ACT Government

ORRORAL VALLEY FIRE RAPID RISK ASSESSMENT NAMADGI NATIONAL PARK

RAPID RISK ASSESSMENT TEAM

Environment, Planning and
Sustainable Development Directorate

March 2020

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ACKNOWLEDGEMENT

We acknowledge the Traditional Custodians of the Canberra region, the Ngunnawal people, and pay our respects to their Elders, past and present.

We acknowledge and respect their continuing culture and the contribution they make to the life of this city and this region.

We acknowledge the deep connections Traditional Custodians have with the lands and waters now known as Namadgi National Park, and their ancestral and ongoing legacy to 'Care for Country'.

We acknowledge that Namadgi National Park contains a rich cultural landscape, with the Aboriginal history of the region dating back over 25,000 years. The cultural values of the area are maintained through oral tradition, dance, memory, ceremony, art and stories; and are also found in tangible heritage sites such as ceremonial sites, rock art sites, cultural trees and artefact scatters.

We acknowledge that, as caretakers of the region, the Ngunnawal people hosted large ceremonies for neighbouring nations, for ceremony, Lore, marriage, trade and the sharing of cultural knowledge. These nations included the Wiradjuri (to the west), Wolgalu (to the south), Yuin (to the east), Ngarigo (to the southeast) and Gundungurra (to the north); and we recognise these connections.

DISCLAIMER

This report documents the process and outcomes from a rapid post-fire risk assessment and is not intended to be a comprehensive report. It has been prepared for Commissioner Georgina Whelan and the Orroral Valley fire Incident Management Team, the ACT Conservator of Flora and Fauna, the Environment, Planning and Sustainable Development Directorate and ACT Parks and Conservation Service for the purposes of rapid risk assessment following a fire event. A representative sample of assets at risk has been surveyed based on fire severity mapping, recommendations are based on best available knowledge from Agency representatives.

The report is provided to other Agencies for the purposes of information only (it is not intended as being fully comprehensive or final and follow-up assessment will be required). Agencies other than the ACT Parks and Conservation Service rely on this report at their own risk and should obtain their own advice.

Risk assessment is inherently a dynamic process of risk identification, risk analysis and risk evaluation. The risk assessment in this report is based on the best information available throughout the term of the deployment.

This report is prepared as part of the 12 to 17 February 2020 deployment of the Rapid Risk Assessment Team to the Orroral Valley fire.

Front cover: Upper Cotter Catchment, Feb 2020, Nathan Kay.

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PURPOSE OF THE REPORT

This Rapid Risk Assessment Team report documents the rapid risk assessment completed in 5 days on the Orroral Valley fire within Namadgi National Park. The report was undertaken as soon as possible after the fire event to support land managers to mitigate immediate risks.

The report scopes the scale and nature of emergency stabilisation, rehabilitation and recovery works emphasising impacts on built, cultural and environmental assets. It identifies and assesses potential risks to life and property, infrastructure and the environment and provides initial recommendations for initial risk mitigation.

This report will inform and contribute to the development of rehabilitation and recovery plans.

THE RAPID RISK ASSESSMENT TEAM

TABLE 1. ACT/NSW RAPID RISK ASSESSMENT TEAM

Discipline	Name	Agency
Team Leader	Margaret Kitchin	Strategic Coordination and Planning Transport Canberra and City Services
Deputy Team Leader	Kristy Gould	ACT Parks and Conservation
NSW Deputy Team Leader	Andrew Boleyn	NSW National Parks and Wildlife
Biodiversity	Wade Young	ACT Parks and Conservation
Biodiversity – Flora	Nathan Kay	ACT Parks and Conservation
Biodiversity – Fauna Terrestrial and Aquatic	Renee Brawata	Conservation Research
GIS Specialist	Jen Smits	Conservation Research
Assets	Allan Bendall	Asset Data Integration Transport Canberra and City Services
Flooding and Erosion	Tom McElroy	ACT Parks and Conservation
Heritage Aboriginal and Historic	Meaghan Russell	ACT Heritage
Logistics and Report Coordination	Luke Bulkeley	ACT Natural Resource Management
Fire Rehabilitation	Scott Seymour	ACT Emergency Services Agency
Fire Recovery	Julian Seddon	Conservation Research

ACKNOWLEDGMENTS

The Rapid Risk Assessment methodology and assessment techniques are based on those developed by the Victorian Department of Environment, Land, Water and Planning Bushfire Rapid Risk Assessment Team (Bushfire RRATs) and their prior work is fully acknowledged.

The following people and organisations assisted in the development of this Orroral Valley Fire Rapid Risk Assessment:

Greg Baines, Matt Beitzel, Neil Cooper, Peter Cotsell, Mark Elford, Lisa Evans, Scott Farquhar, Chris Glennon, Justin Foley, Brian Hawkins, Adam Henderson, Amanda Johnson, Leanne Kaleb-Dumic, Adam Leavesley, Brian Levine, Brett McNamara, Michael Mulvaney, Oliver Orgill, Stephanie Pulsford, Laura Rayner, Louisa Roberts, Melissa Snape, Steve Taylor, Deklyn Townsend, Ian Walker, Claire Wimpenny – **Environmental Planning & Sustainable Development Directorate ACT**

Steve Forbes, Rebecca Hughes, Rick McRae, Erik Sandin, Ludzia Szychowska, Richard Verkuylen, Kate Waghorn, Georgina Whelan – **ACT Emergency Services Agency**

Gabrielle Caddy, Fiona Moore – **ACT Heritage**

Daniel Goodwin, Anthony Haraldson, Sue Marriage – **Transport Canberra & City Services**

Tim Chaseling – **ICON Water**

Simon Hemer, Carl Hollis – **NSW National Parks & Wildlife Service**

Wally Bell – **Buru Ngunawal Aboriginal Corporation**

Adrian Brown – **King Brown Tribal Group**

Bruce Ford – **Significance International**

Graeme Hirth

Reiks Crayfish, Mark Jekabsons

EXECUTIVE SUMMARY

The Orroral Valley fire burnt 87,923 ha in the ACT with extensive areas in Namadgi National Park (NNP) comprising the southern region of the Cotter Catchment. The area overlapped with large areas burnt in 2003. Over the burn area, 22% was estimated to be burned at a high to very high fire severity resulting in impacts due to fire, smoke and earthworks, plus post-fire impacts including debris flows and soil erosion.

The EPSDD has been involved in past ACT/NSW Burned Risk Assessment Team (BAAT) deployments and decided to deploy an ACT-lead team, now called the Rapid Risk Assessment Team (RRAT). These team undertake a very rapid risk assessment of the burned area utilising staff in the Agency and taking a 'learning by doing' approach. The team was led by ACT and NSW staff who had deployed with the BAAT previously.

A team of 13 people were combined over five main disciplines of cultural heritage, flora, fauna, flooding and erosion and assets. A specialist in fire rehabilitation also worked with the team. The team began a five-day deployment on 12 February 2020, completing the deployment with a presentation to the Emergency Services Agency (ESA) and the Land Management Agency (EPSDD) on Tuesday 18 February 2020.

The RRAT team identified 27 key risks across the burn area. This included 9 extreme, 14 high and 4 medium risks. Broadly the key risks centred around:

> Extreme (9) being:
  - Direct impacts on cultural heritage (rock art, sites, huts)
  - Risks to public safety (roads and walking tracks, visitor nodes from trees)
  - Impacts on biodiversity (Alpine bogs)
  - Threats to biodiversity (predation, feral herbivores, invasive spp.)

> High (14) being:
  - Risks to biodiversity (fish – water quality, Large gliders, threatened flora and fauna, fire-sensitive communities, hollow-bearing trees, aquatic and riparian habitat)
  - Risks to cultural heritage (timber sites, stone arrangements, archaeological sites)
  - Water quality – water catchments (sediment)
  - Hillslope erosion
  - Assets – fencing and visitor infrastructure (needing repair)

Mitigation treatments were considered, and initial recommendations compiled. These are indicative only, based on the information available at the time of the deployment. Many of the mitigation treatments are for the initial assessment of the work so that a full recovery plan can be scoped and programmed. Monitoring of the work undertaken and its effectiveness in treating the risks should be part of all implementation.

NNP is a place of exceptional cultural heritage and biodiversity significance. Much of the Orroral Valley fire area has now burnt twice in 20 years – its recovery is in all our hands.

SUMMARY OF THE FIRE

The Orroral Valley fire started at 1:49pm in grassland on Monday 27 January 2020 in Namadgi National Park(NNP). The fire spread approxmately 2,581 ha in the first 24 hours driven predominantly by topography and exceptionally dry forest fuel loads. Over the next 3 days the fire size grew approximatley 4,500 – 8,000 ha per day extending to remote and inaccessible wilderness within NNP.

On Saturday 1st February under extreme fire danger the fire grew by approximately 26,000 ha, spreading predominatly southeast. This included exiting the southeastern border of the ACT at Clear Range.

Approximately 78% of NNP was burnt during the fire, totalling over 82,700 ha. This included impacts across the Cotter River

Catchment, ACT's primary water supply. The fire also spread into Tidbinbilla Nature Reserve (TNR) with 1,444 ha burnt, 22% of the reserve.

Fire intensity varied including significant areas of very high severity with consumption of all ground fuels and tree crowns. At the time of the RRAT deployment significant areas of High Country Bogs and Associated Fens threatened ecological community have been impacted by the fire.

Suppression operations and rain across the fireground (~158 mm between 10 and 14 February) led to containment at approximately 88,000 ha.

CONSIDERATION OF CLIMATE CHANGE

In evaluating risks and potential recovery actions, the RRAT were aware of the need to consider long-term viability of environmental, cultural and built assets in the context of a changing climate. Climate change projections for the fire affected area of NNP and TNR are for an increase in mean temperatures and changes in the seasonality, intensity and total amount of rainfall. Climate change is expected to increase the average Fire Danger Index (FDI) and the number of severe fire danger days in the future. These changes will influence both the post-fire recovery of biodiversity values and long-term viability of some species.

As the RRAT process is rapid in nature and focuses on initial recommendations and immediate actions, future climate change trajectories for the assets impacted were not considered in the assessment. The RRAT recommends that detailed recovery planning and programming of works by the land managers further consider climate change projections to ensure recovery efforts are effective and likely to be viable in the long term. The Agency could consider a conceptual framework on climate change risks to environmental assets and values, to produce a consistent and transparent approach to the future management of these under changing climate scenarios.

2003 CANBERRA BUSHFIRES

This Orroral Valley fire 2020, occurred 17 years after a large wildfire which burnt 90% of NNP in 2003. The 2003 fire occurred in January and February and covered 164,914 ha approximately 70% of the ACT including TNR, the Lower Cotter Catchment and impacting the urban fringe of the city (Cary et al., 2003). The geographic extent and severity of the 2003 fire was unprecedented. Differentiating the 2020 Orroral Valley fire is that it did not make a major progression into the Bendora catchment (the middle catchment of the Cotter River Catchment).

Some of the actions discussed in this RRAT report consider the interval between the 2003 and the 2020 fires. For example, Alpine Ash is recorded to require at least 20 years between fires to enable maturation of trees to produce seed set. Similarly, areas of the Sphagnum bogs and fens have been burnt twice in 17 years. Consideration of recovery and actions will need to take this recent fire history into account.

LANDSCAPE SCALE OPPORTUNITIES POST FIRE

Any fire provides the opportunity for further learning and understanding. Fire has long been part of the Australian landscape and post-fire research, surveys and monitoring provide further information about how our plants, animals and communities respond to fire, as well as being an opportunity to access areas or see locations that are otherwise covered by vegetation or inaccessible.

For example, during the Orroral Valley fire, fire suppressant gel was utilised in the Gibraltar Rocks and Mount Clear areas. It is not clear how the unique environments of the ACT will respond to this; further monitoring and assessment could be considered.

Following the 2003 fires a large amount of new information was generated. The Australian Alps National Parks co-operative management program undertook and have published on-line several post-fire reports, similarly the State and Territory Agencies as well as the Universities. The Orroral Valley fire presents the opportunity to undertaken further research and monitoring on key questions and management challenges, including landscape response to successive fires.

COMMUNITY ENGAGEMENT

Canberra's community, interest and user groups including industry are key stakeholders with a strong affinity to NNP. Collectively they have formed a critical partnership with the Environment Division supporting park operations and research. Engaging the community through the recovery process and reconnecting people with Namadgi will greatly assist recovery actions.

To assist with recovery, a volunteer Fire Assist Program will be established. The Program will be focused on recovery assistance objectives and operate within the existing volunteer assist hub. An EPSDD communications campaign will allow for effective and informative community messaging about progress and Park access as areas become safe to use. As recovery volunteer opportunities are identified the community will be invited to use the volunteer assist hub to be directly involved. For example, the Canberra Bushwalkers Group will be an important resource to assist with trail audits and basic trail rehabilitation.

To facilitate reopening of both Namadgi and Tidbinbilla, a comprehensive audit will be undertaken to ensure visitor nodes and infrastructure is safe. A risk assessment of tracks, trails, toilets, picnic areas, BBQs, campgrounds, drinking water, gates and fencing will be prioritised with a view to open areas as soon as possible. Pending outcomes, some areas may remain closed temporarily. Clear signage, barriers and succinct communication with the community will ensure users are well informed of areas open to access.

TNR sustained relatively minimal damage to the high use areas. An immediate priority will be to ensure toilets, BBQs and shelters are safe for use. Priority will also be given to returning wildlife and the reopening of the Sanctuary, Mt Gibraltar, Cascades and Lyre Bird trails. For the Namadgi area, priorities will be to reopen the visitor centre and walks immediately adjacent to the centre. Progressively walks and campgrounds throughout the Park will be assessed, restored and reopened.

RAPID AREA ASSESSMENT TEAM

RRAT OBJECTIVES

Recovery is an integral component of fire management. Fires cause both immediate impact and potential post fire future risksand impacts. The immediate impacts, driven by fire severity, location and topography can generate many future risks such as erosion, landslips or soil movement. All of these future risks can be exacerbated by storms and flooding. While built infrastrucutre, like roads and builidings are often affected by these secondary impacts, endangered species, sensitive ecological communities and habitats can be impacted too.

The rapid assessment of these risks and identification of mitigation actions after high intensity fires can significantly reduce risks to public safety, infrastructure and the environment.

The ACT/NSW interagency RRAT (previously BAAT) is a 6-12 person multi-disciplinary team who undertake rapid risk assessment of impacted areas. The team works largely on public land to assess risks to life, property, infrastructure and the environment, develop mitigation options, and prepare a report for land managers to consider and action. The team does not assess property loss and destruction.

RRAT METHODOLOGY

The Team consists of a Leader and Deputy, plus specialists in flooding and erosion, asset management, cultural heritage, flora, fauna and GIS spatial analysis. The primary data sources for the team are satellite remotely sensed imagery before and after the fire that provide fire severity, modelled erosion risk potential and local databases and data sets that provide asset information (e.g. Threatened species and communities, Integrated Asset Management System (IAMS), vegetation communities etc).

After an initial briefing from the Incident Controller about the fire, the team collated information on the assets, how they may have been impacted by the fire, identified what threats remained and what were the potential triggers for these threats. Examples of these are rainfall, visitation and invasive species. Using the asset, threat and trigger information,

a risk assessment based on consequence and likelihood was derived and the priority risks identified. The ACTIA risk assessment tables were used for the assessment of risk ratings.

An automated risk assessment tool was used to enter possible mitigation options and how these could reduce the residual risk. Risks across all RRAT disciplines were amalgamated where appropriate in a risk moderation process (e.g. flooding & erosion risks to infrastructure). Mitigation treatments for risks identified as extreme and high were then more fully detailed. Information was compiled into a report and a presentation made at the end of the deployment.

FIRE SEVERITY METHODOLOGY

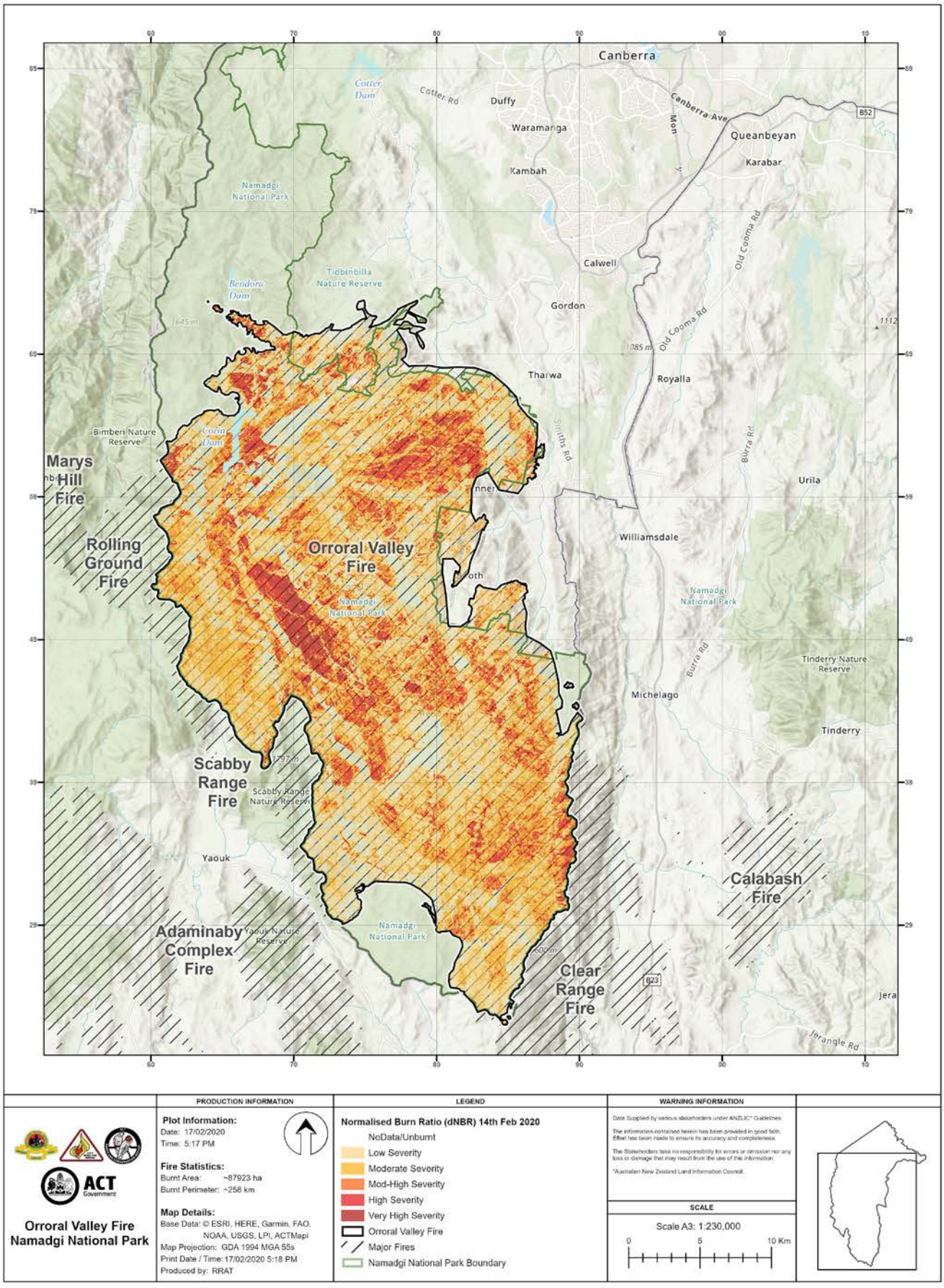
The fire severity map was generated by comparing pre and post-fire satellite imagery using the normalised difference burn ratio index (nBDR) **(Map 1: Orroral Valley fire)**. The reflectance values of selected electromagnetic wavelengths are used to determine the change in greenness of vegetation before and after the fire and the level of change corresponds to fire severity which is mapped as six distinct classes. Capture dates were: Pre fire - 16/12/2019; Post-fire – 4/2/2020 and 15/2/2020. The satellite imagery was captured via Sentinel, at a 20 meter pixel size.

Validation of the severity mapping was carried out by assessing severity classes from helicopter flown on 11/2/2020 via the sampling of approximately 100 points across the burn area. Given the need to undertake a rapid assessment of the fireground, the imagery used occurred when the fire was still burning so some areas have a slight smoke impact and did not cover the full fireground. Utilising this imagery was the only option for producing a fire severity product at the time of the RRAT deployment. The fire severity package will be updated when a clear, cloud free image is available and can be used to inform future works.

TABLE 2. FIRE SEVERITY CLASSES

Severity Classes	Criteria
Very High	Consumption of all or majority of the leaves, exposed soil
High	Complete scorch of leaves
Moderate-High	Mixed loss of canopy, scorched leaves, burnt understorey
Moderate	Mixed scorched leaves
Low	Majority unburnt or green canopy
No class	Unburnt, smoke affected or unmapped

MAP 1: ORRORAL VALLEY FIRE NAMADGI NATIONAL PARK



PRODUCTION INFORMATION

Plot Information:
Date: 17/02/2020
Time: 5:17 PM

Fire Statistics:
Burnt Area: ~87923 ha
Burnt Perimeter: ~258 km

Map Details:
Base Data: © ESRI, HERE, Garmin, FAO, NOAA, USGS, LPI, ACTMapi
Map Projection: GDA 1994 MGA 55s
Print Date / Time: 17/02/2020 5:18 PM
Produced by: RRAT

ACT Government

Orroral Valley Fire
Namadgi National Park

LEGEND

Normalised Burn Ratio (dNBR) 14th Feb 2020
- NoData/Unburnt
- Low Severity
- Moderate Severity
- Mod-High Severity
- High Severity
- Very High Severity
- Orroral Valley Fire
- Major Fires
- Namadgi National Park Boundary

WARNING INFORMATION

Data Supplied by various stakeholders under ANZLIC* Guidelines.

The information contained herein has been provided in good faith. Effort has been made to ensure its accuracy and completeness.

The Stakeholders take no responsibility for errors or omission nor any loss or damage that may result from the use of this information.

*Australian New Zealand Land Information Council.

SCALE

Scale A3: 1:230,000

0 5 10 Km

TABLE 3. ORRORAL VALLEY FIRE RISK TABLE

Theme	Value or Asset at Risk	Threat	Trigger	Result of threat	Risk	Proposed Risk Treatment	Treated Likelihood	Treated Consequence	Residual risk
Fauna	Threatened Fauna populations - predation	Post fire predation from introduced predators	Fire impact	Loss of threatened species populations, reduced ability to recolonise burnt areas	Extreme	Address targeted pest control in prioritiy areas for threatened fauna populations that are highly vulnerable to increased risk of predation post fire (i.e. Broad-toothed Rat and Reik's Crayfish).	Possible	Moderate	Medium
Fauna	Threatened Fish - water quality	Reduced water quality from debris, erosion and sedimentation	Fire impact, high intensity rainfall post fire, reduced water quality	Loss of key threatened fish populations	High	Prioritise sedimentation control and riparian restoration around key populations. Consider translocations if emergency response is required.	Possible	Moderate	Medium
Fauna	Fauna - Large gliders	Direct fire impacts and starvation following fire	Moderate to High fire severity in known population areas	Loss of populations	High	Assess known populations in high fire severity areas, survey target areas and plan priority conservation actions as required.	Likely	Minor	Medium
Fauna	Threatened Birds, Reptiles and Small Mammals	Loss of habitat and fragmentation of populations	Loss of habitat, particularly hollow bearing trees	"Reduced faunal diversity and potential loss of populations"	High	Conduct assessment of connectivity within midstory and understory of burnt patches. Explore possible supplementary habitat provision or other actions to assist persistance of vulnerable fauna populations. Involve community volunteers and citizen science.	Likely	Minor	Medium
Fauna	Theatened Fish - habitat fragmentation	Formation of new instream barriers resulting in fragmentation of populations	High intensity rainfall and movement of debris	"Reduced fish passage and loss of populations"	Medium	Conduct prioritised field assessment to identify high risk areas and any barriers to fish passage. Remove barriers as required.	Rare	Insignificant	Low
Cultural Heritage	Aboriginal heritage - rock art sites	Direct fire - heat and smoke impacts; indirect impacts from physical and chemical changes, increased erosion	Fire impact and subsequent rainfall and erosion	Loss of and damage to Aboriginal rock art	Extreme	Condition assessments by rock art specialist, materials conservator and Representative Aboriginal Organisations to identify additional management actions. Undertake any immediate stabilisation works. High priority - undertake as soon as possible.	Possible	Major	High
Cultural Heritage	Aboriginal and historic heritage - archaeological sites	Damage to heritage values due to construction and rehabilitation of earthworks	Earthworks at known and potential heritage sites	Damage to heritage features and deposits	Extreme	Inspection of affected areas by an archaeologist and RAOs, salvage of displaced artefacts for recording and analysis under approved Statement of Heritage Effect. High priority - undertake as soon as possible.	Almost Certain	Moderate	High
Cultural Heritage	Historic heritage - high country huts	Damage to historic huts from fire. Damage to historic fabric.	Fire impact	Loss of heritage values	Extreme	Condition assessment of Demandering Hut and Max and Bert Oldfield's Hut by heritage specialist to identify any additional management actions needed. Install temporary fencing prior to park reopening. Medium priority - undertake within 3 months.	Likely	Major	High
Cultural Heritage	Aboriginal and historic heritage - timber heritage sites	Loss of heritage trees (standing/fallen) due to fire impacts. Health impacts that shorten tree life.	Moderate to very high fire severity areas	Loss of cultural heritage	High	Includes scarred trees, survey marker trees, and brumby yards. Condition assessements by archaeologist, including arborist and RAOs for Aboriginal cultural tree inspections. Identify any additional management actions. Medium priority - undertake within 3 months.	Possible	Moderate	Medium
Cultural Heritage	Aboriginal heritage - stone arrangements	Exfoliation and spalling of stone from fire. Indirect impacts from increased erosion	Fire impact and potential post-fire erosion	Damage to and displacement of heritage fabric	High	Condition assessments by archaeologist and RAOs. Identify any additional management actions needed. High priority - undertake as soon as possible.	Possible	Moderate	Medium
Cultural Heritage	Aboriginal heritage - archaeological sites	Damage to heritage values due to erosion and soil movement	Fire impact and potential post-fire erosion	Damage to heritage places, loss of archaeological context and information	High	Condition assessements of known sites by archaeologists and RAOs. Identify any additional management actions needed. Medium priority - undertake within 3 months.	Possible	Minor	Medium
Cultural Heritage	Historic heritage - built heritage	Damage to historic huts, homesteads and structures. Damage to historic fabric	Fire impact	Loss of heritage values	Medium	Condition assessments for select built heritage sites where condition is unknown. Identify any additional management actions.	Possible	Moderate	Medium
Flora	Alpine Bogs and associated fens	Loss of vegetation community and associated habitat and function	Fire impact	Loss or degradation of sphagnum and associated community, erosive incising impacting water retention and filtering	Extreme	Commence assessment of sphagnum bogs immediately with focus on loss of habitat for threatened fauna species particularly the Broad-toothed Rat and Northern Corroboree Frog. Undertake rehabilitation and recpvery program as a priority. Funding reflects initial 3 years of the program.	Possible	Moderate	Medium
Flora	Native plants and ecological communities - invasive plant impacts	Invasive plant introduction (new species) and encroachment (existing species)	Fire severity and extent, fire suppression activities	Invasive plants outcompeting native species, modification of native ecological communities	Extreme	Monitor invasive plant encroachment prioritising control lines, retardant lines, key access nodes and disturbed soils. Timely implementation of control programs as required. Response consistent with EPSDD biosecurity strategies. High-risk species include African Lovegrass, Nodding Thistle, Hawkweeds, Coolatai Grass, Broom, and Ox-eye Daisy. Funding reflects initial 3 years of the program.	Likely	Minor	Medium

Theme	Value or Asset at Risk	Threat	Trigger	Result of threat	Risk	Proposed Risk Treatment	Treated Likelihood	Treated Consequence	Residual risk
Flora	Threatened species and ecological communities – feral herbivores	Vertebrate pests	Increased access following fire (particualry horses and deer), green pick from regenerating plants	Direct impacts include digging, trampling, wallowing, browsing and track formation. Indirect impacts on water quality through damage to riparian ecosystems.	Extreme	Feral herbivores represent a significant threat to flora and fauna populations post fire, particularly to threatened species, ecosystems and vegetation communities of high sensitivity. Address vertebrate pest encroachment prioritising species and habitat with species for control (i.e. horses, deer, pigs, rabbits). Funding reflects initial 3 years of the program.	Likely	Minor	Medium
Flora	Threatened and significant plant species - sites	Loss of threatened plants and communities	Fire severity, extent, and interval. Changing climate	Localised extinction, increased pressure from invasive plants and vertebrate pests, native fauna grazing	High	Commence assessment of fire impact on EPBC and Nature Conservation Act listed species and ecological communities. Develop post-fire monitoring and management plan for long-term viability. Funding reflects initial 3 years of the program.	Possible	Moderate	Medium
Flora	Fire-sensitive vegetation communities	Loss of species and vegetation communities	Fire impact, fire interval and severity. Changing climate	Localised extinction, fire below the tolerable fire interval, increased pressure from invasive plants and vertebrate pests	High	Includes Snow Gum, Alpine Ash, Callitris, Black Sallee, and Large-flowered Tea Tree. Assess fire impacts on all communities and develop management response where required. Commence monitoring regime where considered appropriate. Implement future fire management planning to consider long term viability of these communities.	Possible	Moderate	Medium
Flora	Large hollow-bearing trees	Loss of habitat	Fire impact	Loss of significant habitat	High	Undertake habitat tree assessment in key habitat for protected fauna species. Development management actions. Consider nest boxes and tree hollow construction and research into other innovative options.	Likely	Moderate	High
Flooding/ Erosion	Roads and walking tracks	Erosion and/or sediment deposition impacting road infrastructure	Rainfall events and subsequent erosion and debris flows in moderate to high burn severity areas	Loss/damage to road and walking track infrastructure	Extreme	Assess individual roads that fall within the high risk zone (where roads/trails intersect with high burn severity or key riparian zones); temporarily close roads where access is not critical; install erosion and sediment controls above roads at risk. Costings reflect intial assessment only.	Possible	Moderate	Medium
Flooding/ Erosion	Water quality and quantity in the Cotter River catchment	Water impacted by sediment flows within potable water catchment and dams	Moderate to significant rainfall events and assosciated sediment flows	Reduced total source water availability in the ACT, increased water treatment costs	High	Hillslope erosion control on priorty areas in the Cotter River catchment, per erosion risk model, engagement with Icon Water to determine future water management approach, including the consideration of specific debris and sediment controls, expansion of water quality monitoring programs. Costings reflect intial assessment only.	Possible	Moderate	Medium
Flooding/ Erosion	Aquatic and riparian habitat in priority sites	Sedimentation from hillslope and gully erosion, streambank erosion	Rainfall events that increase catchment peak discharges	Reduced biodiversity, alterered hydrological flows, increased catchment flow rates	High	Protection of riparian vegetation in streams of second order and above, especially where such streams intersect with high hillslope erosion and/or debris flow risks, field assessments may trigger targeted streambank and bed protection in high priority sites. Costings reflect intial assessment only.	Possible	Moderate	Medium
Flooding/ Erosion	Hillslopes in high erosion areas - requiring stabilisation	Hillslope and gully erosion	Rainfall events leading to increased runoff in moderate to high burn severity areas	Loss of fertile ashbed and residual native seeds, gully formation and subsoil loss, downslope/downstream sedimentation impacts	High	Install runoff and erosion control measures at high priority sites, per erosion risk map, assess roads/culverts likely to increase concentrated flows on high risk hillslopes - implement culvert outlet protections or consider alternative road drainage structures that do not capture and concentrate flows. Costings reflect intial assessment only.	Possible	Moderate	Medium
Flooding/ Erosion	Research and monitoring infrastructure	Flooding, debris flows, sediment deposition	Rainfall events leading to increased runoff, flooding and sedimentation	Damage to assets through direct flood impacts and/or sedimentation	Medium	Coordinate with asset owners/managers from EPSDD, Universities and Icon Water to determine critical, long term water quality and ecological monitoring assets (e.g. turbidity probes) to be prioritised for protection or restoration, through either targeted sediment control or relocation.	Possible	Minor	Medium
Assets	Fire Trails, walking tracks, visitor nodes	Staff and public safety resulting from falling trees/ limbs	Fire impact, storm/ wind	Injury or death. Damage to road surface	Extreme	Keep areas closed to public until safety works have been completed. Maintain barriers, signage and regular compliance patrols. Arborists to address hazardous trees. Ongoing monitoring of hazards.	Unlikely	Major	High
Assets	Fencing	Stock movement, illegal access	Fire impact	Wandering stock, illegal vehicle access causing environmental/ asset damage	High	Engage fencing contractors to repair/replace boundary fences within 3 months. Engage fencing contractors to repair/replace internal fences within 12 months. Consider using flame resistant fencing materials.	Possible	Minor	Medium
Assets	Visitor infrastructure	Fire impacted infrastructure requiring repair. Staff and public safety	Fire impact	Injury to staff and public, damage to infrastructure, environmental contamination	High	Keep areas closed to public until safety works have been completed. Assess damaged infrastructure and remove and rebuild as required. Consider using flame resistant materials to enhance durability.	Unlikely	Moderate	Medium
Assets	Cultural assets (not heritage listed - in heritage section)	Damage/destruction of European cultural sites not registered on the Heritage Register	Fire impact, moderate to heavy rainfall event	Loss/damage to European cultural sites	Medium	Field assessment of European cultural sites. Provide report on future actions and ongoing costs of management. Consult with ACT Heritage regarding recovery actions and ongoing maintenance or reconstruction.	Unlikely	Minor	Medium

DISCIPLINE ASSESSMENT

FLOODING AND EROSION

DESCRIPTION

Fires that burn with high severity are known to considerably increase the likelihood of soil erosion and sedimentation. With the loss of vegetation and litter that protects soil, together with heat-induced changes that reduce soil structural stability, hillslopes and associated drainage systems that are impacted by high severity fire are highly vulnerable to erosion and sedimentation.

The burnt area of the Orroral Valley fire within NNP is mostly within upland landscapes at altitudes above 800 metres. Two broad geological units are within the fire area: Ordovician sediments and metasediments (which cover most of the Cotter River catchment) and Silurian granites (which cover the remainder of the burnt area). Soils derived from both these geologies are generally shallow and sandy, with high localised erosion and mass movement risk (Cook 2016).

The catchments in NNP have been impacted by the Orroral Valley fire to varying degrees. Within the Upper Cotter catchment, 99% of the Corin dam catchment and 29% of Bendora dam catchment was burnt, though the severity was highly variable in both water storage catchments. Burn severity was similarly variable in the other impacted catchments.

METHODS

Using spatial and field sourced information, the assessment of the erosion and flooding risk considered the potential impacts on both ecological and infrastructure assets. These impacts and the subsequent prioritisation of mitigation strategies were assessed using the rapid methods below.

- Evaluating landscape modelling of hillslope erosion risk at natural, low severity and high severity burn (URS 2009)
- Soil landscapes data evaluated to establish erosion risk hazard
- Spatial analysis of the extent of catchment and stream/riparian areas impacted by burn severity
- Spatial analysis of the intersection of roads and trails with both high hillslope erosion risk hazard and high burn severity
- Modelled debris flow risk and its intersection with burn severity (Nyman 2016)
- Aerial survey to assess burn severity and extent and to visibly gauge erosion and debris flows on severely burnt hillslopes

ASSUMPTIONS AND GAPS

The erosion and flooding assessments undertaken were based on the best available spatial data and modelling available at the start of the deployment, with limited field verification. Burn severity, for example, was partially incomplete on parts of the western and north-western burn edge due to smoke and cloud; therefore, spatial modelling of these areas will likely understate erosion risk.

The hillslope erosion risk modelling adopted for this assessment may slightly understate erosion risk: while soil cover factors in this dataset are modelled to account for increased runoff, they do not predict complete crown and surface layer vegetative consumption during very high burn severity. Physicochemical changes to soils which may increase their erosive likelihood are also not predicted.

The erosion risk hazard model used in this assessment does not quantify sediment flows through catchment systems.

Discipline: Flooding and Erosion

Asset name: Roads and walking tracks

Location: Various locations within burn area

Risk: Extreme

Impact: Loss of, or damage to road and walking track infrastructure

General description

With elevated runoff rates and erosion potential in areas of high burn severity, roads and walking tracks that intersect such areas within the burn are likely to be impacted by debris flows, mass movement, and sedimentation. At high erosion risk locations, 3 km of roads and 5 km of walking tracks have been identified, and for debris flow risk, 2.5 Ha adjacent to walking tracks and 6.5 Ha adjacent to roads have been identified.

A thorough field assessment of these roads and walking trails will determine the damage extent, to develop specific remediation measures. Where roads and walking tracks intersect highly erodible hillslopes, upslope stabilisation works will mitigate sedimentation impacts.

Targeted drainage control works will minimise road and track surface erosion issues until surrounding vegetation recovers and runoff rates and volumes decline.

Initial treatment recommendations

> Assessment of roads and walking tracks that intersect with high erosion risk hazard modelling
> Refer to prescribed management strategies for invasive plants and animals to mitigate riparian vegetation impacts
> Direct stabilisation works, where required

Map: See Map 2 Erosion Risk Orroral Valley Fire

See page 18.

Photo

Sedimentation on Cotter Hut Road, Julian Seddon

Discipline: Flooding and Erosion

Asset name: Water quality and quantity in the Cotter River catchment

Location: Cotter River Catchment

Risk: High

Impact: Reduced total source water availability; increased water treatment needs

General description

Corin and Bendora Dams are within the Cotter River catchment. The increase in runoff and the subsequent erosion and sediment flows can impact catchment waterways and each dam. Of the highly erodible landscapes of the Cotter River catchment, 1951 ha of Corin catchment and 137 ha of Bendora catchment have been impacted by high severity fire. These areas intersect with 24 ha of buffered waterways, the adjacent hillslopes and riparian areas of which are the priority for erosion control.

In managing the risk of debris flows into water storages, debris flow barrier systems and sediment boom nets should be considered. In partnership with Icon Water, engineering and financial scoping of such systems is proposed. Sediment boom nets could either be installed at the primary stream inputs into each dam, or near water intake points within the reservoirs.

Vegetation losses post fire reduce infiltration and evapotranspiration, leading to increased runoff rates, which in turn leads to greater catchment water yields. As the catchment recovers, however, water yields reduce as infiltration and evapotranspiration increase. Additional monitoring of these altering hydrological affects will assist Icon Water in future water management, including environmental flows.

Initial treatment recommendations

> Undertake hillslope erosion control adjacent to high priority streams, involving the installation of coir logs and felled timber contour barriers ($5,920 per Ha)

> In partnership with Icon Water, commission a scoping assessment to determine the practical and financial viability of debris flow barriers and sediment boom nets

> Additional monitoring to better manage water quality and quantity impacts of future fire events – partnership between Icon Water and EPSDD

Map: See Map 2 Erosion Risk Orroral Valley Fire

See page 18.

Photos

Corin Dam, Tom McElroy

Mountains near Bendora Dam, Luke Bulkeley

Discipline: Flooding and Erosion

Asset name: Aquatic and riparian habitat protection in high risk sites

Location: All catchments within burn area

Risk: High

Impact: Reduced biodiversity and altered hydrological flows

General description

At a catchment scale, where high burn severity, high erosion risk, and waterways of second order and above intersect, the likelihood of elevated stream flows and subsequent waterway erosion is increased. This is exacerbated when riparian vegetation is also impacted by fire.

Relative to catchment area, the Cotter River draining into Corin Dam and the Gudgenby River catchments are the most impacted by high severity fire. The increased runoff rates in these catchments are, therefore, the most likely to impact the geomorphic stability of waterways, which can result in wider, shallower and less sinuous stream channels. These changes directly impact aquatic habitat. An assessment of riparian and waterway condition will determine the need for specialised streambank and bed stabilisation works, such as bank and bed revetment and sedimentation controls.

The control of pest and invasive plants that could threaten the recovery of riparian vegetation is also a critical component of habitat recovery.

Initial treatment recommendations

> Detailed survey of the extent of riparian vegetation and waterway condition in high risk sub-catchments
> Refer to prescribed management strategies for pest plants and animals to mitigate riparian vegetation impacts
> Direct stabilisation works, where required

Map: See Map 2 Erosion Risk Orroral Valley Fire

See page 18.

Photos

Sediment deposition adjacent to Cotter River
Julian Seddon

Riparian vegetation adjacent to Cotter River
Julian Seddon

Discipline: Flooding and Erosion

Asset name: Hillslope stabilisation in high erosion risk sites

Location: All catchments within burn area

Risk: High

Impact: Gully formation and soil loss; downslope/downstream sedimentation impacts

General description

The erosion risk hazard of hillslopes is directly correlated with the localised severity of the fire and the extent to which hillslopes are naturally susceptible to erosion. After fire, as surface vegetation that would otherwise capture rainfall is reduced, the proportion of rainfall that results in overland flow significantly increases. Soil protection measures that reduce runoff and increase infiltration are proposed, including the installation of coir logs, felled timber barriers and contour furrowing.

Roads are an importing contributing factor to runoff velocities, especially where they capture, concentrate and redirect flows down susceptible hillslopes. Culverts, for example, can be especially problematic in initiating gully erosion. Prioritisation for assessment are where roads are situated within 50 metres of streams. Stabilisation works, where required, involve energy dissipating structures at culvert outlets, and grade control works in gullies.

An assessment will determine the precise extent of the required works.

Initial treatment recommendations

> Install coir logs and other slope length minimisation measures in high priority sites
> Assess the road network to determine where culverts/road drainage are contributing to gully initiation; broadly evaluate road design to determine if road drainage generally can be modified to mitigate runoff concentration
> The design and installation of energy dissipators and associated erosion control works

Map: See Map 2 Erosion Risk Orroral Valley Fire

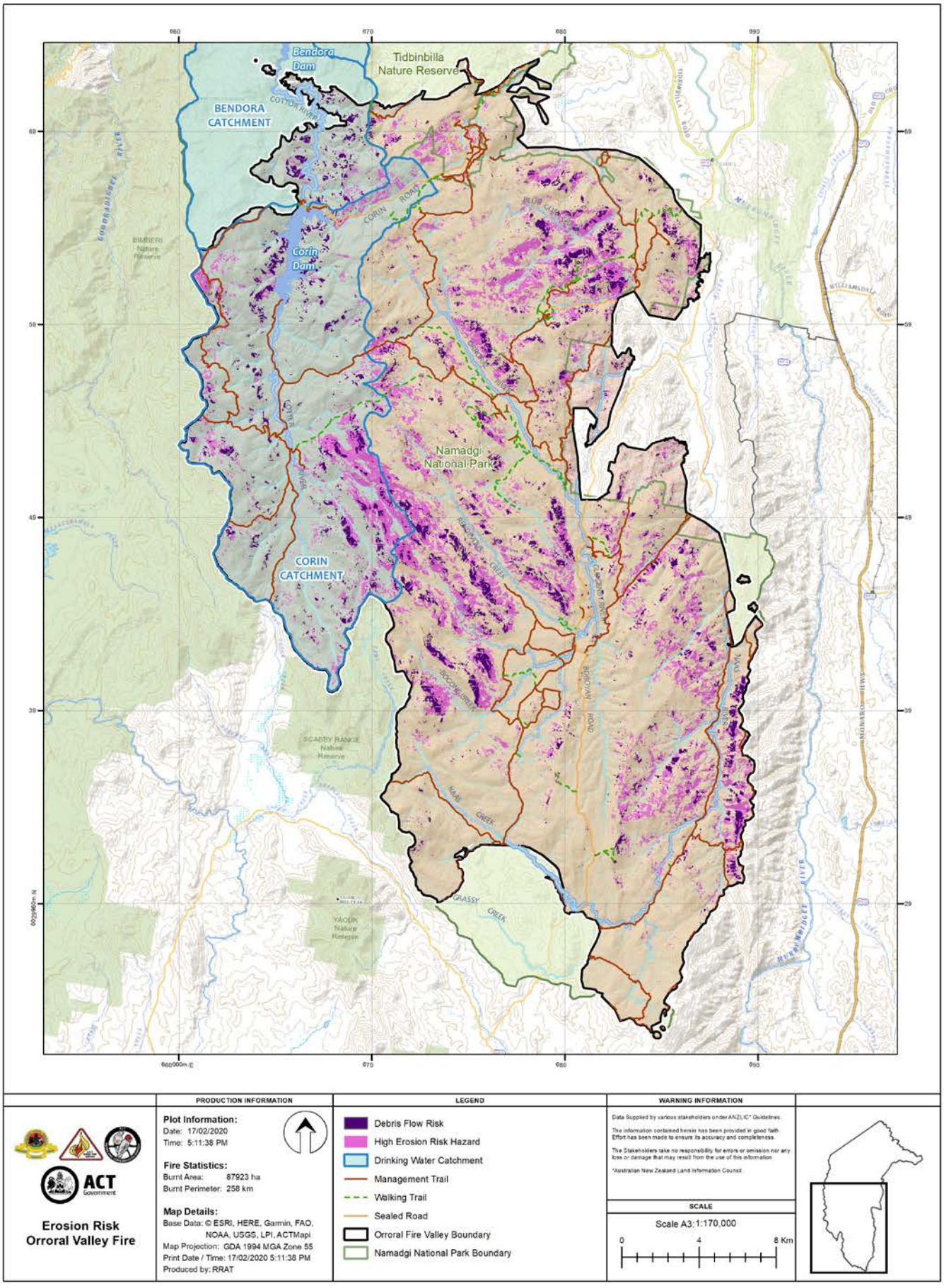
See page 18.

Photos

High severity burnt hillslope
Brett McNamara

Erosion initiated from culvert outlet
Julian Seddon

MAP 2: EROSION RISK ORRORAL VALLEY FIRE



ASSETS

DESCRIPTION

NNP is a major recreational destination for the people of Canberra and surrounding NSW. The Orroral Valley fire spread across most of the park, impacting numerous recreation and management assets including campgrounds, picnic areas, car parks, walking tracks and fences. All these assets consist of multiple smaller associated assets that also can be impacted by fire for example shelters, toilets, huts, tables/chairs, bridges, boardwalks, and steps.

METHODS

Assessment of the impact of the Orroral Valley fire on park assets used the following methodology:

- The ACT Parks and Conservation Service (ACT PCS) asset management system was queried to identify all assets recorded within the burnt area
- The separate NNP sites of significance GIS data was queried to identify additional sites within the burn area
- Assets were prioritised for field checking by overlaying them with high and very high burn severity
- High priority assets were inspected by helicopter to identify impacts
- Field staff where supplied with the list of assets in the fire impacted area and conducted on-ground inspections and returned the information and photos
- Assets were assessed based on fire impact, safety, environmental impact and recreation value to identify the priority sites
- Assessment via helicopter was conducted of the priority sites to identify impacted assets and provide risk mitigation actions

ASSUMPTIONS AND GAPS

- Assets are assumed to be recorded in the asset management system or sites of significance data
- Burn area mapping is assumed to be accurate
- Burn severity mapping is not complete for the entire fireground
- Not all assets could be inspected on the ground and were visually inspected from the air
- Detailed inspections of individual sites (e.g. walking tracks) was not possible during the deployment
- Not all fencing is mapped. In measuring fence length an assumption has been made that the full length of the NNP boundary with neighbouring rural land is fenced
- The treatments for this discipline consider full replacement of the asset, not decommission

DISCUSSION

The burnt area includes several high use recreation facilities highly valued and regularly used by the community. All three designated campgrounds in NNP are in the burnt area. A structured approach is recommended to quickly assess, make safe, repair and reopen recreational facilities to the public especially in the higher use sites.

Discipline: Assets

Asset name: Fire trails, walking tracks, visitor nodes

Location: Various

Risk: Extreme

Impact: Injury or death, damage to roads, tracks and trails

General description: Risk to public safety from hazardous trees

Fire trails, walking tracks, car parks, picnic areas and campgrounds are the primary areas in NNP used by members of the public.

290 km of fire trail, 84 km of walking tracks and 19 recognised visitor nodes are within the burn area. Falling trees and limbs are an extreme risk to life and will need to be mitigated prior to reopening these areas to the public.

All those working in fire affected areas need to consider the risk from hazardous trees to their own safety and the safety of any others working under their direction.

Initial treatment recommendations

- Keep areas closed to the public until safety assessments and works have been completed
- Maintain barriers, signage and regular compliance patrols
- Identify sites where minimal work is required and prioritise to allow public access
- Arborists to inspect hazardous trees and make recommendations
- Ongoing monitoring of hazards will be required, particularly following storm events

Map: See Map 3 Impacted Assets Orroral Valley Fire

See page 23.

Photo

Tree assessment and tree clearing, Boboyan Road
Amanda (AJ) Johnson

Discipline: Assets

Asset name: Fencing

Location: Various

Risk: High

Impact: Wandering stock, illegal access, environmental/asset damage

General description: Park boundary, public access control and internal fencing

Approximately 120 km of fence line are within the burnt area, 109 km of which are used as boundaries with adjacent rural land or for access control. These are important for preventing the movement of stock into the national park, restricting the movement of feral animals and preventing illegal access.

Fences have been damaged by direct fire impact, falling trees and runoff from rain events. Replacement of fencing will require liaison with adjacent landholders regarding access, fence type and possible consideration of future gate locations. Responsibility for boundary fences between Government and private managed land varies across the ACT and needs to be considered for each lease. Significant lengths of fencing require liaison with NSW landholders.

Initial treatment recommendations

> Contractors and staff to consider the risk of hazardous trees prior to works
> Engage fencing contractors to repair/replace damaged sections of fencing in accordance with PCS standards
> Prioritise works along boundaries with agricultural land
> Replacement fencing should comply with current PCS standards to use non-flammable materials such as steel/concrete posts

Map: See Map 3 Impacted Assets Orroral Valley Fire

See page 23.

Photo

Fence damage from fire and runoff
Scott Seymour

Discipline: Assets

Asset name: Visitor Infrastructure

Location: Various

Risk: High

Impact: Injury, damage to infrastructure and environmental contamination

Description: Fire impact to walking tracks, camping grounds, picnic areas and car parks

Approximately 84 km of walking track and 19 recognised visitor nodes (camping grounds, picnic areas, car parks) are located within the burnt area.

The major visitor node for access to the Gudgenby area at Yankee Hat car park is known to have sustained significant fire damage. Likewise, the Booroomba Rocks car park is in an area of very high intensity burn and is assumed to be significantly impacted. All three designated campgrounds in NNP are within the burn area, however none has sustained more than minor damage. The area includes the majority of the specifically constructed walking tracks in NNP and significant damage is either confirmed or expected from either fire impact or suppression works.

Initial treatment recommendations

- Keep areas closed to public until safety works have been completed
- Maintain barriers, signage and regular compliance patrols
- Staff to assess all trail infrastructure to accurately record asset damage and needs
- Remove all damaged dangerous items
- Rebuild assets to current standards
- Consider using non-flammable materials wherever possible
- Prioritise sites that require less work to enable public access as soon as possible
- Ongoing monitoring and maintenance of additional hazards will be required

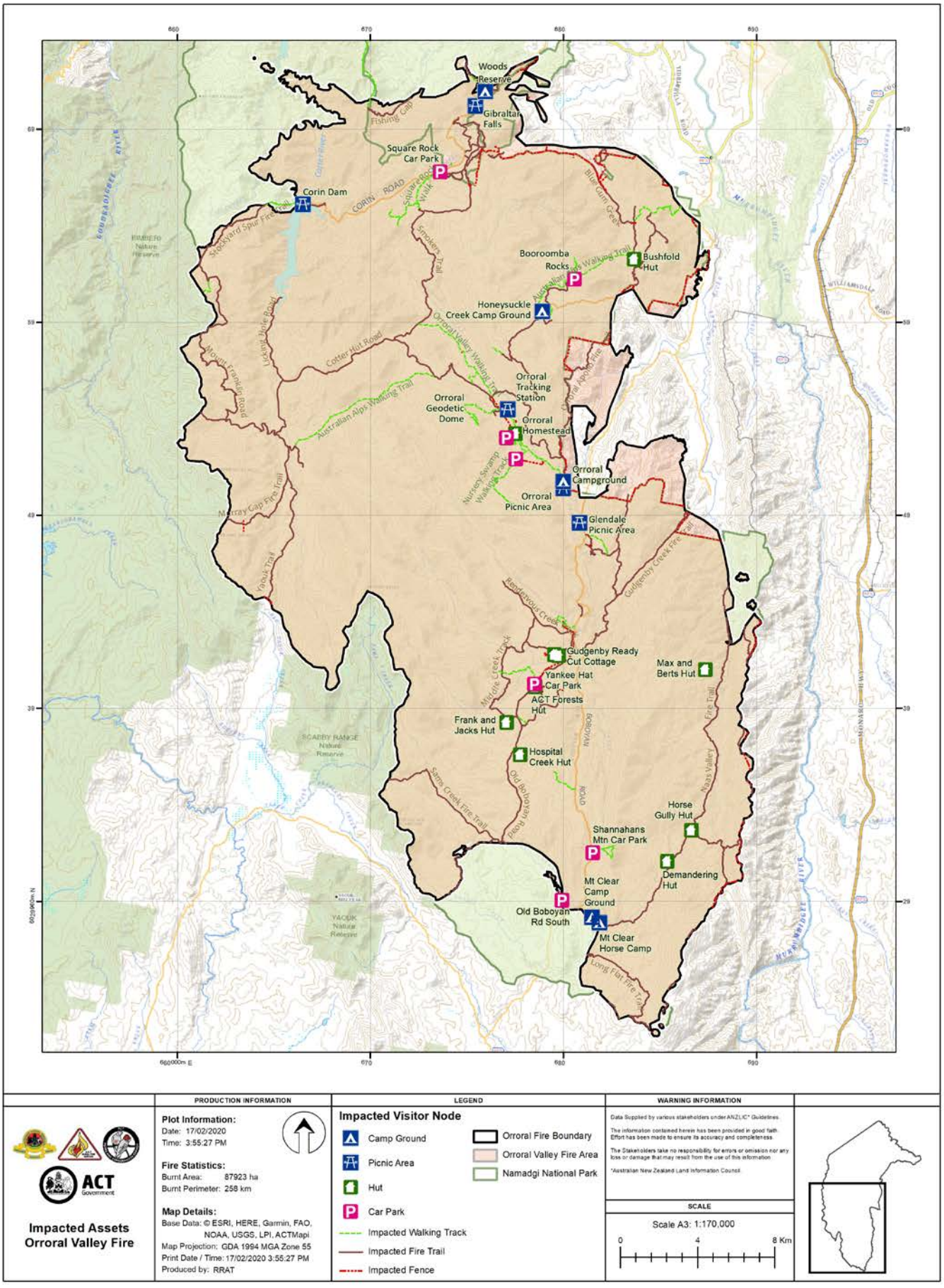
Map: See Map 3 Impacted Assets Orroral Valley Fire

See page 23.

Photo

Damaged boardwalk Brandy Flat Walk
Deklyn Townsend

MAP 3: IMPACTED ASSETS ORRORAL VALLEY FIRE



PRODUCTION INFORMATION	LEGEND	WARNING INFORMATION
Impacted Assets Orroral Valley Fire	**Impacted Visitor Node** Camp Ground Picnic Area Hut Car Park Impacted Walking Track Impacted Fire Trail Impacted Fence Orroral Fire Boundary Orroral Valley Fire Area Namadgi National Park	Data Supplied by various stakeholders under ANZLIC* Guidelines. The information contained herein has been provided in good faith. Effort has been made to ensure its accuracy and completeness. The Stakeholders take no responsibility for errors or omission nor any loss or damage that may result from the use of this information. *Australian New Zealand Land Information Council.
Plot Information: Date: 17/02/2020 Time: 3:55:27 PM **Fire Statistics:** Burnt Area: 87923 ha Burnt Perimeter: 258 km **Map Details:** Base Data: © ESRI, HERE, Garmin, FAO, NOAA, USGS, LPI, ACTMapi Map Projection: GDA 1994 MGA Zone 55 Print Date / Time: 17/02/2020 3:55:27 PM Produced by: RRAT		**SCALE** Scale A3: 1:170,000 0 4 8 Km

HERITAGE

DESCRIPTION

NNP contains a rich cultural landscape, spanning Aboriginal, historic and built heritage. The Aboriginal history of the region dates back over 25,000 years, and Traditional Custodians maintain a deep connection to the Park, having an ancestral and ongoing legacy to 'Care for Country'. Aboriginal cultural values are embedded in tangible places and objects found throughout the Park, such as ceremonial sites, rock art sites, cultural trees, grinding grooves and artefact scatters. Evidence of 19th and 20th century European settlement and use is also found throughout the Park, and includes pastoral properties, stockman's huts, original survey markers and space heritage sites.

METHODS

The following was undertaken to inform this rapid assessment:

- Review of the known heritage values of the Park, from the heritage databases maintained by ACT Heritage and the ACT PCS
- Consultation with Representative Aboriginal Organisations (RAOs) on Aboriginal cultural values and recovery priorities
- Review of information provided by the ESA and PCS on fire preparation and response actions, and on the known heritage effects of the fire
- Preliminary analysis of fire intensity, earthworks and post fire erosion at heritage places
- Aerial inspection of several heritage areas, to assess fire effect and intensity

ASSUMPTIONS AND GAPS

Limitations of this rapid assessment include:

- The Park has not been subject to extensive heritage assessment and is likely to contain many unrecorded heritage places and objects
- The heritage data set used for this review contains duplicate entries, and due to time constraints, was not subject to detailed validation or verification
- No on-ground site inspections or condition assessments were undertaken for this assessment
- RAO availability was limited during the rapid assessment, however, both Buru Ngunawal Aboriginal Corporation and King Brown Tribal Group were able to participate in the process

DISCUSSION

All Aboriginal heritage assessment and management actions are to be undertaken in collaboration with Traditional Custodians; with Representative Aboriginal Organisations (RAOs) to provide guidance on cultural values, cultural protocols and appropriate outcomes for all proposed actions.

Heritage Act 2004 approvals will be required for some actions recommended in this report, and

ACT Heritage Council advice should be sought on all proposed conservation and recovery actions.

The fire impact has increased ground surface visibility creating a short-term opportunity to undertake highly effective heritage surveys and assessments throughout. This opportunistic work would improve our understanding of heritage values and Park management. On this basis, it is recommended that the land manager seek additional funding to commission cultural landscape surveys and assessments within the next three months, to be undertaken by RAOs and qualified archaeologists.

Discipline: Heritage

Asset name: Aboriginal Heritage – Rock Art sites

Location: 6 locations within the fire area

Risk: Extreme

Impact: Loss of and/or damage to rock art

General description

There are known rock art sites within the fire affected area, including Yankee Hat. Specific locations and information is available from ACT Heritage.

These sites are of very high cultural and heritage significance and are registered on the ACT Heritage Register.

Fire can cause irreparable damage to, or loss of, rock art; through the exfoliation of pigment, coating of art with soot and ash, and mechanical failure of the stone shelter. Later fire effects can include chemical changes to pigment and increased erosion.

All rock art sites are within the fire affected area. Available information suggests that art at some locations, including Yankee Hat, have not been significantly damaged, although one stone shelter has been damaged (rock fall).

Condition assessments of all rock art sites are required.

Initial treatment recommendations

> Initial inspection by RAOs, to assess cultural damage and provide guidance on appropriate management
> Following the above, detailed condition assessment by rock art specialist, materials conservator and RAOs, to assess fire effects and identify any required management actions
> Undertake any immediate stabilisation works recommended by the condition assessment
> Recommendation immediate priority – undertake as soon as possible

Discipline: Heritage

Asset name: Aboriginal and Historic – Archaeological Sites

Location: Numerous locations within fire affected area

Risk: Extreme

Impact: Damage to heritage features and deposits

General description

The fire affected area contains c.700 Aboriginal archaeological sites, and 13 heritage registered huts with archaeological potential.

Earthworks undertaken in advance of and during the fire event included: dozer lines around most historic huts for their protection; and the upgrade of c.200 km of fire control lines.

Preliminary review identifies that c.150 known Aboriginal archaeological sites occur in within or adjacent to these control lines. Additionally, due to the limited history of archaeological assessment within the Park, many more unrecorded Aboriginal heritage sites are likely to occur within earthwork areas.

These earthworks are likely to have impacted Aboriginal and historic archaeological sites and features, and heritage management actions are required to assess affected areas and salvage displaced archaeological fabric.

Initial treatment recommendations

- Identification of priority earthwork areas for heritage inspection, by a qualified archaeologist and RAOs
- Seek a Heritage Act 2004 approval for the salvage and relocation of Aboriginal objects
- Detailed inspections of priority earthwork areas by a qualified archaeologist and RAOs, to identify, record and salvage/ relocate displaced archaeological sites and features. Estimated 20 fieldwork days required
- Recommendation immediate priority – undertake prior to rehabilitation of earthworks

Photos

Waterholes Hut, 2020 dozer line
Adam Henderson

Fire control line, NNP, 2020
ACT PCS

Discipline: Heritage

Asset name: Demandering and Max and Bert Oldfields Huts

Location: Block 40 Mt Clear and Block 6 Booth

Risk: Extreme

Impact: Loss of heritage value

General description

Two historic huts within the fire affected area – 'Demandering Hut' and 'Max and Bert Oldfield's Hut' – have been directly impacted by fire, resulting in collapse and major damage.

Both huts were of heritage significance and were registered on the ACT Heritage Register.

Initial treatment recommendations

- Installation of temporary protective fencing prior to reopening of the Park
- Inspection by built heritage specialists; document damage and identify appropriate management actions
- Removal of significant heritage fabric to PCS Depot for storage
- Recommendation priority – undertake within 3 months

Photo

Demandering Hut, post 2020 fire

Brett McNamara

Discipline: Heritage

Asset name: Aboriginal and Historic Heritage - Timber Sites and Timber Features

Location: Numerous locations within fire affected area

Risk: High

Impact: Loss of cultural heritage

General description

There are 29 standing historic blaze trees/posts, one known Aboriginal cultural tree and two brumby yards within the fire affected area. Specific locations are available from ACT Heritage.

All these sites are of heritage significance and registered on the ACT Heritage Register.

Timber heritage sites are particularly vulnerable to fire effects, which can result in significant damage to or the loss of these heritage sites.

Analysis of fire severity mapping indicates that 13 of the known historic blaze trees/posts are within moderate to very high intensity fire areas, with a further three in areas of unknown fire severity.

Initial treatment recommendations

> Detailed condition assessments by a qualified archaeologist, including RAOs for the Aboriginal scarred tree inspection, to assess fire effects and identify any required management actions
> Recommendation priority – undertake within 3 months

Photos

Historic blaze tree
Matthew Higgins

Aboriginal scarred tree
ACT Heritage

Discipline: Heritage

Asset name: Aboriginal Heritage - Stone Arrangements

Location: 12 locations within the fire area

Risk: High

Impact: Damage to and displacement of heritage fabric

General description

There are known stone arrangement within the fire affected area; including two complexes identified as priority cultural sites by RAOs.

These sites are of very high cultural and heritage significance and are registered on the ACT Heritage Register.

While stone is relatively resilient to fire effects, fire can cause exfoliation and mechanical damage to stone arrangements; and increased post-fire erosion can displace significant fabric.

Initial treatment recommendations

> Detailed condition assessment of priority stone arrangements by a qualified archaeologist and RAOs, to assess fire effects and identify any management actions
> Undertake any immediate stabilisation works recommended by the condition assessment
> Recommendation immediate priority – undertake as soon as possible

Discipline: Heritage

Asset name: Aboriginal – Archaeological Sites

Location: Numerous locations within fire affected area

Risk: High

Impact: Damage to heritage and loss of archaeological context

General description

The fire affected area contains c.700 Aboriginal archaeological sites. Due to the limited history of archaeological assessment within NNP, many more unrecorded Aboriginal archaeological sites are likely to occur.

During the recent fire, highly erodible landscapes within the Cotter River catchment were impacted by high severity fire, including 750 ha within the Corin catchment and 29 ha within the Bendora catchment. Where these landscapes intersect with waterways and adjacent hillslopes, there is high potential for debris flows, which can occur as landslides within steep upper catchments.

Preliminary analysis identifies that 23 known Aboriginal archaeological sites occur within these areas of high potential for debris flow, including 4 rock shelters with deposit and 19 artefact scatters. Debris flows could significantly damage these sites and result in the loss of significant Aboriginal objects.

Initial treatment recommendations

> Inspections of rock shelter and artefact scatter sites by an archaeologist and RAOs to assess potential damage from debris flow events.
> Undertake any immediate stabilisation works at rock shelter sites recommended by the initial inspection
> Recommendation priority – undertake within 3 months

BIODIVERSITY – FAUNA

DESCRIPTION

The richness and diversity of faunal communities is a key natural asset of NNP. There are a number of threatened species and species of national concern, many of which are likely to be directly impacted by fire, or indirectly through loss of habitat and increased predation risk.

METHODS

The following spatial layers and information sources were used for fauna population assessments:

- Species sightings from ACT Wildlife Atlas and Canberra Nature Map records
- Species distribution maps (where available) for listed fauna populations
- Environmental layers including fire extent, fire severity, debris flow, priority bogs (Conservation Research assessment), control and retardant lines
- *Provisional list of animals requiring urgent management intervention* (national threatened species and species of concern priority list)
- Technical reports and survey results (where available) for species of concern
- Expert input from fauna, pest and aquatic ecologists within ACT Government
- Species distribution and point locations were overlayed with environmental layers, then combined with expert input for action prioritisation

ASSUMPTIONS AND GAPS

Some *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) listed species that are identified as priority species have historical records within the fire extent. Such species with either historic or few records were not considered for direct actions at discrete locations but will benefit from more general actions including invasive predator control, herbivore control, habitat supplementation and maintenance of habitat connectivity, including into NSW. Species of national concern kept in captive populations at TNR were not considered in this assessment unless part of current reintroduction programs.

DISCUSSION

There is an opportunity to monitor critical weight range successional species (e.g. Long nosed Bandicoots *(Perameles nasuta)* and vulnerable folivores such as large gliders, post fire. The critically endangered Smokey Mouse *(Pseudomys fumeus)* has not been detected in NNP since the 2003 fires and this species is a priority for assessing options to promote recovery.

Long-term bird population monitoring which considers connectivity of patches within the burnt area and persistence or recovery of ground and mid-story vegetation would be beneficial to help inform future recovery actions. Similarly, EPBC listed invertebrate species and rare taxa that have records from within the burn area should have follow-up monitoring conducted.

Finally, animal welfare is an important consideration post fire and a topic of significant public concern. A wildlife response plan is being drafted to address immediate and long-term actions. This includes the establishment of a triage area, the appointment of a wildlife vet to oversee animal care and a wildlife assessment team to assess wildlife health in fire impacted areas.

Discipline: Biodiversity – Fauna

Asset name: Threatened Fauna Populations - predation

Location: Bog habitats (including unburnt) and riparian areas above Corin Dam

Risk: Extreme

Impact: Increased level of predation on remnant populations, possible loss of populations

General description

There are several threatened fauna populations in NNP that are highly vulnerable to increased risk of predation post fire. The Broad toothed Rat *(Mastacomys fuscus)* is an endangered rodent and a species of national concern that is endemic to sub-alpine bogs and associated habitats. A recent survey (Milner et al. 2016) found the species was present at 13 of 14 monitoring sites. Of these sites, seven have been impacted by severe intensity fire, three have been impacted by moderate intensity fire (Little Bimbiri, Murray's Gap and Leura) and three populations remain unburnt (Cheyenne Flats, Ginini East and Ginini West). It is important that remnant populations and those impacted by moderate intensity fire are protected from increased predation to enable recolonisation of severely burnt sites as the ecosystem recovers.

Reiks Crayfish *(Euastacus reiki)* is a poorly known species of mountain spiny crayfish that inhabits the tributaries and bogs in the upper Cotter catchment, upper Nass, Orroral and Gudgenby Valleys. It is estimated that 95% of its habitat in the ACT is within the burn area. The species is extremely vulnerable post fire as poor water quality encourages them to emerge from their burrows, exposing them to increased risk of predation.

Targeted pest control across the identified extent of these two species is also likely to benefit other threatened fauna, including waterbirds, reptiles and amphibians. Ideally aerial baiting will aim to retain Dingoes in core areas and compliment current ground baiting activities. Targeted trapping for invasive predators is recommended as there is currently no broad scale control method for Feral Cats.

Initial treatment recommendations

> Undertake targeted predator control across threatened species habitats (bogs and riparian areas) impacted by high severity fire and around remaining Broad-toothed Rat populations

Map: See Map 4 Fauna Priorities Orroral Valley Fire

See page 36.

Photos

Broad-toothed Rat, Ken Green

Fox attending lure, Reconyx Wildlife Camera

Discipline: Biodiversity – Fauna

Asset name: Threatened Fauna populations (Fish)

Location: Upper Cotter catchments and riparian areas above Corin Dam

Risk High

Impact: Sedimentation of waterways leading to reduced water quality and loss of key populations

General description

Two-spined Blackfish *(Gadopsis bispinosus)* and Macquarie Perch *(Macquaria australasica)* are two threatened fish species found in the Upper Cotter catchments. High severity fire within catchments followed by substantial rainfall can lead to increased sedimentation of waterways and decreased water quality. In extreme cases, aquatic environments can become toxic to fish leading to fish kills and loss of local populations.

Macquarie Perch are species of national concern, with a significant proportion of their range burnt nationally. The population of Macquarie Perch that extends from Corin Reservoir upstream in the Cotter River is an important insurance population and one of only two populations of the species in the ACT. This area has been subject to high severity fire.

Similarly, the Upper Cotter catchment tributaries are the stronghold for Two-spined Blackfish populations in the ACT. Of the five identified tributary areas important for Two-spined Blackfish, three have catchments that have been impacted by high severity fire. Priority areas for assessment include Desalis Creek, Pond Creek, Licking hole Creek, Creamy Flats Creek, Scabby Range and Cotter River source including Cotter Bog and Cotter Flats. Sedimentation control and restoration of riparian areas will also benefit threatened amphibians and the Platypus (Ornithorhynchus anatinus), an identified species of national concern.

Initial treatment recommendations

> Assess water quality in locations identified above. Undertake prioritised sedimentation control in Upper Cotter tributaries, and along the Cotter River above Corin Dam to Cotter Hut, in areas impacted by high severity fire (see per hectare rate for hillslope stabilisation in Flooding/Erosion)
> Assess the need for riparian restoration along the Cotter River north of Corin Reservoir
> Consider translocation of Two-Spined Blackfish or Macquarie Perch into captivity if required, until water quality improves. If translocation not conducted, monitor populations

Map: See Map 4 Fauna Priorities Orroral Valley Fire

See page 36.

Photos

Two-spined Blackfish
Mark Jekabsons

Macquarie Perch release Cotter River
Mark Jekabsons

Discipline: Biodiversity – Fauna

Asset name: Threatened Fauna Populations (Large Gliders)

Location: Honeysuckle Creek and Orroral Valley area

Risk: High

Impact: Loss of large glider populations

General description

Two species of large gliders, the Greater Glider *(Petauroides volans)* and the Yellow-bellied Glider *(Petaurus australis)* are found in NNP. Both these species are listed as species of national concern because fire has impacted a large extent of their national range.

Recent surveys in NNP identified three main areas where large gliders occur. The largest of these areas, which has the highest density of gliders, is in an unburnt region of the park (Bendora area of the Brindabella Range). The second area is in the Upper Cotter area of the Bimberi Wilderness and has been impacted by fire of moderate to low severity and retains much of its canopy cover. The third area around Booroomba Rocks and Honeysuckle Creek has been impacted by moderate to high fire severity with extensive canopy scorch. If gliders survive initial fire impacts in the Booroomba Rocks and Honeysuckle Creek area, they are then highly susceptible to starvation during the weeks following the fire. Greater gliders are particularly vulnerable as they are folivores, requiring fresh leaves for nutrition, have small home ranges (1-3 ha) and limited capacity to disperse to new areas.

Initial treatment recommendations

> Undertake on ground assessment of fire impact and conduct post fire surveys for large gliders in known population area around Booroomba Rocks and Honeysuckle Creek
> Plan and undertake priority conservation actions as required

Map: See Map 5 Fauna Priorities Orroral Valley Fire

See page 36.

Photos

Greater Glider in Meroo National Park post fire
Anonymous

Post fire, Upper Cotter Bimberi Wilderness
Renee Brawata

Discipline: Biodiversity – Fauna

Asset name: Threatened Fauna (Birds, Reptiles and Small mammals)

Location: Upper Naas and Glendale area, identified areas for connectivity

Risk: High

Impact: Reduced faunal diversity and loss of populations

General description

There are many threatened fauna species, including birds, reptiles, small mammals and bat species, that do not have identified population locations and are only known to occupy the burn area from opportunity sightings or historical records. Loss of arboreal, midstory and ground cover habitats, including hollow bearing trees, is likely to have widespread impacts on the persistence of fauna populations in some areas.

Additionally, there is a large amount of community concern and will to assist wildlife in fire impacted areas. Community construction of beneficial supplementary habitats, such as bat bark, nest boxes for target species and ground habitat tunnels may assist in reducing predation, provide breeding resources or areas of refuge and improve connectivity between habitats if strategically deployed. There is added benefit in harnessing citizen science in this action to maintain broader communications around post fire risk management actions.

The addition of coarse woody debris (CWD) will be particularly beneficial for threatened fauna in areas where this resource has been completely removed by high fire severity. CWD is an important resource for woodland birds and reptiles, and priority areas for restoration of CWD are the lowlands woodlands of the Naas Valley and Glendale area. This action may link with targeted restoration of midstory connectivity between NNP and Caloola Farm/Upper Naas areas.

Initial treatment recommendations

> Undertake an assessment of connectivity of midstory and ground cover in priority areas for improving connectivity
> Priority areas include connecting habitat patches within NNP and restoring connectivity for woodland birds between NNP and rural lands in the Upper Naas area
> Liaise with community groups to construct supplementary habitats and distribute strategically based on assessment

Map: See Map 4 Fauna Priorities Orroral Valley Fire

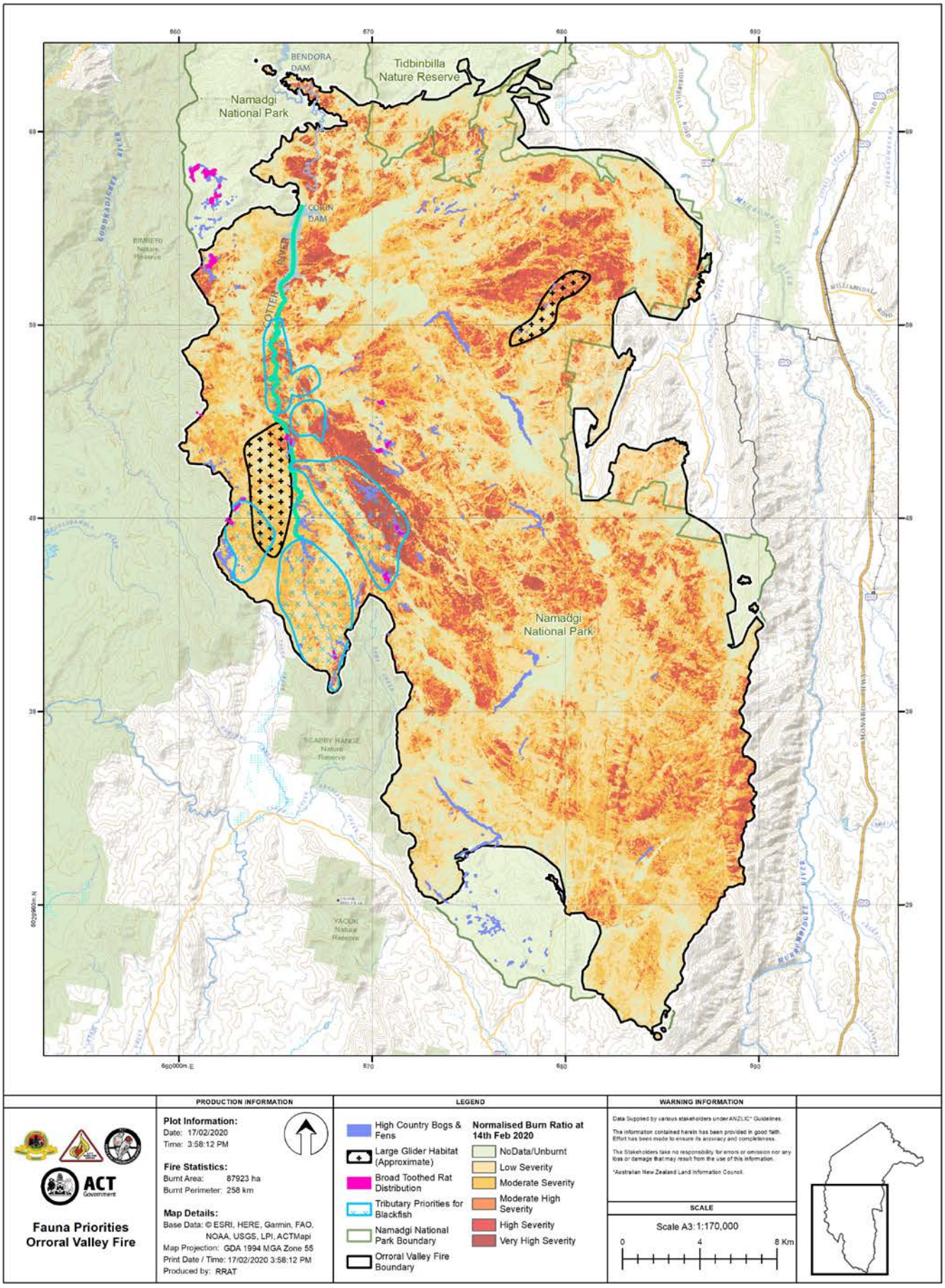
See page 36.

Photos

Yellow-footed Antechinus, Stephanie Pulsford

Hooded Robin, Deb Ralph

MAP 4: FAUNA PRIORITIES ORRORAL VALLEY FIRE



BIODIVERSITY – FLORA

DESCRIPTION

The fire burned through significant areas of floral biodiversity, including two EPBC threatened ecological communities, five populations of EPBC threatened species and 17 nationally significant species. The fire has also impacted many other fire sensitive plant species and ecological communities outside of protection classifications. Prolonged drought conditions (2+ years) has led to a significant amount of stress on plant populations, ecological communities and the broader ecosystem, many areas which were burnt in 2003. The combination of drought and fire is likely to increase the risk of an impact on plant populations and ecological communities in some areas.

The ACT's primary water catchment begins in NNP and is sourced through a network of *Sphagnum* bogs and associated fens that hold and slowly release filtered water into the Cotter River, which flows into Corin, Bendora and eventually Cotter Dams. The Orroral Valley Fire has significantly impacted these *Sphagnum* bog and fen sites.

METHODS

Risks to natural floral values created by the fire were identified with an initial assessment of what values existed within the impacted area. Utilising the NNP and TNR Management Plans, ACT Government Central Geo Database layers, listings provided by the ACT Government Conservation Research branch, advice from other local professionals and online research, a comprehensive list of protected, rare, threatened, small and isolated and locally significant plants and communities was developed. To prioritise this extensive list, the approach taken was to select known species and communities with a legislated protection status. The ability of one ecological community to impact another was also considered. Beyond this refined list, species and communities that are nationally significant were considered.

The next step was to identify the likely impact of the fire on these species utilising fire severity mapping and other information on the species' fire response. From this point, priority species were identified and analysed through researching further information and practical considerations. This identified what threats might be faced into the immediate, short and long-term. Threats were identified based on prior learnings, expert advice from local and inter-state professionals, research and modelling.

Proposed risk treatments have been based on current best practice methods, techniques and applications, in consultation with land managers and industry professionals.

ASSUMPTIONS AND GAPS

Legislated protection status applied to only five plant species and two ecological communities impacted by the fire. Given the burn area has significantly more rare and threatened species than this, it was obvious considerations needed to be broadened without being exhaustive. It was decided that a further addition of nationally significant species would provide more benefit to analyses. In order to not overlook all other rare and threatened species, a comprehensive list of other species, although not exhaustive, was considered.

Burn severity data was not available for the western edge of this fire at the time of the initial assessment. As a result, some species/communities may not have received appropriate consideration, although the assumption was made that everything in this area was burnt to some extent, priorities were generally made on the very high and high severity data. A detailed analysis of this western area of the burn would be recommended.

Discipline: Biodiversity – Flora

Asset name: ACT High Country Bogs and Fens

Location: Various areas Namadgi National Park

Risk: Extreme

Impact: Loss or degradation of *Sphagnum* and associated community

General description

There are 148 bog and fen complexes within the Orroral Valley Fire area. The *ACT High Country Bogs and Associated Fens community* are listed as Endangered under the *EPBC Act*. They are also home threatened fauna species including the Broad-toothed Rat and the Northern Corroboree Frog *(Pseudophryne pengilleyi)*. The National Recovery Plan for the Alpine Sphagnum Bogs and Associated Fens (Department of Environment 2015) and the Australian Alps Rehabilitation Manual (Good 2006), identifies high and moderate intensity fire and changing climate as threatening processes that, when combined, will alter the structure and diversity of floral and faunal species in these communities, and lead to a loss of soils, invasion by exotic species and a change in hydrological processes, and ultimately the loss of the ecological community.

While the Ginini wetland was not burned, other ACT Government identified priority bogs such as Snowy Flats, Hanging Flats, Rotten Swamp, Cotter Source and Bimberi were impacted by moderate and high severity fire.

Following the 2003 fires a restoration program to maintain hydrological functions of bogs and fens was conducted. It is proposed that this previous work is reviewed in context of the current fire impact, and where possible, drawn on to inform treatment options.

Initial treatment recommendations

> Engage specialist restoration ecologist/s to undertake a fire impact assessment on bog and fen sites and develop a priority report for bog sites recovery actions and ongoing monitoring
> Engage contractors to install mitigation devices and maintain over 5 years
> Undertake twice yearly monitoring and repair measures by specialist teams including EPSDD staff

Map: See Map 5 Priority Flora Orroral Valley Fire

See page 44.

Photo

Rotten Swamp – post 2020 fire Wade Young

Discipline: Biodiversity – Flora

Asset name: Native plants and ecological communities - invasive plant impacts

Location: Namadgi National Park and Tidbinbilla Nature Reserve

Risk: Extreme

Impact: Invasive plant incursions (new species) and encroachment (existing species)

General description

The Orroral Valley fire and associated suppression activities have the potential to enhance the spread of invasive plants (including Weeds of National Significance) and facilitate new incursions throughout NNP and TNR. Increased impacts from invasive plants are likely in susceptible vegetation communities such as grasslands and riparian habitats, and in areas of disturbance. This includes around fire control lines, retardant lines, key access nodes, staging areas, and disturbed soils. Other priority ecosystems include threatened species habitats and threatened ecological communities. Competitive exclusion of native plants by invasive plants alters the community composition and may affect resilience to other threats, including drought and climate change. Priority emergent invasive plants that represent new threats to these ecosystems include Coolatai Grass, Ox-eye Daisy, and Hawkweed species. Priority existing invasive plants that pose a high-risk include African Lovegrass, Broom, and Nodding Thistle. It is recommended that seven years of extensive control be undertaken to manage invasive plants effectively post fire.

Initial treatment recommendations

- An initial assessment to determine if there are any new invasive plant incursions and to detect changes in distribution of existing invasive plant species is required
- Based on the assessment a targeted invasive plant control program aimed at priority invasive plant establishment or spread, and to promote regeneration of native flora
- Undertake monitoring of high-risk areas until the risk of establishment is sufficiently reduced
- Monitor the effectiveness of treatments to ensure effectiveness of control

Map: See Map 5 Priority Flora Orroral Valley Fire

See page 44.

Photo

Nodding Thistle invasion, post-fire 2019, Deklyn Townsend

Discipline: Biodiversity – Flora

Asset name: Threatened species and ecological communities – Feral herbivores

Location: Namadgi National Park

Risk: Extreme

Impact: Feral Herbivore impacts both direct and indirect on environmental values

General description

Feral herbivores represent a significant threat to flora and fauna populations post fire, particularly to threatened species, ecosystems and vegetation communities of high sensitivity. Impacts of feral herbivores include direct impacts such as digging, trampling, wallowing, browsing and track formation as well as indirect impacts on water quality through damage to riparian ecosystems. In addition to impacting threatened fauna and flora populations, feral herbivores may jeopardise the integrity of ACT's water supply. There is an increased risk of feral horse incursions into the ACT post fire. Movement of feral herbivores throughout NNP is likely to be enhanced post fire as food resources initially decline and then as vegetation recovers throughout the park. Feral herbivores represent a significant threat to threatened ecosystems such as alpine bogs and fens and are likely to impact on threatened fauna populations that occur in these communities, including the Broad-toothed Rat and Reiks Crayfish. Feral herbivores create competition with native fauna for resources, graze regenerating flora, and promote weed dispersal. High priority species for control include Sambar Deer, Feral Pigs, Feral Horses and Rabbits.

Initial treatment recommendations

> Undertake additional targeted feral herbivore (Sambar Deer, Feral Pigs, Feral Horses and Rabbits) control in priority habitat areas

> Control at key transit points such as Leura Gap and Murrays Gap, and sensitive habitats such as bogs and associated fens and grassland communities and riparian areas.

> Control should use a range of techniques including trapping, baiting, and aerial shooting. Ongoing control in this report is considered for the next three years during the most vulnerable timeframe after fire and would be in addition to current business as usual programs.

Map: See Map 5 Priority Flora Orroral Valley Fire

See page 44.

Photo

Horse damage in sub-alpine bog

D Butcher

Discipline: Biodiversity – Flora

Asset name: Threatened and significant plant species and communities

Location: Namadgi National Park

Risk: High

Impact: Loss of threatened plants and communities

General description

Within the burn area five EPBC-listed flora species and two ecological communities are listed and likely to have been impacted, of which two species and two communities are also listed as threatened under the ACT Nature Conservation Act. A further 17 species for which the ACT has a nationally important population were also identified (M. Mulvaney pers comm. 2020). There is concern that populations and extents will decline, and some populations may have been lost. In addition to the possibility of localised extinction following the event, post-fire risks include increased pressure from invasive plants, vertebrate pests, and native fauna grazing.

Initial treatment recommendations

- An immediate initial assessment and monitoring program of these species and communities, as well as impacted rare and uncommon species
- Assessment criteria to assess condition, presence/absence, condition, health, and extent of impacts
- Assessment will aid the development and implementation of a post-fire management plan to aimed as long-term viability and protection
- Note: discussions for the *Alpine Sphagnum Bog* community are excluded here, but detailed in the previous table (bogs and fens)

Map: See Map 5 Priority Flora Orroral Valley Fire

See page 44.

Photos

Hoary Sunray
(Leucochrysum albicans var. tricolor)
Canberra Nature Map

Natural temperate grassland – NNP
Deklyn Townsend

Discipline: Biodiversity – Flora

Asset name: Fire Sensitive Vegetation Communities

Location: Namadgi National Park and Tidbinbilla Nature Reserve

Risk: High

Impact: Loss of threatened plants and communities

General description

Five ecological communities within the Orroral Valley fire area have been identified as requiring immediate post fire assessment. These include Snow Gum, Alpine Ash, Callitris, Black Sallee, and Large-flowered Tea Tree dominant grass and woodlands. Populations have all been impacted by the fire and more information is needed on the population-level impact. Further assessment can determine the percentage of population impacted, fire history strategies, existing stressors and responses to drought conditions. These communities also need future management planning.

Initial treatment recommendations

- An immediate initial assessment to assess presence/absence, condition, health, extent and population size
- Assessment will aid the development and implementation of a post-fire management plan to aimed as long-term viability and protection
- The NNP and TNR Plans of Management will benefit from the assessments
- Determine if assisted recovery is an appropriate methodology
- Interventions considerate of changing climate challenges and long-term viability

Map: See Map 5 Priority Flora Orroral Valley Fire

See page 44.

Photos

Mount Tennant (Callitris)
RRAT Team

Blue Gum Hills (Callitris)
RRAT Team

Discipline: Biodiversity – Flora

Asset name: Hollow bearing trees

Location: Various trees across the Orroral Valley fire

Risk: High

Impact: Loss of significant habitat and associated species reliant on habitat

General description

Loss of hollow bearing trees has been listed as a key threatening process as it negatively affects threatened species and communities and can cause species to become threatened. Tree hollows are important for many fauna species and provide shelter, breeding sites and protection from predators. A correlation often exists between the abundance and richness of fauna species and the number of hollow bearing trees (Gibbons 2002). Wildfire removes hollow bearing trees from landscapes for a period, reducing immediate post-fire availability of this habitat resource. If hollow dependant fauna are unable to find suitable habitat, these species may be lost from the system until appropriate habitat is available and recolonisation occurs. Some montane forest trees will take over 100 years to naturally form hollows suitable for small fauna, and over 200 years for larger fauna species, such as large gliders (Gibbons 2002).

Initial treatment recommendations

- An immediate initial assessment to determine availability of hollow bearing trees for arboreal fauna in the areas impacted by fire (the assumption is great loss of hollow bearing trees)
- The assessment criteria should identify locations where decline in species abundance is likely and where assisted recovery could be appropriate
- An assessment report with describes management options for assisted recovery
- Modelling of habitat tree availability in relation to past fire regimes can assist this analysis
- Considerations have been for widespread manual hollow creation.
- Monitoring of hollow use by fauna populations, natural hollows and management interventions

Map: See Map 5 Priority Flora Orroral Valley Fire

See page 44.

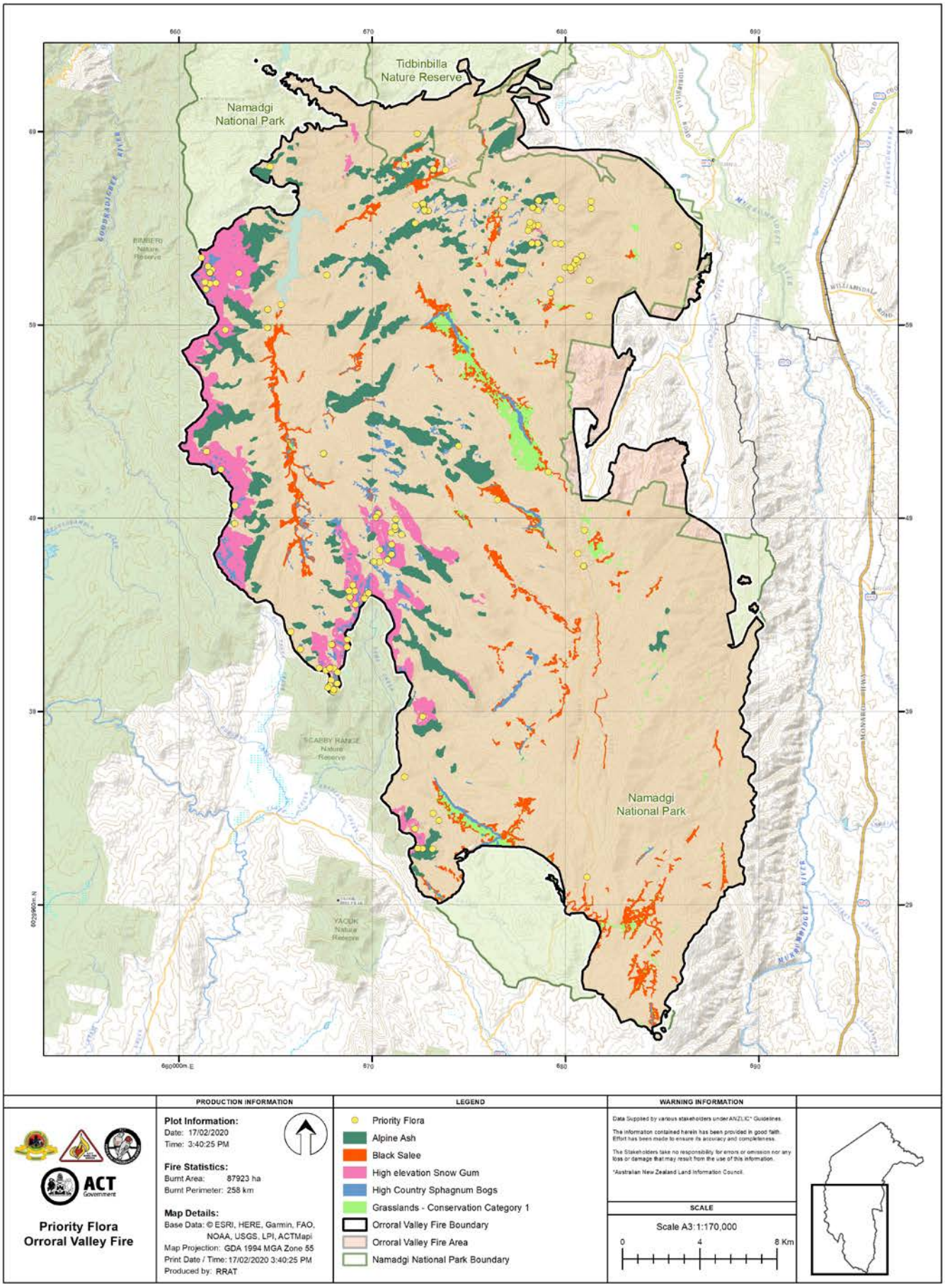
Photos

Gudgenby Valley post fire Feb 2020
Wade Young

Boboyan Valley post fire Feb 2020
Wade Young

Alpine Ash regeneration, c.2003
Julian Seddon

MAP 5: PRIORITY FLORA ORRORAL VALLEY FIRE



PRODUCTION INFORMATION

Plot Information:
Date: 17/02/2020
Time: 3:40:25 PM

Fire Statistics:
Burnt Area: 87923 ha
Burnt Perimeter: 258 km

Map Details:
Base Data: © ESRI, HERE, Garmin, FAO, NOAA, USGS, LPI, ACTMapi
Map Projection: GDA 1994 MGA Zone 55
Print Date / Time: 17/02/2020 3:40:25 PM
Produced by: RRAT

ACT Government

Priority Flora
Orroral Valley Fire

LEGEND

- Priority Flora
- Alpine Ash
- Black Salee
- High elevation Snow Gum
- High Country Sphagnum Bogs
- Grasslands - Conservation Category 1
- Orroral Valley Fire Boundary
- Orroral Valley Fire Area
- Namadgi National Park Boundary

WARNING INFORMATION

Data Supplied by various stakeholders under ANZLIC* Guidelines.

The information contained herein has been provided in good faith. Effort has been made to ensure its accuracy and completeness.

The Stakeholders take no responsibility for errors or omission nor any loss or damage that may result from the use of this information.

*Australian New Zealand Land Information Council.

SCALE

Scale A3: 1:170,000

0 4 8 Km

FIRE REHABILITATION

DESCRIPTION

Fire rehabilitation focuses on the works required to restore areas after the direct fire operations. This is the 'make safe, make good' principle and involves actions to address urgent remediation of dozer lines and other earth works and ensure safe access through firegrounds. Key aspects of the Orroral Valley fire operations requiring remediation are associated with the consolidation of control lines with heavy plant and the use of retardant within the water catchment.

Tasks undertaken as part of this project include:

> Dozer line and fire operations works identification

> Dangerous tree assessment and removal, especially along key public access routes

> Stabilisation of critical infrastructure

> Protection of catchment values

There are 577 kms of control lines associated with the fire operations. The majority of these were along existing fire trails. There has been approximately 20 kms of control lines in agricultural lands for infrastructure protection. Liaison with landholders is underway to identify remediation work.

There were 360 flights undertaken in the ACT which delivered approximately 2.17 million litres of retardant across 46 kms of the Orroral Valley fire. The location of the broad strategic drops can be seen on **Map 6: Containment & Rehabilitation.** Retardant drops were also made around key assets such as communications towers (e.g. Bulls Head, Ginini and Mt Booth) and huts. From aircraft tasking information it may be possible to refine estimates of retardant concentrations should site specific concerns arise.

METHODS

Assessment of key actions has come from operational reports of specific rehabilitation or mitigation works undertaken as part of fire operations. For example, the installation of sedimentation controls around Corin Dam was based on information on the catchment and the removal of dangerous trees along key access roads and trails.

Determination of priorities for immediate action has considered timing, safety, public access and mitigation measures to protect water quality.

Access to Australian Defence Force resources to support time critical stabilisation work has supported the delivery of these operations.

ASSUMPTIONS AND GAPS

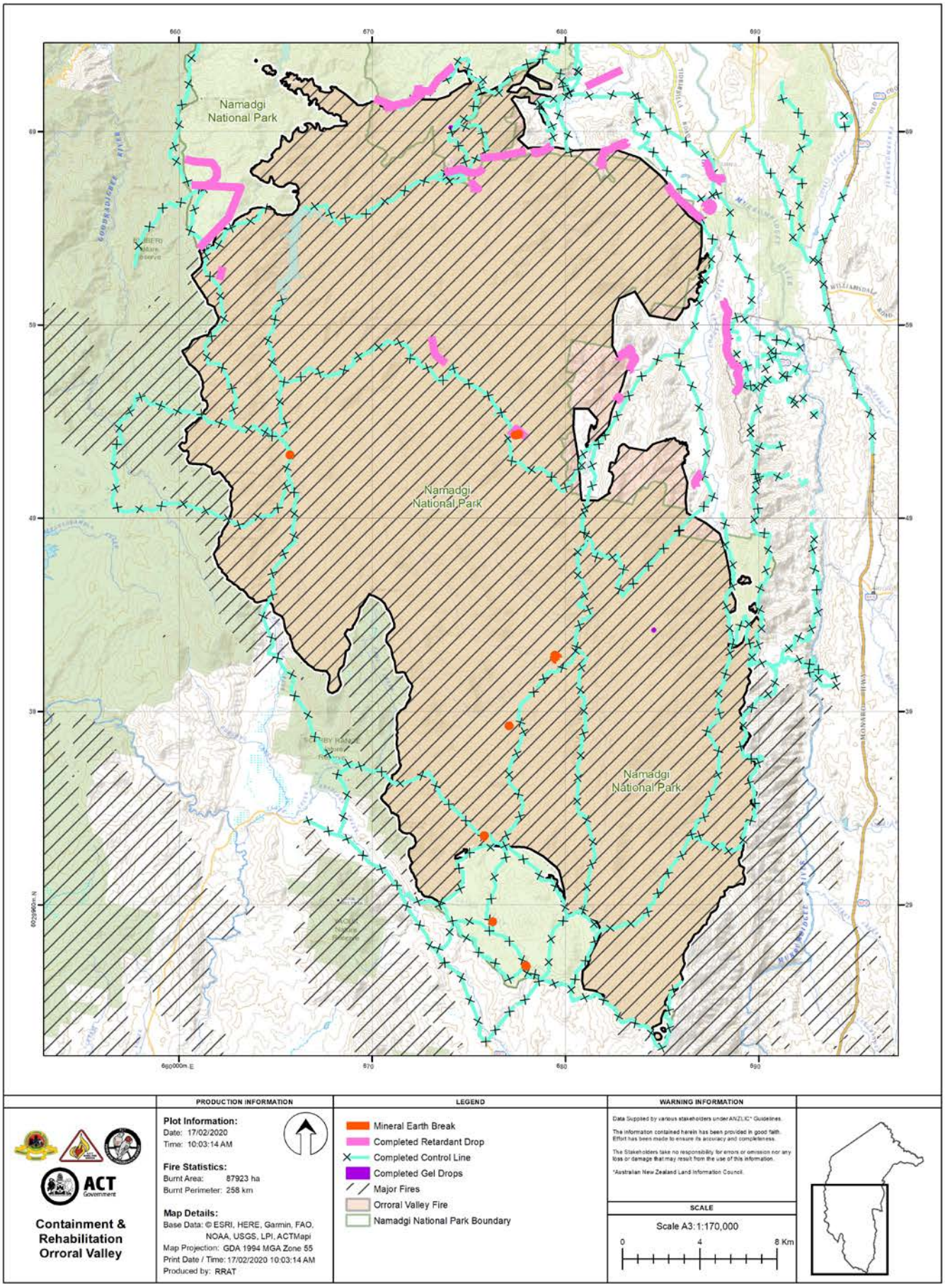
The mapping of the new control lines is incomplete and has included work undertaken on existing farm tracks. Addressing the accuracy of this data set will provide longer term capability to address issues not currently identified.

DISCUSSION

Recovery work with landholders has commenced to address high priority recovery tasks that are not time critical which include replenishing water used during fire operations, repair of damaged or burnt fences and remediation or stabilisation of new control lines.

Future planned work has the potential to involve a broad cross section of the community. It is important to ensure that cultural and social values are embedded in the rehabilitation process.

MAP 6: CONTAINMENT AND REHABILITATION ORRORAL VALLEY FIRE



GLOSSARY

Aboriginal places and objects. Places and objects associated with Aboriginal people because of Aboriginal tradition, encompassing customs, rituals, institutions, beliefs or general way of life of Aboriginal people; and including archaeological sites. All Aboriginal places and objects within NNP are afforded protection by the Heritage Act 2004.

Aboriginal stone arrangements. Deliberate placement of stones to create to various designs and morphologies, including circles, lines, pathways, standing stones and cairns; for purposes that ranged from practical (e.g. fish traps) to ceremonial (ie, Bora or male initiation sites). Many ceremonial stone arrangements were aligned with cardinal points, reflecting significant astronomical knowledge.

Coarse Woody Debris Logs that have a diameter greater than 75mm.

Consequence. The impact a risk event will have on objectives if it occurs.

Ecological Community. An ecological community (EC) is a group of native plants, animals and other organisms that naturally occur together and interact in a unique habitat. Its structure, composition and distribution are determined by environmental factors such as soil type, position within the landscape/seascape (e.g. altitude/depth), climate, and water availability, chemistry and movement (e.g. oceanic currents). Species within each ecological community interact with and depend on each other—for example, for food or shelter. Listed ecological communities include grasslands, woodlands, shrublands, forests, wetlands, marine, ground springs and cave communities. (Dept. of Environment)

Energy Dissipator. A structure used to absorb the energy of flowing water of high velocity. These are often incorporated into hydraulic structures (such as culverts) to reduce the erosive power of flowing water.

Evapotranspiration. The removal of moisture from soil by evaporation combined with the transpiration of vegetation in that soil.

Grade Stabilisation. A structure installed within a gully or waterway which is designed to gradually accumulate sediment above it, resulting in a lessoning of the grade, and hence the velocity of flowing water, of the gully or waterway.

Heritage places and objects. Places and objects that have heritage significance under Section 10 of the Heritage Act 2004, and which are registered on the ACT Heritage Register. All registered heritage places within NNP are afforded protection by the Heritage Act 2004.

Infiltration. The downward movement of water into the soil, which is regulated by surface and subsurface soil conditions and vegetation cover.

Key threatening process. A process that threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community.

Likelihood. Probability or chance of something occurring.

Nationally significant species. Taxa for which the ACT has nationally significant populations.

Priority Bogs. ACT Government identified priority bogs as identified on the ACT Government Priority Bogs list. Prioritised based on international protection listings (RAMSAR), elevation, size, condition and Corrobboree Frog release sites.

Representative Aboriginal Organisations (RAOs). Four organisations declared by the Minister under the *Heritage Act 2004,* who have a formal statutory role in Aboriginal heritage assessment and management. Declared RAOs are Buru Ngunawal Aboriginal Corporation; King Brown Tribal Group; Mirrabee; and Ngarigu Currawong Clan.

Residual Risk. The level of risk which is present after taking into account further treatments and the effectiveness of treatments.

Risk Assessment. The overall process of risk identification, risk analysis and evaluation.

Risk Matrix. Used to analyse the level of risk by considering the category of probability or likelihood against the category of consequence severity.

Risk Treatment. The process of selection and implementation of measures to modify risk.

Runoff. The proportion of precipitation not immediately absorbed into or detained upon the soil and which therefore becomes surface flow. Runoff is the major agent of erosion, and the amount depends of rainfall intensity and duration, slope, vegetation cover and soil conditions.

Species of national concern. Species prioritised for post fire management response through the Rapid analysis of impacts of the 2019-20 fires on animal species, and prioritisation of species for management response – preliminary report. Prepared for the Wildlife and Threatened Species Bushfire Recovery Expert Panel, February 2020.

Threatened Species. A species that is listed as endangered, critically endangered, vulnerable or conservation dependant under the Environment Protection and Biodiversity Conservation Act 1999.

The Fire. The Orroral Valley fire begun in Orroral Valley on January 27th, 2020 and which burned through NNP and into TNR as well as some rural properties in the ACT. Topic of this report.

Weeds of National Significance. Weeds recognised as having the potential to become a significant threat to biodiversity if they are not managed based on their invasiveness, potential for spread and environmental, social and economic impacts.

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