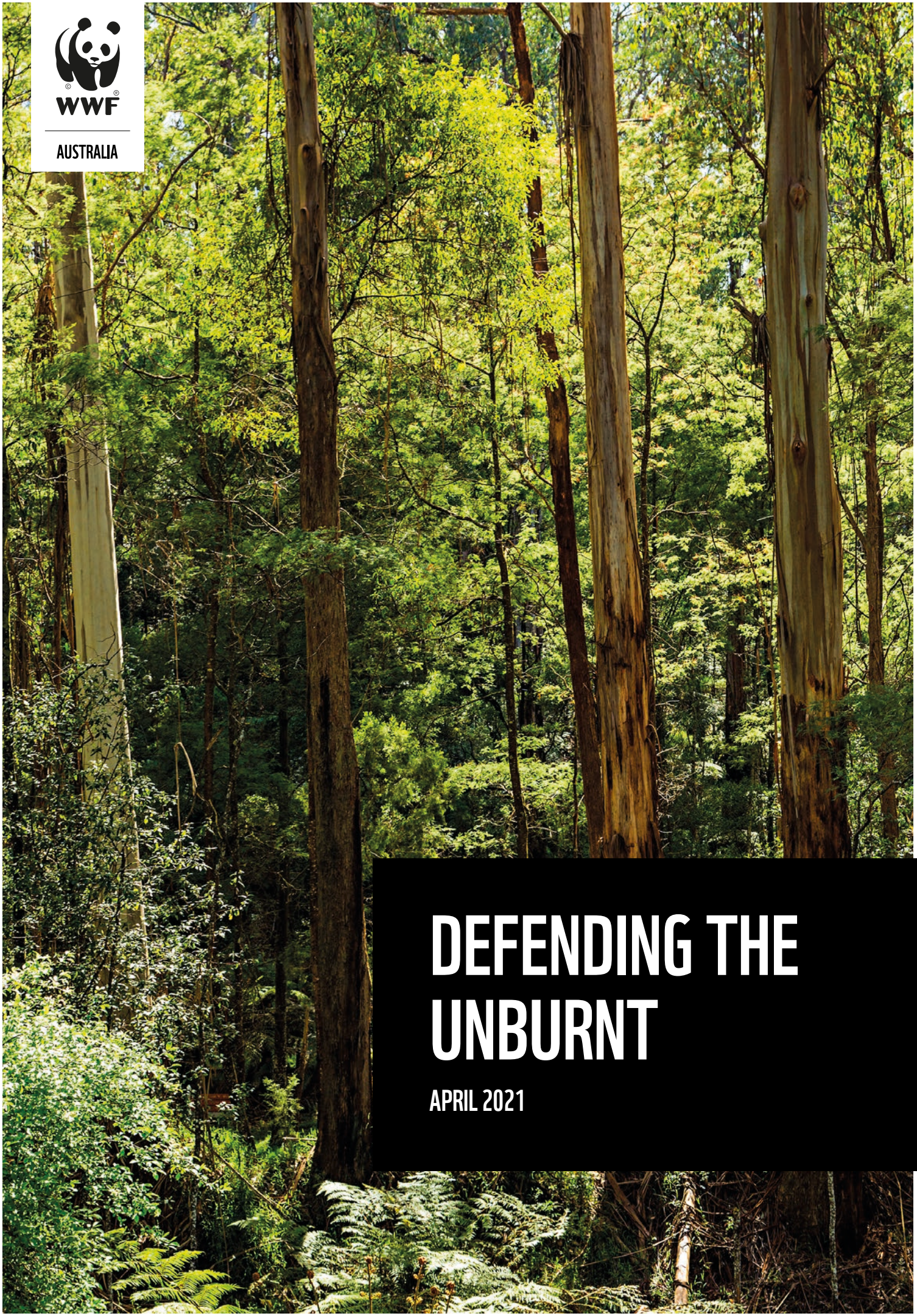

WWF

AUSTRALIA

DEFENDING THE UNBURNT

APRIL 2021

PRIORITIES FOR PROTECTION AND RESTORATION OF HABITATS FOR THREATENED SPECIES AND ECOSYSTEMS AFTER THE 2019/20 BUSHFIRES

In the wake of Australia's 2019-2020 bushfires, the protection of critical unburnt habitat emerges as a priority in WWF-Australia's Bushfire Response Framework, for achieving lasting impact through a combination of both on-ground actions and protection.

WWF-Australia's Senior Scientist, Dr Martin Taylor, has performed a spatial prioritisation that identifies priority areas for protection and restoration of habitats for threatened species and ecosystems in Queensland, New South Wales and Victoria. Our Eminent Science Group, comprising some of Australia's leading and most distinguished scientists, has endorsed the spatial prioritisation work that identifies six priority landscapes, covering nearly 5.8 million hectares, that warrant enhanced legal protection due to these landscapes now holding far greater biodiversity value post-bushfires (Fig. 1).

Achieving lasting impact requires both on-ground actions and government and business commitments to policy and finance that drives major on-ground changes. An overarching objective of this report is to prevent further destruction of high conservation value habitats, and advance their protection and regeneration, in the context of increased habitat disturbance due to bushfire and drought under climate change, and so prevent and reverse threatened species decline, including the listing of species not yet formally listed as threatened.

Acknowledgements

WWF-Australia acknowledges the Traditional Owners of the land on which we work and their continuing connection to their lands, waters and culture. We pay our respects to Elders, past and present, and emerging leaders.
WWF is one of the world's largest and most experienced independent conservation organisations, with over five million supporters and a global network active in more than 100 countries.

WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

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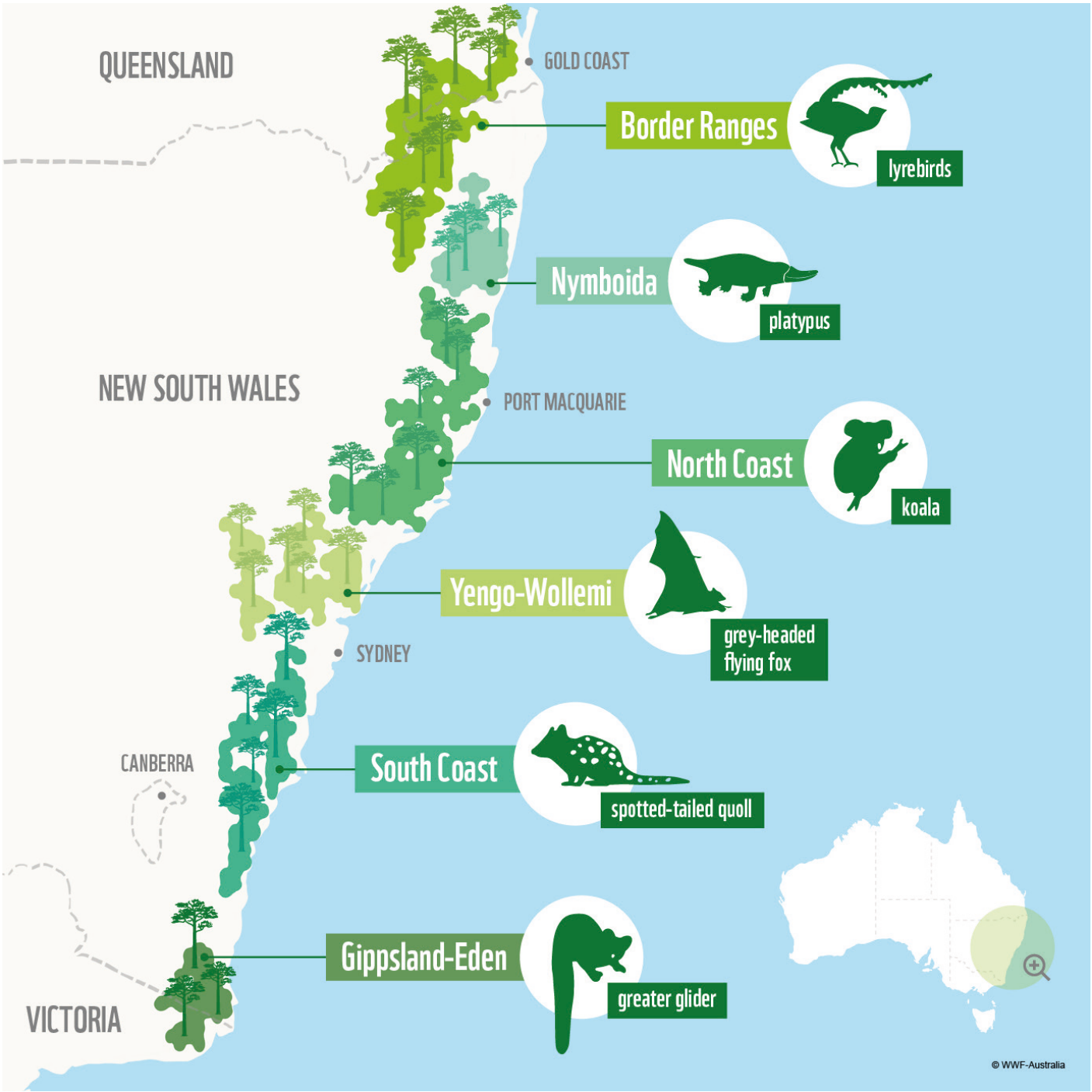


Figure 1. Six priority landscapes as identified by WWF Australia spatial prioritisation.

PRIORITISATION CRITERIA AND APPROACH

Biodiversity Assets: Species Habitats & Threatened Ecological Communities

The starting point already available for habitat prioritisation is the species level prioritisation done by the federal government appointed "Wildlife and threatened species bushfire recovery Expert Panel", ("Expert Panel") for both animals and plants.[1]

Those priority species have been aggregated into a single Excel file, and is available on the supplementary website for download.

This can be turned into spatial layers for prioritisation by extracting the habitats as mapped by government in the *Species of National Environmental Significance* database. This report uses the unredacted 2016 issue.

Only EPBC listed threatened species were included in this prioritisation, not the other unlisted species named by the Expert Panel.

Carbon value

Carbon sequestration targets can be quite difficult to estimate. This is especially speculative when we have to project what might be the outcome of legislative change due to science-based advocacy. NCAS provides a "max potential biomass" layer which we can use to estimate total carbon stocks of vegetation. We did not include carbon value in this prioritisation, largely because all the areas with highest value for species and ecosystems, tend also to have a high carbon value (tall, wet forests).

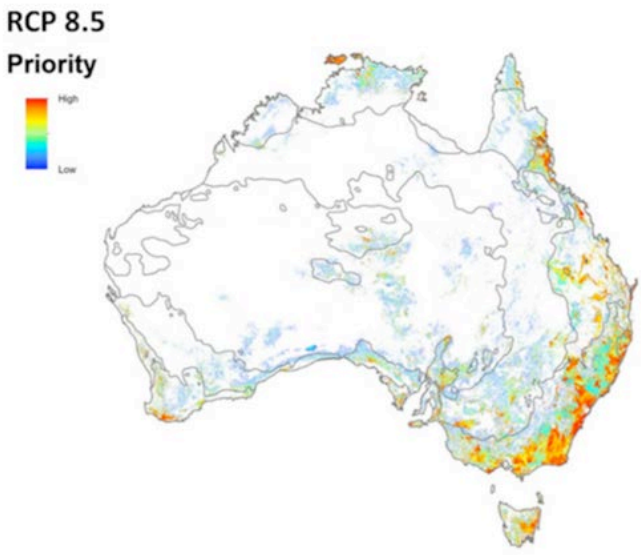
Connectivity

The Australian Government connectivity value layer can be also incorporated into the spatial heatmap of value. In this version 1 it is left out as an asset, noting that the species and ecosystem priorities largely coincide with areas of high connectivity value anyway (much of the Great Eastern Ranges region).

Species climate shifted habitats

Any prioritisation based on current distributions of the Expert Panel priority species or Threatened Ecological Communities as above can only have a limited shelf-life due to changes in suitable habitat.

In 2011-13, we did a prioritisation for threatened species habitat restoration and protection (in protected areas) in the context of shifting ranges due to climate change.[2] We produced a priority areas map (Fig 19 reproduced right) for the top 17% of Australia for protection (mindful of Aichi target 11).



[1] https://www.environment.gov.au/biodiversity/bushfire-recovery/expert-panel

[2] https://www.nccarf.edu.au/sites/default/files/attached_files_publications/Maggini_2013_Protecting_and_restoring_habitat.pdf

The highest priorities are clustered in the south eastern forests which nearly all burned this past summer. Unfortunately, we did not consider bushfire risk in that 2013 analysis as it is unclear how it could have been addressed.

With climate change, even prioritising unburned habitats for protection gives us no comfort that the unburnt areas won't burn next or in subsequent summers unless we find an ecological reason to underpin and validate these areas being genuine fire refugia and therefore less likely to burn.

Future fire risk & fire refugia

Forecasting fire risk under climate change scenarios is important for any prioritisation and there is existing literature (see Clarke et al. 2016 & Meddens et al. 2018) on this subject, however, these findings need to be pulled together and made spatially explicit at a fine enough scale to be useful. This would be a major project with many uncertainties and would take much longer to complete with additional staff or external consultancies needed to accomplish this task. Furthermore, if we are looking at enduring (through protected areas) rather than short term impact we would need to discount for future catastrophic fire risk (as opposed to just regular fire).

METHODS

Study area and planning units

The study area is confined to priority bioregions as identified by the Expert Panel for Queensland, New South Wales, and Victoria only.

Within those priority bioregions we drew a 25km buffer around burned areas 2ha+ in size, using the *National Indicative Aggregated Fire Extent Dataset* v20200428 (Fig. 2).[3]

The study area was then divided into 4218 equal shaped hexagons in geographic coordinates, ranging in projected area from 12,894 to 15,466ha.

For each of these hexagons we developed an index of Asset priority and an index of Action priority and multiplied these to produce a joint priority index.

[3] http://www.environment.gov.au/fed/catalog/search/resource/details.page?uuid=%7B9ACDCB09-0364-4FE8-9459-2A56C792C743%7D

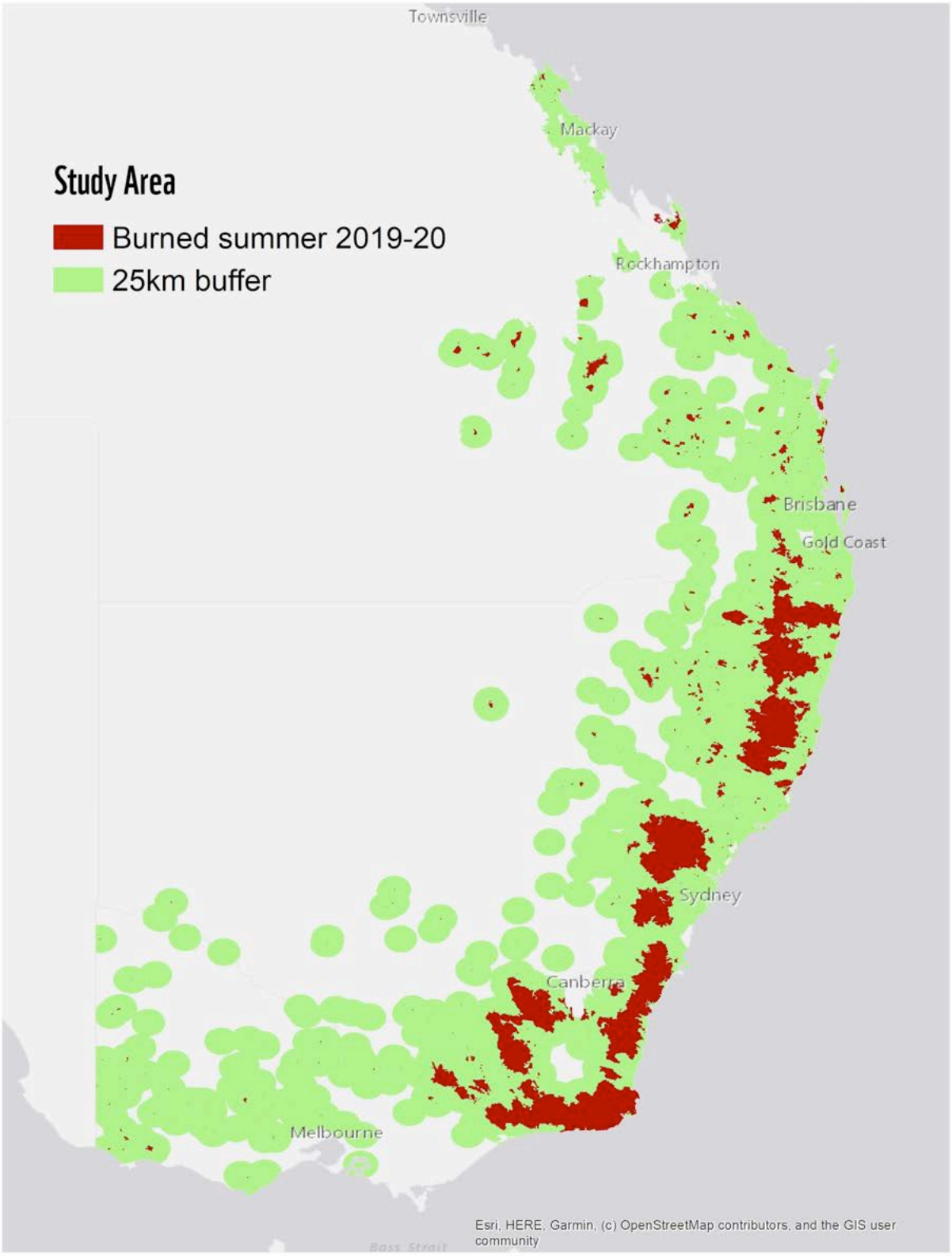


Figure 2. The study area showing areas burned from July 2019 to April 2020, and 25km buffer around burned areas.

Asset priorities

We collated known and likely habitats for EPBC listed threatened species that were determined to be priorities by the Expert Panel,[4] using the 2016 release of the *Species of National Environmental Significance* undenatured (not public) database obtained under licence.[5] We also downloaded the public grids for Threatened Ecological Communities (dated 4/12/18).[6] For each species and communities we excluded "may-occur" polygons as these are too generic. We calculated from intersection with Vegetation condition (see below) how much of the combined "known" or "likely" habitat is in each stage and calculated the percentage of remaining undeveloped habitat that burned over the summer. For Threatened Ecological Communities we simply calculated the proportion of all likely habitat burned.

From percentage of remaining habitat burned (X) we created a priority index for each species and Threatened Ecological Community ("asset") as follows: Int(X*10)+3 for critically endangered, Int(X*10)+2 for endangered and Int(X*10) for vulnerable species and Threatened Ecological Communities. Then we intersected hexagon planning units, with asset distributions and for each hexagon in each asset calculated the proportion of each unit that is habitat for each asset and multiplied this by the asset priority. Then for each unit we summed these proportional priorities across all assets falling in that planning unit to give a final aggregated asset priority for each unit (Fig 3).

[4] https://www.environment.gov.au/biodiversity/bushfire-recovery/expert-panel

[5] http://www.environment.gov.au/fed/catalog/search/resource/details.page?uuid=%7B163F2377-7849-4109-9752-D37DA873CE49%7D

[6] http://www.environment.gov.au/fed/catalog/search/resource/details.page?uuid=%7B184A3793-2526-48F4-A268-5406A2BE85BC%7D

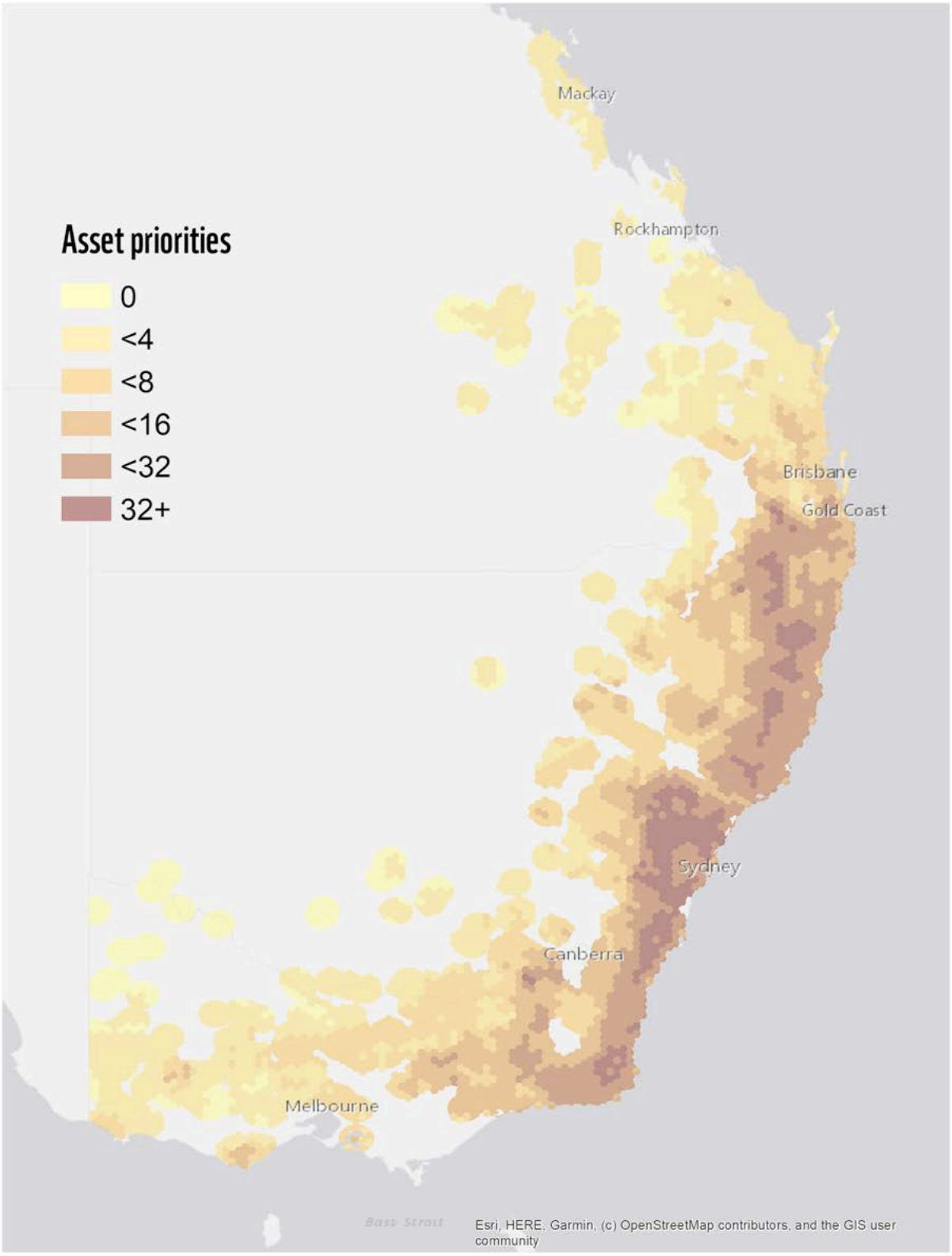


Figure 3. Asset priorities of planning units in the study area.

Action priority mapping

Action priority was based on a combination of vegetation condition and level of vegetation protection.

Vegetation condition

- From the ABARES catchment land use latest release (2018) (50m pixel) we derived an "undeveloped land" filter by excluding any already developed land uses (i.e. crops, plantations, urban, intensive, water) but retaining marshes and swamps and also rural residential which can have significant forest cover.
- We used NVIS 5.1 Major Vegetation Subgroups (Extant) (MVSE) to sort vegetation into previously cleared (0) vs intact (1).
- For previously cleared areas (0), we split off any areas cleared since 2004 (and hence less than 15 years old if regrowing, albeit not knowing if cleared after 2017) using:
    - For NSW using SLATS 2004-17
    - For Qld use SLATS 2004-18
    - For Vic use the derived derived forest loss layer 2004-17 (from Ward et al 2019)

We combined all of these layers to produce a 100m pixel "Vegetation condition" raster with five levels:

0. Mature unburned (according to MVSE v 5.1)
1. Previously cleared (according to MVSE v 5.1) and not cleared since 2004.
2. Previously cleared in 2004-17 (according to SLATS in Qld and NSW and synthetic woody loss from Ward et al 2019, regardless of what MVSE says is extant uncleared)
3. Burned since July 2019 (according to NIAFE 28/4 release, excluding small burns <2ha see Fig. 2)
4. Developed or unreclaimable (per ABARES Catchment scale land use 2018 crops, plantations, water bodies but not swamps, modified pastures, built development but not urban residential).

Level of protection

We use CAPAD2018 to map currently protected areas.

Using regulated vegetation maps for NSW and Qld we extracted all vegetation mapped as exempt.

For Victoria there is no regulated vegetation map but there is a general exemption for regrowth 10 years or younger. Therefore, from the national forest loss map used in Ward et al. 2019, we extracted areas of loss since 2009 as potentially less than 10 years old regrowth and so, exempt.

From these we derive a crude relative protection raster with 1= protected areas 2= regulated and 3= exempt aligned to the Vegetation condition raster above.

Action priority derivation

An index of action priorities was derived from the intersection of Vegetation condition and Level of protection rasters as shown in Table 1. Priorities were then averaged for each hexagon planning unit. The map of average action priorities for planning units is shown in Fig. 4.

Table 1. Translating level of protection and vegetative condition into Action priorities.

Protection	Veg condition	Action Priority
Protected	Remnant	0 Maintain
Protected	Cleared	0 Maintain*
Protected	Cleared 2004+	0 Maintain*
Protected	Burned	1 Aid post burn recovery
Protected	Developed	0 Maintain*
Regulated	Remnant	2 Protect
Regulated	Cleared	4 Protect restore
Regulated	Cleared 2004+	5 Protect urgently & restore
Regulated	Burned	3 Protect, aid post burn recovery
Regulated	Developed	Unrecoverable excluded
Exempt	Remnant	7 Protect urgently**
Exempt	Cleared	8 Protect & restore urgently
Exempt	Cleared 2004+	9 Protect very urgently & restore
Exempt	Burned	6 Protect urgently, aid post burn recovery
Exempt	Developed	Unrecoverable excluded

* may be misassigned as cleared, an edge effect or could be roads and buildings inside protected areas
** may be misassigned as it is unusual for remnant to be exempt, but is not unknown.

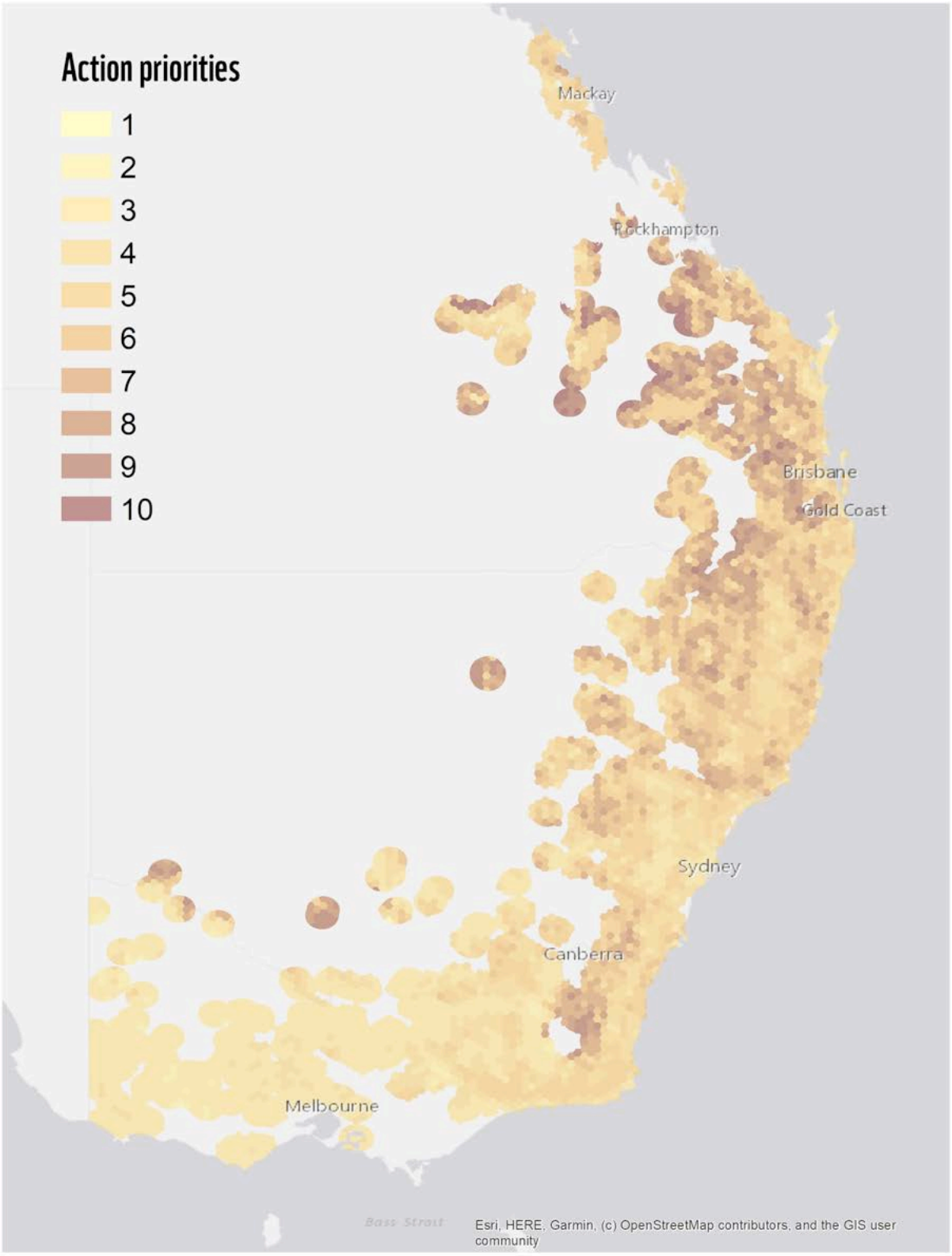


Figure 4. Average action priorities for planning units.

Final joint asset and action priorities

We multiplied asset and action priorities together to provide a final priority map (Fig. 5).

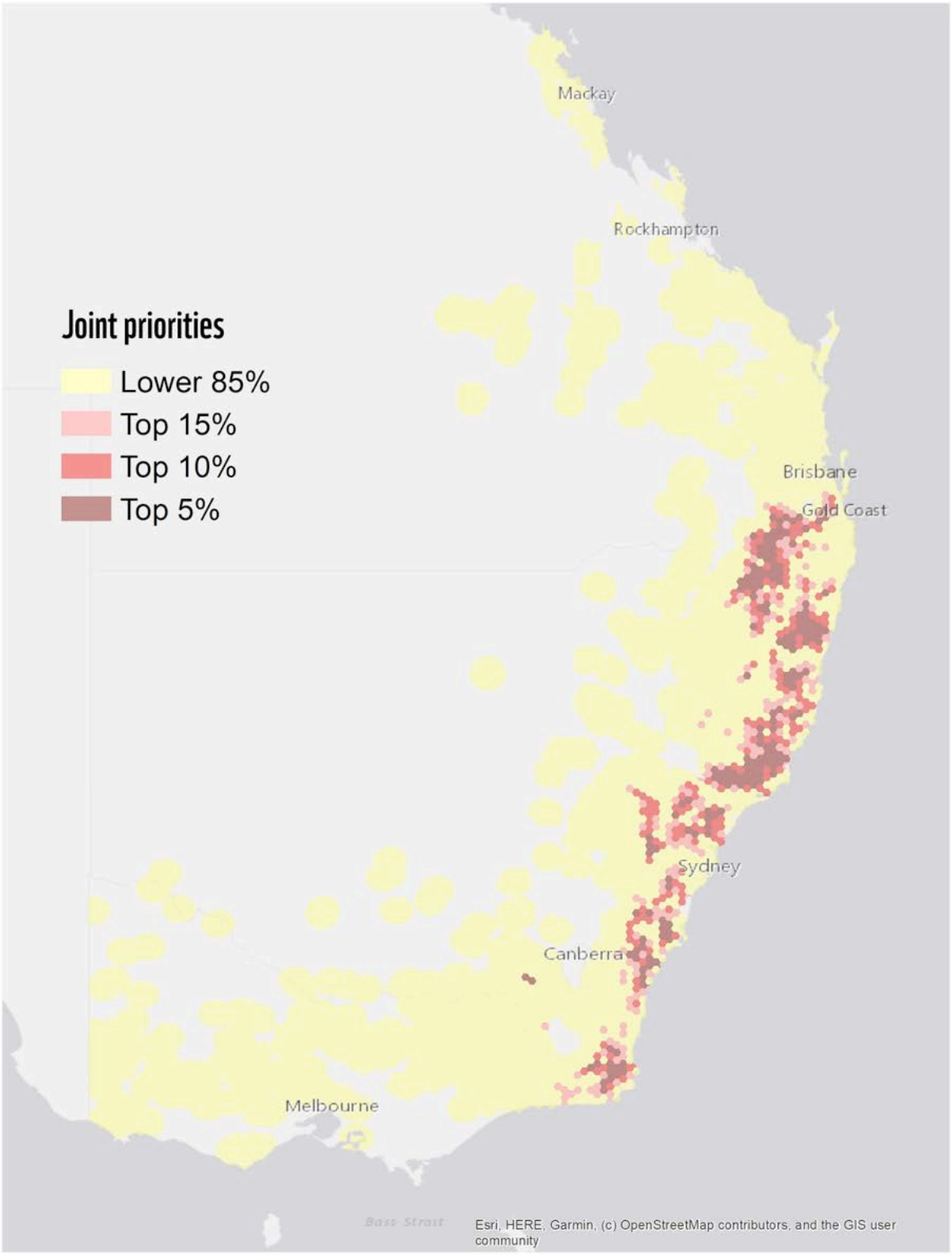


Figure 5. Final post bushfire prioritisation for protecting and restoring nationally threatened species and ecological communities.

Priority landscapes

Zero priority and partial hexagons were initially excluded, to leave a set of 3377 whole hexagons with non-zero joint priorities

We selected the top 10% whole hexagons, ordered by priority and among them identified six large aggregations. We then added back in and absorbed into whole neighbouring hexagons any partial hexagons whose joint priorities also fell about the top 10% threshold determined as above, to ensure the six regions were not missing key elements in partial neighbouring hexagons along the coast.

All of these regions are in NSW but two cross the Queensland and Victorian borders

The areas of threatened assets in each landscape are shown in Supplementary Table 3 and in each action priority category are shown in Supplementary Table 4.

An example of more detailed mapping of actions and asset priorities are shown in Figs 6 and 7 for the Border Ranges region.

Different tools are available to achieve these actions depending on whether the approach will be to advocate for legislative change, or to push for government funding for new protected areas and restorative activities, or to invest directly in these activities.

The precise nature of programs of actions to be taken within each region is beyond the scope of this analysis.

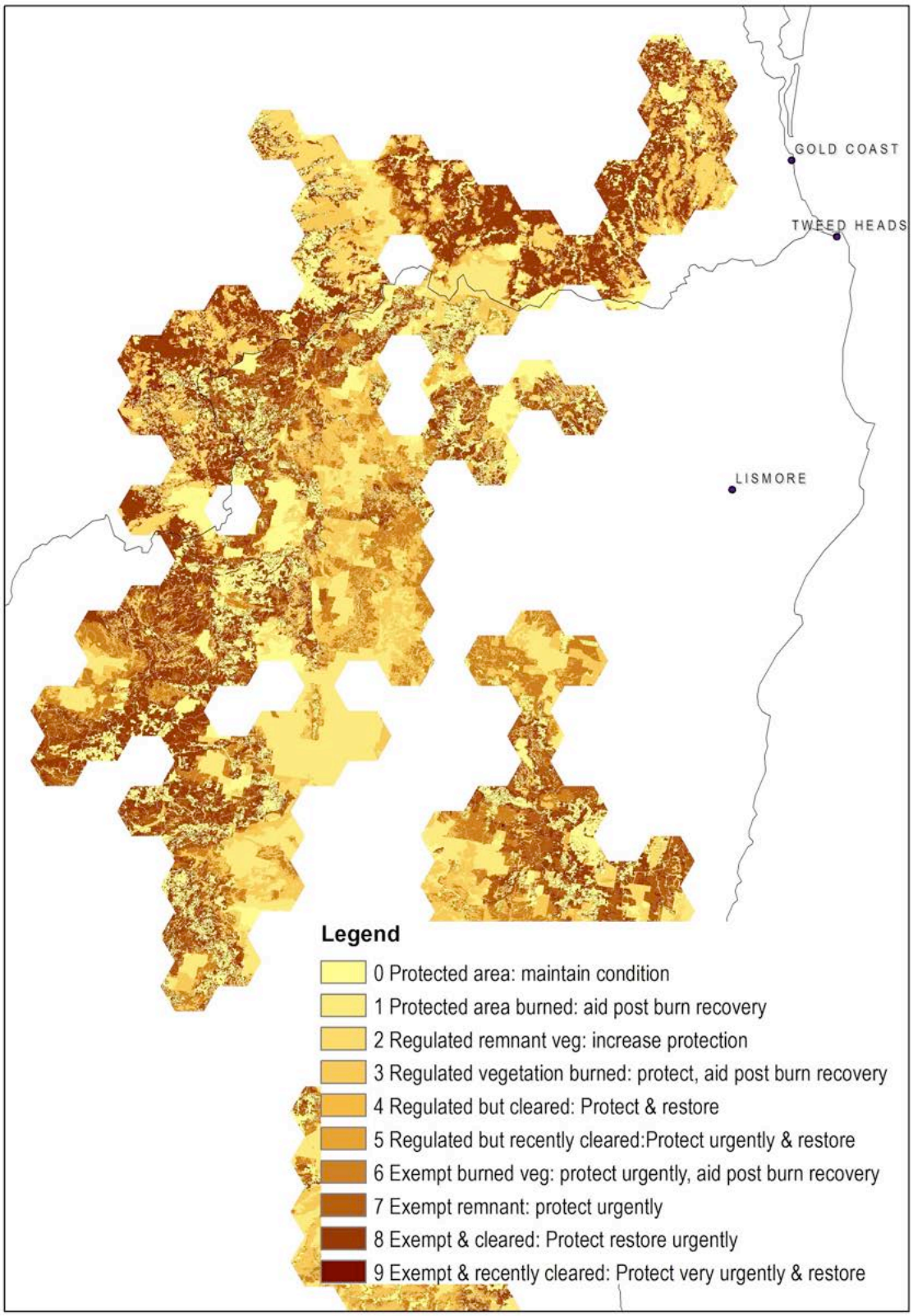


Figure 6. Action priorities border ranges region.

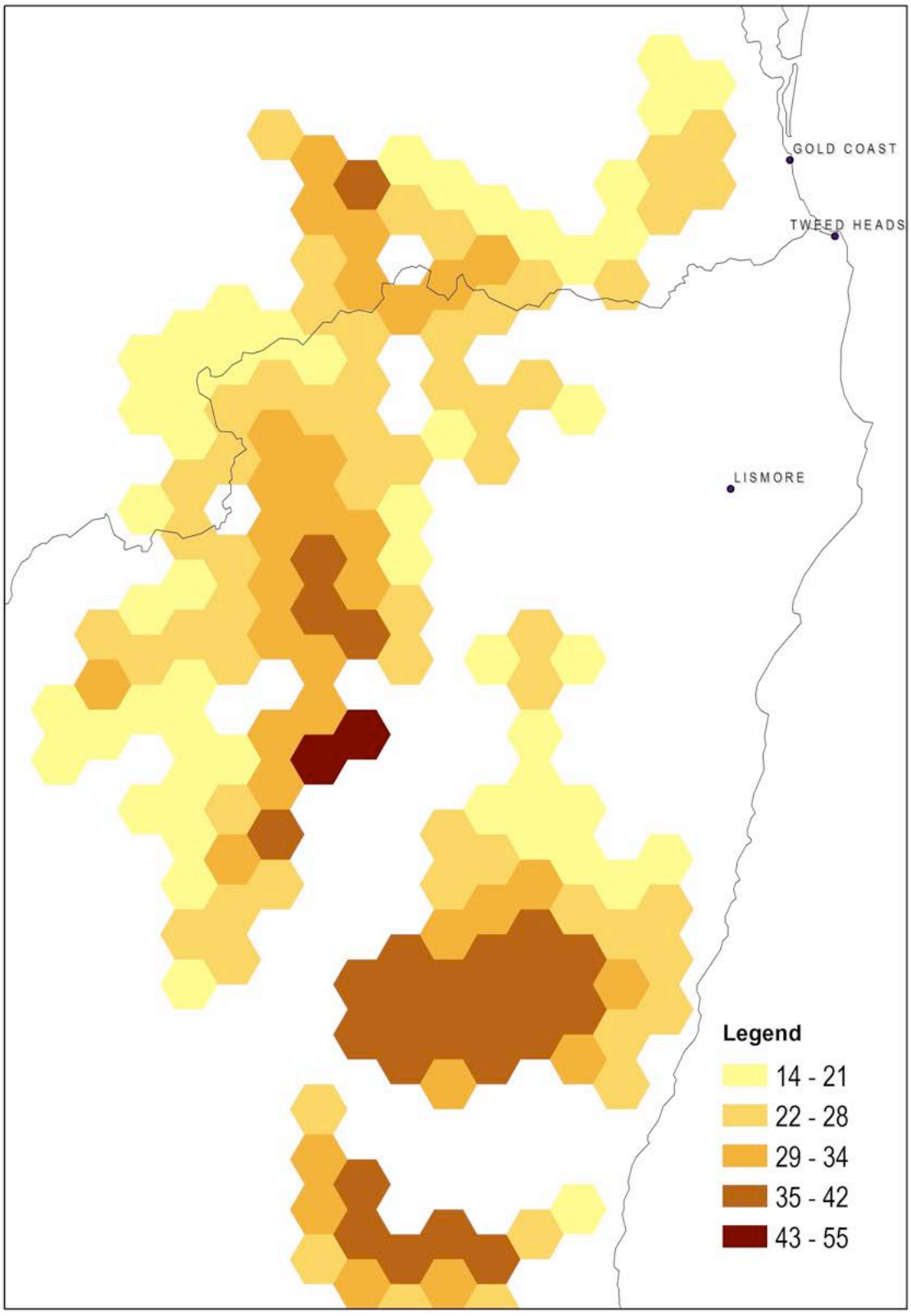


Figure 7. Threatened species and communities' priorities, Border ranges and Nymboida regions.

Caveats

The prioritisation is coarse scaled and further work would be needed at finer scales to identify priority properties for protection and restoration within these large landscapes.

The prioritisation is based on static indicators which have limitations. The most important limitation is that no quantitative desired outcome targets are articulated.

A more sophisticated but more time-intensive approach is to use spatial target-driven tools such as Marxan, which finds optimal solutions to meet desired outcome targets, with the ability to include costs of actions.

An even more sophisticated option is to include the cost of activities and likelihoods of success in a Marxan or Zonation procedure to identify best value for money areas as was done in Maggini et al. 2013, for climate refugia as cited above.

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