood, Market Analyst, Greening Australia  
Title: Bushfire impacts — ArcGIS resources

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Australian Government



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# EXECUTIVE SUMMARY

## About the project

**The integration of state government priorities and the development of restoration scenario planning will enable the identification of priority areas for seed and plant supply for the restoration of impacted ecological communities.**

To inform discussions with key stakeholders such as state and federal governments, this project developed accurate and aligned mapping related to the 2019–20 Black Summer bushfires and historic fire events.

It provides baseline spatial data for outcomes associated with Project Phoenix.

## Scope

1. **STAGE 1** — Mapping and Spatial Analysis Support.
2. **STAGE 2** — Understand literature, spatial and subject matter expert review of national bushfire impacts and liaising with state government to identify priority restoration actions.



## Introduction

The provision of baseline spatial files aligned to those used by key stakeholders underpinned Project Phoenix's capacity to communicate with external audiences on a like for like basis, providing baseline data for subsequent Activities to build upon.

**This project focused upon the compilation of an internal *Resource* for future use within Project Phoenix and enabled alignment of communication outside of Project Phoenix by ensuring alignment of fire impact spatial data.**

This project was implemented to collate available data on focal regions and associated restoration plant/hectare targets, via a desktop review and summation of existing data sources and published reports.

This project occurred in two Stages.

1. **Stage 1** focused upon the extent and immediate impact of the 2019–20 Black Summer bushfires and included some analysis of the precursor conditions (drought) that contributed to the event. This stage was led by Dr Rachael Gallagher (Australian Research Council DECRA Fellow Deputy Chair, NSW Threatened Species Scientific Committee) and her team at the Plant Conservation and Ecology Group Macquarie University.
2. **Stage 2** involved a desktop survey of planned recovery actions, as well as an expansion of spatial datasets to enable land tenure to be overlain by fire impacts.

### Stage 1

The project included the following areas of focus:

- Fire Impacts
  - Map extent of the 2019–20 fires inside the Priority Assessment Area as determined by the Bushfire Recovery Expert Panel — fire extent data based on the National Indicative Aggregated Fire Extent Dataset (NIAFED) and provided at 1km resolution as a stand-alone mapping product for ArcGIS.
  - Map fire intensity (severity) inside the PAA based on Google Earth Engine Burnt Area Map (GEEBAM) dataset which classifies the fire extent into four categories of burn severity (Low/Med/High/Very High) — mapped at 1km resolution as a stand-alone mapping product for ArcGIS.
  - Identify the history of fire across the PAA presented as a national 'heat-map' and contain:
    - ❖ A count of the number of fires which have occurred since 2003 (nationally) and since 1969 (in NSW) in each grid cell.
    - ❖ An estimate of the average interval between fires since 2003 (nationally) and since 1969 (in NSW) in each grid cell.



- Identify the 10km x 10km locations where large numbers of fire-affected species co-occur.
- Spatial extent and severity of drought
  - Assess the extent and severity of drought conditions over four time periods prior to the 2019–20 fire season in each 10km x 10km location.
- Landscape context
  - Assess the proximity of each burnt grid cell across the PAA to protected areas of vegetation.
  - Assess the proximity of each burnt grid cell across the PAA to cleared areas of vegetation.
- Threatened community

For all *EPBC Act 1999* listed threatened communities with available mapping:

- Full extent of fire across the range of all listed communities (c. 120) at 10km with indication of % of cell occupied by the ecological community.
- Extent of threatened ecological communities inside and outside the extent of the 2019–20 fires, provided as a dataset (not a spatial product).
- Linking EC data to species mapping via ArcGIS joins function.

## Stage 2

Bushfire recovery planning is primarily delivered by state and territory government agencies with the support and collaboration of the Australian Government. However, the 2019–20 bushfires also saw significant funding from private sources (corporates, philanthropy, small donations).

While responses primarily focused upon protection and recovery of assets, responding to the impacts upon the natural estate also featured, often manifesting in commitments to plant trees.

Understanding how native seed and plant requirements intersect with bushfire recovery plans can assist the sector in identifying priority regions. However, as of December 2020, the dimensions of native seed and plant requirements were unclear.

This project was implemented to collate available data on focal regions and associated restoration plant/hectare targets, via a desktop review and summation of existing data sources and published reports.

Data will then be used to assist in the estimation of native seed supply requirements across impacted regions. An assessment of the capacity or otherwise of the sector to service demand will be undertaken by subsequent Project Phoenix projects, in particular:

- *Bushfire impacts — A national model for assessing local landscape restoration priorities.*
- *Bushfire impacts — How much seed will I need?*
- *Bushfire impacts — Where will the seed come from?*



Drawing upon GIS data from Stage 1, this project also generated a map of fire-impacted areas overlain with land tenure to assist in the identification of public land to enable future direct engagement with agencies.

This project focused upon the compilation of internal resources for internal use within Project Phoenix and not for communication outside of the project.





# Issues

## Stage 1

- Mapping and spatial analysis
  - The project was planned to be delivered ‘in-house’ by Greening Australia. However, the rapidly evolving datasets related to the 2019–20 fires and the need to combine these with historic fire data and impacted species resulted in a decision to engage external support from Dr Rachel Gallagher and her team at the Plant Conservation and Ecology Group, Macquarie University.
  - The engagement of Dr Gallagher resulted in the provision of a strong dataset which was per recommendations, expanded to include data on impacted taxa and conditions pre-fires, i.e. drought.

## Stage 2

- Inconsistency between state and territory reporting
  - There was no consistency in reporting between and across state and territory governments
  - Details regarding restoration/rehabilitation plans post-fires were not clear including:
    - ❖ hectares
    - ❖ plants
    - ❖ locations
  - As a result, it was not possible to obtain a clear and consistent understanding of planned recovery actions across jurisdictions.
- Restoration pledges from the private sector generally contained details on target plant numbers and/or hectares, but limited detail on focal areas or species
  - It is not clear whether such pledges made direct contributions to bushfire recovery within impacted areas or were ultimately delivered where land availability occurred.
  - Such pledges are not transparent and there is generally no information available in relation to where seed and plant materials are sourced.
    - ❖ Exceptions include funding provided to the Foundation for National Parks and Wildlife which is specifically focused upon supporting the production of native plants via bushfire recovery nurseries.
- Spatial layers
  - It was identified early in the project that intended land tenure mapping aligned closely with that required for the report *Everything you wanted to know about access to land for native seed collection*.
  - As a result, the spatial mapping component of this project was removed and incorporated within the report *Everything you wanted to know about access to land for native seed collection*. This was successfully delivered by Stuart Allen and Rachael Gallagher of Macquarie University.



- Fluid nature of reporting
  - Updates on bushfire response initiatives are not static in time, i.e. different jurisdictions release data at different times and in different formats. This presented a challenge for Stage 2, in that time and resourcing was not available to continually investigate and update the dataset as new information was released.
  - As a result, the dataset provides an imperfect picture of the overall response as it was impractical to update continually.

## Comment

### Spatial data

Data provided through this project provides a snapshot of a point in time (i.e. the initial extent and intensity of the 2019–20 bushfires), underlying conditions that contributed to the fires (i.e. drought) and enables analysis of the impact that these fires may have upon EPBC listed communities and species.

It is not within the scope nor timeframes to undertake subsequent mapping focused upon the recovery or otherwise of impacted areas. Such information would provide valuable data, which could inform the mobilisation of resources after future fire events.

### Transparency

Great transparency regarding private sector pledges and support is required in order to understand how they have supported the bushfire recovery effort.

This could be aided through early signalling from government departments in relation to priority locations/species. As private contributions (beyond immediate donations to first responder groups i.e. WIREs etc) tend towards restoration activities, as opposed to regeneration, there would be benefit in providing direction for such effort.

## Key outputs

**STAGE 1: The key output was the provision of spatial datasets, that can be combined within ArcGIS.**

**STAGE 2: The compilation is contained in an Excel dataset with a summary of information pertaining to the impact of the 2019–20 bushfires and recovery efforts where data was available.**

Spatial data identified within the Project scope was delivered in consultation with the Project Lead for the report *Everything you wanted to know about access to land for native seed collection*.



# Outcomes

## Stage 1

A series of relational datasets which can be joined in ArcGIS to combine and filter information to prioritise locations and species.

- Fire extent
  - This is an ArcMap-compatible raster layer including an attribute table. Each 10x10km cell has a unique ID that can be used to join related attribute tables (provided separately as CSV files).
- Taxa within fire extent
  - For each 10x10km cell, a list is provided of those taxa known or inferred to occur within that cell. Also provided is a raster of number of fire-affected species in each cell.
- Fire-affected taxa
  - Fire-affected taxa are considered to be those having 80% or more of their estimated range or known sites burnt.
- Fire history
  - Fire history data are available for the period 2003 to 2018 (Australia-wide) and for the period 1969 to 2002 (NSW only). Two stand-alone rasters incorporating the above data were also provided.
- Fire intensity
  - Fire intensity is provided as a stand-alone raster at 1000m resolution. Intensity is rated using values from 2 (low) to 5 (very high) intensity; 1km cells are rated according to the modal (i.e., most frequent) intensity value in that cell.
- Ecological communities
  - Data provided for the 48 Ecological Communities of National Environmental Significance that are found in one or more 10x10km cells within the NIAFED/PAA.
- Drought
  - Drought data was derived as the accumulated severity of drought conditions and based on the Standardised Precipitation Index (SPI) defined as the number of standard deviations that observed cumulative precipitation deviates from the average.
  - Data is available for SPI at 3, 6 and 12-month periods prior to December 2019.
  - Cell attribute data made available for each 10x10km cell, comprising the proportion of the cell that is in severe drought (top quartile) under each of 3/6/12-month scenario.
- Protected areas
  - Protected area data were derived from the Collaborative Australian Protected Area Database (CAPAD) 2018. For each 10x10km cell, the three protected areas nearest to the cell's centroid were determined. Protected area data is provided as a stand-alone raster.



- Cleared vegetation
  - Cleared vegetation data was derived from the National Vegetation Inventory System Major Vegetation Group product. For each 10x10km cell, the proportion of that cell considered to have been cleared, and also the distance to the nearest cleared vegetation were computed.
  - Stand-alone rasters are provided for proportion of cell cleared (Australia-wide), and also distance to nearest cleared vegetation.
- Combined cell attributes
  - Several datasets containing cell attributes are described above. For convenience, these have also been combined into a single dataset.
- Taxon attributes
  - A dataset of taxon attributes is provided, containing data relating to individual taxa.
- Regional boundaries
  - For convenience, relevant regional boundaries were provided in ESRI Shapefile format.

## Stage 2

The impacted areas dataset contains the following information:

- Fire impacts
  - Impacts by broad vegetation type: a summary of impacted Major Vegetation Groups (NVIS 5.1) across impacted bioregions.
  - Species fire traits: Fire trait data for 270 taxa with more than 50% of geocoded location records or predicted ranges occurring within the south-east Australian mainland fires.
  - Impacted species: A list of species with more than 50% of geocoded location records or predicted ranges occurring within the south-east Australian mainland fires, including model, range, life form, trait and habitat data.<sup>1</sup>
- Department of Agriculture, Water and the Environment Priority Areas
  - Summary of the seven Priority Area Workshops and proposed management actions
- Fire history
  - Previous major bushfires
- Spatial
  - Land tenure mapping: Delivered via the report *Everything you wanted to know about access to land for native seed collection*. Refer to the report for full details.
  - Spatial layers are combined into an ArcGIS ‘map package’ for each state and territory. All map layers are in Albers GDA 1994. The Tenure of Australian Forests raster layer has a resolution of 100m x 100m, i.e. each cell represents one hectare.

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<sup>1</sup> Godfree, R.C., Knerr, N., Encinas-Viso, F. et al. *Implications of the 2019–20 megafires for the biogeography and conservation of Australian vegetation*. *Nat Commun* 12, 1023 (2021).



## Findings

### Stage 1

Not applicable. This project is intended to provide a resource for subsequent activities.

### Stage 2

Preliminary analysis/observations only. To fully understand the fire response and the relationship between public and private investment requires a major review.

**There is no clear coordination between public and private commitments to support bushfire recovery. This is not necessarily surprising, as they operate on different time scales and with a different focus.**

- Public — primarily focused upon remnant vegetation. Generally, a focus upon threat abatement and natural regeneration. Timing: Assess impact and response before planning actions.
- Private — primarily focused upon private land, though not exclusively. Funding not directed through government. Often focused upon ‘quick’ actions (i.e., number of trees planted). Timing: rapid response, to maximise visibility of support.
- Public funds generally focus upon immediate response actions, threat abatement and natural regeneration. Active restoration is not/has not been a major focus. This likely reflects the type of land and condition being managed (per above).
- Public funding is often distributed via small grants. While this is useful in supporting community groups, it can minimise potential impact.
- Project funding from the Australian Government has little environmental focus. For example under the Local Economic Recovery program, ~2% had an environmental focus or impact. This is despite studies that show that such programs can have wide-reaching economic and employment benefits.<sup>2</sup>
- The private sector has been the driving force behind large-scale and long-term bushfire recovery and resilience building programs. While these are not fully funded, nor completely mapped out, initiatives such as Regenerate Australia (WWF) and Restore Australia (Ark2030) are potential medium-term drivers of seed demand.
- Private funding often has little transparency. Beyond initial announcements, there is often little subsequent detail or reporting.
- Private pledges are usually from companies with little or no experience in restoration/recovery planning. Where they relate to seed or plant, there is a risk that inappropriate seed will be utilised.






## Evidence

All datasets are open source provided and refined by Macquarie University and are available from Project Phoenix.

<sup>2</sup> *Delivering economic stimulus through the conservation and land management sector Economic impact assessment.* Ernst and Young, 2020.



# RECOMMENDATIONS

	<p><b>Include within the Strategy a provision for updating and expanding upon these datasets</b></p> <ul style="list-style-type: none"> <li>• Mapping in relation to the 2019–20 bushfires provided a snapshot in time focused upon impact (i.e. extent, severity and impacted matters). What was/is currently unknown is the recovery trajectory of these areas.</li> <li>• This data, where available, could enable improved planning for bushfire recovery in response to this event (i.e. areas that require assistance or future events and predicting need based on past events).</li> </ul>
	<p><b>Addition of data on traits of species (e.g. regeneration capacity, growth form, dispersal mechanism) to refine choices of species for regeneration projects</b></p> <ul style="list-style-type: none"> <li>• Note this will be limited by the number of species with data available and permissions for data use for the AusTraits database.</li> </ul>
	<p><b>Analysis of the vulnerability of locations across the PAA, or those prioritised for restoration, to future projected changes in rainfall and temperature</b></p> <ul style="list-style-type: none"> <li>• This analysis would be based on the realised niche limits of the species present, relative to the long-term average climate conditions at the site.</li> </ul>
	<p><b>Government departments provide guidance to private investors in regard to priority landscapes and species</b></p>
	<p><b>Development of an industry-wide Code of Practice accompanied by an accreditation scheme will minimise the risk of inappropriate usage and provide confidence to purchasers</b></p>



## WANT TO KNOW MORE?

These project datasets are available from Project Phoenix.

This project contributes to the evidence base for a ten-year strategy to guide the native seed and landscape sector. The document, which is untitled until endorsement in September 2021, is referred to as the Strategy in all Project Phoenix publications.



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