UPPER NEPEAN STATE CONSERVATION AREA

Fire Management Strategy (Mapsheet 1 of 3)

2009

This strategy should be used in conjunction with aerial photography and field reconnaissance during incidents and the development of incident action plans.

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This strategy is a relevant Plan under Section 38 (4) and Section 44 (3) of Rural Fires Act 1997.

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Department of Environment & Climate Change NSW

SYDNEY CATCHMENT AUTHORITY

Endorsed By: ______________________

Executive Director,
Park Management Division

Map Details

Datum: Australian Geodectic Datum of Australia (AGD) 1966	**Aerial Photography:** NSW Department of Lands (2001).
Projection: Australian Map Grid (AMG) Zone 56	**1:25k Topographic Map:** Bargo 9029-3-N, Picton 9029-4S

Communications Information

Service	Channel	Location and Comments
NPWS - VHF	2	• Good coverage on ridges; poor in gullies. • NPWS channel 2 • Repeater located at High Range
NPWS – Car to car	34, 36, 41, 42	• Only good using a designated car to car channel.
NPWS mobile cross band repeater	15	• Can be transported to accessible ridgetops. • Enables comms between NPWS & RFS radios • Repeaters stored at Royal National Park and Nattai Area Office, Picton • Contact NPWS Fire Management or Regional Duty Officer for release of repeater on 0419 428 054.
NPWS	95	• = SCA channel 1 & allows NPWS & SCA staff to communicate between each other.
SCA - VHF	1	• Very good coverage • SCA channel 1 = NPWS channel 95 • During the official fire season, SCA fire tower operators report weather conditions & fire reports via this radio channel to Wollondilly Fire Control.
RFS – Wingecarribee GRN	G093	• Good coverage
RFS – Wingecarribee Fire Ground VHF	Channels 1-7	• Good coverage
RFS – Wingecarribee PMR	P079, P080, P092, P107, P108	• Good coverage
RFS – Wollondilly Fire Ground VHF	Channels 8-15	• Good coverage
RFS – Wollondilly GRN	94	• Good coverage
RFS – Wollondilly PMR	Vote 95, 110, 222, 234	• Good coverage
UHF - CB	1 - 40	• Available in most RFS vehicles & some NPWS staff have hand helds. • Only to be used by NPWS where all other forms of comms fails & when approved by Operations. • Choose channel on fire-ground with RFS.
Mobile Phone - GSM	-	• Average coverage, very poor in gullies. • Shouldn't be relied upon
Mobile Phone – Next G	-	• Moderate coverage on ridges; poor in gullies. • Shouldn't be relied upon
Mobile Phone – 3G	-	• Moderate coverage on ridges; poor in gullies. • Shouldn't be relied upon

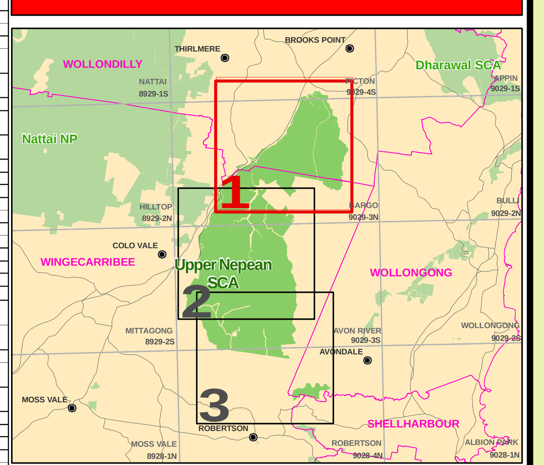
Related Documents

- Upper Nepean SCA Draft Plan of Management 2006
- Special Areas Strategic Plan of Management (SASPOM) 2007
- Shale Sandstone Transition Forest Endangered Ecological Community Information, February 2007
- O'Hares Creek Shale Forest Endangered Ecological Community Information, February 2007
- Cumberland Plain Woodland Endangered Ecological Community Information, February 2007
- Southern Highlands Shale Woodland Endangered Ecological Community Information, January 2007
- Robertson Basalt Tall Open Forest Endangered Ecological Community Information, January 2007
- Robertson Rainforest Endangered Ecological Community Information, January 2007
- NPWS 'Native vegetation of the Woronora, O'Hares and Metropolitan Catchments' 2003
- DECC 'Terrestrial vertebrate fauna of the Greater Southern Sydney Region' 2007
- Wollondilly BFMC S52 Bushfire Operations Coordination Plan 2008
- Wingecarribee BFMC S52 Bushfire Operations Coordination Plan 2008
- NSW Threatened Fauna Fire Response Database 2002
- NSW Flora Fire Response Database 2002
- National Parks and Wildlife Service Fire Management Manual

Contact Information

Agency	Position / Location	Phone
National Parks & Wildlife Service	SSR Regional Duty Officer (24 hour)	0419 428 054
	Illawarra Area Office	4223 3000 (ph) 4223 3009 (fax)
	Fire Management Officer	9542 0636
	Regional Operations Coordinator	9542 0644
Sydney Catchment Authority	Incident Control (24 hour)	1800 061 069 or 9751 1988
	South-East Catchment Office - Campbelltown	4640 1280 (ph) 4640 1222 (fax)
Wollondilly NSW Rural Fire Service	Duty Officer (24 Hours)	(not for public use - fireline) 4677 1605
	Business Hours	4677 7000 (ph) 4677 2999 (fax)
Wingecarribee NSW Rural Fire Service	Duty Officer (24 Hours)	(not for public use -fireline) 4871 3765
	Business Hours	4871 2666 (ph) 4871 3756 (fax)
SES	Wollondilly	4677 1417
	Wingecarribee	4871 2433
Police	Emergency	000
	Picton	4677 8999
	Mittagong	4871 1222
	Bowral	4862 9299
	Moss vale	4868 1222
	Robertson	4885 1244
Ambulance	Emergency	000
	Bookings	131 233
Hospital	Bowral	4861 0200
Council	Wollondilly Council	4677 1100 (24 hrs) 4677 2339 (fax)
	Wingecarribee Council	4868 0888 (bh) 4869 1203 (fax)
Rural Lands Protection Board	Moss Vale	4655 9165
RTA	Head office management transport	9831 0911 131 700 (24 hours)
TransGrid	Head office control room	9620 0893 (bh) 1800 027 253 (24 hrs)
Integral Energy	Business Hours	131 081
	Emergency Service (24 hours)	131 003
Telstra Australia		1300 368 387
Optus	24 hrs	1800 505 050
Bureau of Meteorology	General	9296 1555 9269 8589
	Special fire weather forecasts	9296 1508 (ph) 9638 7956 (fax)
Wildlife Rescue/Rehabilitation	WIRES - Wollondilly	4684 1656
	NANA - Picton	4681 9526

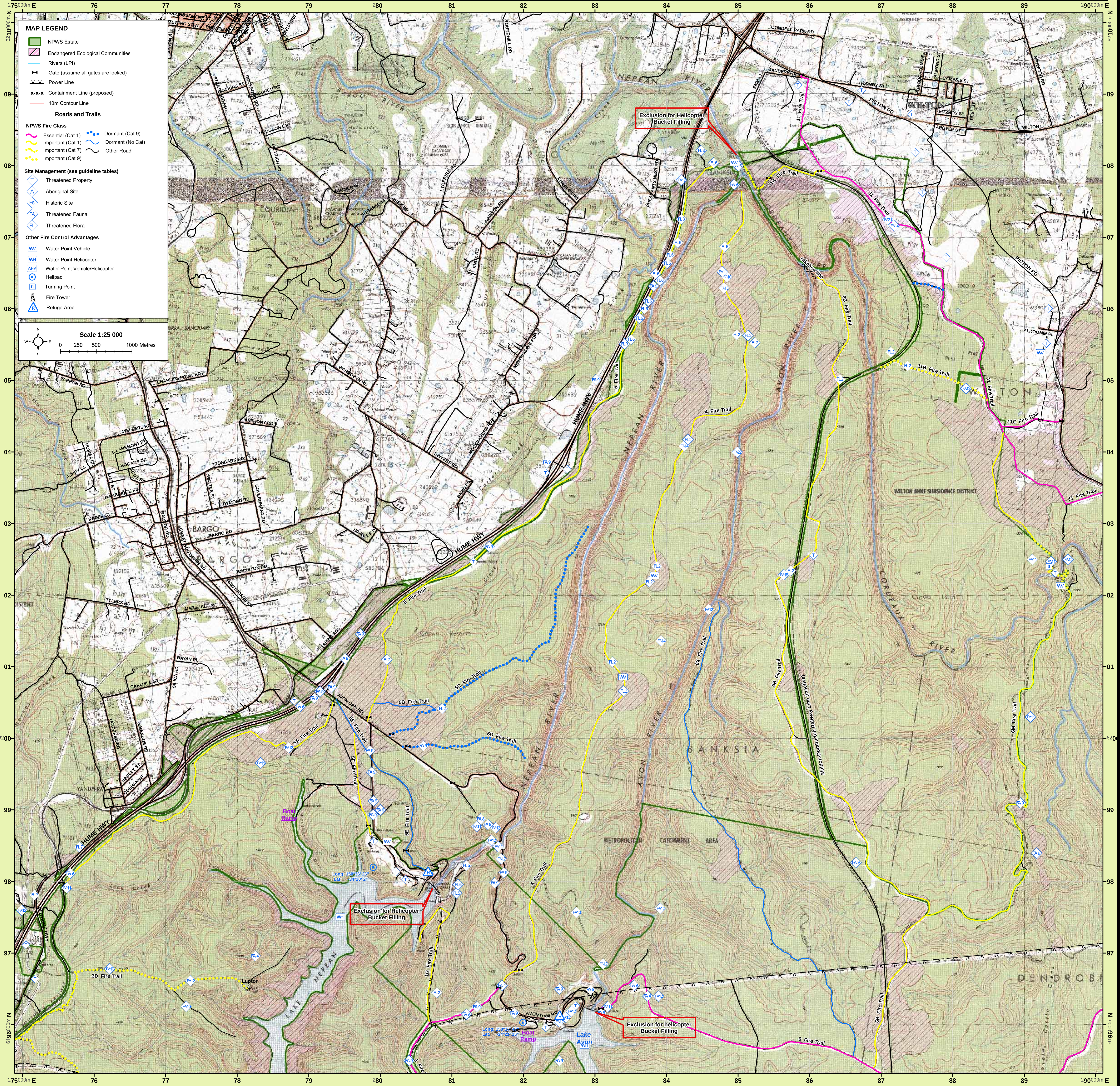
Locality of Reserve and Local Government Areas



Fire Season Information

Wildfires	The statutory wildfire season occurs between 1st October and 31st March. This may be extended if weather conditions lead to increased fire danger outside of this period.
Prescribed Burning	Prescribed burning in this area is normally undertaken from Autumn until early winter.

Bushfire Suppression



Resource Management Guidelines

Resource	Guidelines
Threatened Flora Management	
Daphnandra sp. C Illawarra Illawarra Socketwood *(Endangered)* **FL1**	Medium sized tree that occurs in rainforest on rocky hillsides & gully slopes of the Illawarra escarpment & coastal lowlands. Limited information available on effects of fire on this species, but fire would be likely to cause a negative impact on the life cycle of this species. • Exclude fire & mechanical vegetation clearance from known habitat that supports this species.
Epacris purpurascens var purpurascens *(Vulnerable)* **FL2**	Shrub that occurs in a range of habitats • Recommended fire interval of 10-15 years. • Lifespan of plant is 5-20 yrs, with 2-4 yrs to set first seed. • Obligate seeder which is killed by 100% scorch. • Regenerates by seed. Seed stored in the soil. Propagule store exhausted (germinates or lost) at first disturbance. • Avoid winter & spring burns (flowering season). • Grows in a range of habitats.
Grevillea parviflora subsp parviflora Small-flower Grevillea *(Vulnerable)* **FL3**	Small shrub that occurs in heath & shrubby woodland & open forest. • Avoid too frequent burning. Limited information on recommended fire intervals, but minimum time needed between fires is that which plants become sexually mature & produce seed, which is at least 10 years. • Reproduces by seed. Seed stored in the soil. Germination rate from seed seems to be very low. Plant is usually killed by fire but sometimes regenerates by suckering from rhizomes. Propagule store exhausted (germinates or lost) at first disturbance. • Main flowering period is Winter-Spring, but has also been recorded flowering in Autumn.
Irenepharsus typherus Illawarra Irene *(Endangered)* **FL4**	Annual herb that occurs in steep rocky slopes and cliff lines at the ecotone of sclerophyll forest & rainforest. • Species likely to be killed by fire. • Exclude fire where species grows within rainforest habitats. • Occasional burning where species occurs in sclerophyll forests, but minimum fire interval of once every 25 years; may assist in maintaining the habitat's structure & floristics. • Avoid slashing/clearing/mechanical fuel reduction at known sites. • Reproduces by seed stored in the soil, depending on the intensity of the fire. • Recruitment of species occurs readily in the inter-fire period.
Melaleuca deanei Deane's Paperbark *(Vulnerable)* **FL5**	Large shrub/small tree that occurs in Sandstone Woodland (in heath). • Avoid too frequent burning. • Recommended minimum fire interval is 8 years. Indefinite lifespan, approximated to 100 years (=Maximum plant age at which senescence is expected to occur and seedbank longevity). • Limited capacity to regenerate from seed. Regenerates by resprouting from rhizomes/lignotubers. • Serotinous = most seed retained for a few years (released by fire, death, drying over time). Seed is stored in the canopy. Survives 100% scorch. Propagule store short-lived (transient or lost at senescence of plant). Intolerant of competition. Frequent fire regime leads to sp. decline. Sensitivity to infrequent fire regime leads to extinction. Plant age at first flowering is 3-4 years. Post-fire age at which flowering first occurs from resprouting material is less than 2 years.
Persoonia bargoensis Bargo Geebung *(Endangered)* **FL6**	Shrub that occurs in woodland & dry sclerophyll forest. • Avoid too frequent burning. • Recommended minimum fire interval is 7 years. • Obligate seeder which is killed by 100% scorch (or possibly even lower fire intensity). • Recruitment occurs by seed stored in the soil. Propagule store exhausted (germinates or lost) at first disturbance. • Flowers in Summer.
Persoonia hirsute Hairy Geebung *(Endangered)* **FL7**	Shrub that occurs in dry sclerophyll open forest, woodland, & heath on sandstone • Avoid too frequent burning. • Minimum fire interval is 7 years. • Obligate seeder which is killed by 100% scorch (or possibly even lower fire intensity). • Reproduces by seed stored in the soil. Propagule store exhausted (germinates or lost) at first disturbance. • Flowers in Spring-Summer.
Solanum celatum *(Endangered)* **FL8**	Shrub that occurs in rainforest clearings & wet sclerophyll forest. • Fire sensitive species – adults killed by fire. Avoid too frequent burning. • Recruitment occurs by seed stored in the soil. • Flowers from August – October & produces fruit in December.
Threatened Property	• Where possible property owners with assets at risk from a wildfire event should be kept informed regarding the progress of the fire; and asked for an assessment of their current level of asset protection preparedness

Resource Management Guidelines

Resource	Guidelines
Aboriginal Cultural Heritage Site Management	
A2	• As far as possible, protect site from moderate to high intensity fires (post-fire soil erosion may cause artefact movement and damage deposit). Low intensity fires unlikely to have an impact. • Avoid all ground disturbance including the use of earthmoving machinery, handline construction and driving over site. • Avoid water bombing which may cause ground disturbance. • If achievable and will cause less damage, consider using wetlines rather than clearing fuel.
A3	• Clearly identify site and avoid all ground disturbance including the use of earthmoving machinery, handline construction and driving over sites. • Avoid waterbombing which may cause ground disturbance. • Site may be burnt by wildfire, backburn or prescribed burn without damage.
Threatened Fauna Management	
	Amphibians
Heleioporus australiacus Giant Burrowing Frog *(Vulnerable)* **FA1**	• Avoid ground & hydrological disturbance in areas of known locations, eg water courses & wetlands. • Be aware of this species when constructing hand tool lines & containment lines using heavy machinery that disturbs bare earth, especially in sandstone geology, incl near riparian areas in upper catchments. • Avoid too frequent burning. • Research generally indicates that as these mature frogs deep burrow & raise tadpoles in true riparian areas, they are not generally affected by prescribed fire, but could be sensitive to its habitat & associated food sources being burnt through too frequent burning. Tadpoles possibly at risk from the fallout of ash, & influx of sediments after heavy rainfall following fires, into waterholes. • Peak breeding season is summer & autumn, also tadpoles often over winter. Breeding dependant on weather conditions, ie heavy rainfall events.
Litoria littlejohni Littlejohns Tree Frog *(Vulnerable)* **FA2**	• Any fire potentially affects this species. • Avoid canopy fires & too frequent burning. • Threatened frog that is possibly most at risk because it is often arboreal (shrub layer) & only known to come to the ground to breed, & also likely to refuge in tree hollows. • Tadpoles possibly at risk from the fallout of ash, & influx of sediments after heavy rainfall following fires, into waterholes. • Peak breeding season is late Winter through to Autumn, also tadpoles often over Winter. • Highly susceptible to spread of Chytrid fungus by personnel & machinery – wear footwear that is dry & clean of mud/dirt.
Mixophyes balbus Stuttering Frog **FA3**	• Semi-aquatic species in rainforest & wet sclerophyll forest utilising leaf litter. Possibly locally extinct. Limited information available on fire response. • Avoid burning of riparian areas within known habitat. • Tadpoles possibly at risk from the fallout of ash, & influx of sediments after heavy rainfall following fires, into waterholes. • Peak breeding season is late Summer, also tadpoles over winter. Breeding triggered by heavy rain events. • Highly susceptible to spread of Chytrid fungus by personnel & machinery – wear footwear that is dry & clean of mud/dirt.
Pseudophryne australis Red-crowned Toadlet **FA4**	• Avoid unnecessary clearing of rocks, fallen logs & other components of ground fuel which provide shelter/habitat for the species, especially in table & mitre drains adjacent to fire trails. • Autumn burns preferred over Spring burns, dependant on local breeding events. • Research generally indicates that the occasional fire does not impact on this species as they will often refuge in rock crevices, but that too frequent burning could cause detrimental impacts. Most at risk are juveniles & egg masses, which are deposited in leaf litter. • Peak breeding season is summer, but may occur at any time of the year. Breeding dependant on weather conditions, ie rainfall. • Highly susceptible to spread of Chytrid fungus by personnel & machinery – wear footwear that is dry & clean of mud/dirt.
	Reptiles
Hoplocephalus bungaroides Broad-headed Snake & *Varanus rosenbergi* Rosenberg's Goanna *(Vulnerable)* **FA5**	• Autumn burns preferred as less likely to affect nests & young individuals. • Requires fires of low intensity & frequency. • Avoid unnecessary clearing rocks, fallen logs & other large components of ground fuel that provide shelter/habitat for the species. • Avoid canopy fires & too frequent burning. • BH Snake - Species potentially at risk because it utilises tree hollows during summer months. Lives beneath slabs of sandstone during winter months. Generally not highly affected by prescribed burning activities of low fire intensity, but will be affected if the burns are of a high intensity & result in old hollow-bearing trees being killed &/or falling, esp in Summer & early Autumn. • R goanna - Protect termite mounds as these are important nesting & shelter sites.

Suppression Strategies

Current FDR	Forecast FDR	
Low – Mod	Low – Mod	• As far as possible, undertake indirect, parallel or direct attack along existing control lines. • As far as possible, maximise area burnt without threatening assets, including biodiversity. • Identify and survey backup control lines.
Low – Mod	=> High	• Undertake indirect, parallel or direct attack to minimise the time taken to contain the fire. • Construct new control lines if necessary to minimise the time to contain the fire. • Identify and survey backup control lines.
High	All	• Undertake indirect attack along existing or newly constructed control lines. • Secure and deepen control lines along the next predicted downwind side of the fire. • Identify and survey backup control lines.
All	All	• Ensure there is sufficient time to secure control lines before the fire gets to them. • If there is insufficient time to secure control lines, fall back to the next potential control line. • As far as possible, implement threatened species and cultural heritage management guidelines.

Resource Management Guidelines

Resource	Guidelines
	Mammals
Cercartetus nanus Eastern Pygmy Possum *(Vulnerable)* & *Isodon obesulus obesulus* Southern Brown Bandicoot (eastern) & *Potorous tridactylus* Long-nosed Potoroo *(Vulnerable)* **FA6**	• Avoid high intensity fires & too frequent burning. • Avoid frequent, low intensity fires/burns which remove dense shrub cover. • Avoid high intensity fires in known locations, eg moist sandstone gully forest, fringing eucalypt woodland, & upland swamp. • EPP – Avoid burning old growth Banksias, & try to maintain mosaic of older & younger stands. • Mosaic burn effect preferred to increase diversity & structural complexity of vegetation & protective cover, as well as mosaic of age classes. • Bandicoot - Avoid too frequent burning, but species may decline if extensive habitat is left too long unburnt. • Avoid fire in gullies, moist habitats & hollows (impt refuge/shelter). • Protect known den trees. • Autumn is preferred timing for prescribed burns. • Consider undertaking feral animal control programs (esp. foxes, wild dogs & deer) at known locations of this sp. after fires & prescribed burns.
Dasyurus maculatus Spotted-tailed Quoll *(Vulnerable)* **FA7**	• Relatively large home range suggests that quolls have good dispersal ability to avoid the direct effects of fire. Indirect affects can include competition with foxes. • Protect known den trees, fallen logs with hollows, & tree hollows (alive & dead), esp trees with hollow diameter greater than 20cm. • Avoid high intensity fires. • Autumn is preferred timing for prescribed burning (avoid spring burns), based on breeding season: mating occurs May-June; young in pouch June – late August; young in den August – September = most vulnerable time; & juveniles dispersing end Dec/Jan/Feb (summer).. • Avoid felling of known roost trees & potential roost trees (those with hollows).
Petaurus australis Yellow-bellied Glider *(Vulnerable)* & *Petaurus norfolcensis* Squirrel Glider *(Vulnerable)* **FA8**	• Protect den trees/feed trees & avoid high intensity fires in canopy. • Avoid too frequent burning, especially during winter months when preferred food sources are in flower eg Banksia, Allocasuarina & Ironbark. • Autumn is preferred timing for prescribed burning. • Avoid felling of known roost trees & potential roost trees (those with hollows).
Phascolarctos cinereus Koala *(Vulnerable)* **FA9**	• Prevent fires from reaching the canopy. • Avoid too frequent fire. • High frequency burning & consequent reduction in cover is likely to increase predation pressure, so feral animal control programs should occur immediately following any fires or prescribed burns in koala habitat. • Home range size vary, but female home ranges average 1 animal per 30ha, so burn patch size should be less than 10ha where possible. • Reports of all koalas (alive or dead) to be reported to the Koala Hotline on phone (02) 9962 9996 (& describe colour of ear tag if known). • Avoid frequent low intensity burning which removes dense shrub cover. • Avoid fire in gullies, moist habitats, & dense thickets – important refuge.
Chalinolobus dwyeri Large-eared pied bat *(Vulnerable)* **FA10**	• Occurs across a range of mostly drier vegetation types in both wet & dry sclerophyll forests, Callitris forest, sandstone outcropping, & wet gullies. Limited information available on fire response. • Potentially unaffected by fire when within preferred fire regimes as species often roosts in caves, but may be affected short-term by smoke within the caves.
Falsistrellus tasmaniensis Eastern False Pipistrelle *(Vulnerable)* & *Miniopterus schreibersii oceanens* Eastern Bentwing Bat *(Vulnerable)* & *Mormopterus norfolkensis* Eastern Free-tail Bat *(Vulnerable)* & *Scoteanax rueppellii* Greater Broad-nosed Bat *(Vulnerable)* & *Myotis adversus* Large-footed Myotis *(Vulnerable)* & *Pteropus poliocephalus* Grey-headed Flying Fox *(Vulnerable)* **FA11**	• Avoid interfire intervals of <10 years in locations where these species are known to occur. • Avoid felling of known roost trees & potential roost trees (those with hollows). • Large footed myotis - Exclude fires from riparian areas & moist forests. • More likely to be affected (suffocated) by smoke whilst in tree hollows. • Maintain a mosaic of age classes within known or potential foraging habitat. • Protect large & hollow-bearing trees where sp occurs, & avoid fire in fallen logs with hollows. • More likely to be affected (suffocated) by smoke whilst in tree hollows. • GH Flying Fox - Prevent canopy fires. Avoid too frequent burning (particularly larger Banksia sp. in the understorey). Avoid fire in near vicinity of roost within known or potential habitats where possible, esp during breeding season (March-October).

Resource Management Guidelines

Resource	Guidelines
	Birds
Callocephalon fimbriatum Gang-gang cockatoo *(Vulnerable)* **FA12**	Fire requirements unknown. Unlikely to be affected by fire as species has good dispersal ability. • Avoid fire in canopy with hollows – preferred nesting site. • Avoid winter burns in locations frequented by this species.
Calyptorhynchus lathami Glossy Black-cockatoo *(Vulnerable)* **FA13**	Species has good dispersal ability, but can be affected by wildfire as it's a specialised feeder which only eats Allocasuarina/Casuarina seeds. These forage species are sensitive to high intensity fire with a recurrent frequency of <10 years. • Avoid high intensity fires that consume canopies, sub-canopies, & fallen logs, particularly where Allocasuarina sp. are present, & have previously been burnt within the last 15 years (minimum time required for sp. to set seed). Protect large & hollow-bearing trees where species occurs. • Locations include creeklines.
Lathamus discolor Swift Parrot *(Endangered)* & *Neophema pulchella* Turquoise Parrot *(Vulnerable)* **FA14**	• Fire regime should create a mosaic of burnt & unburnt areas, & a mosaic of age classes within habitat. • Avoid frequent, high intensity burns within known or potential habitat. • Protect large & hollow-bearing trees where species occurs. • Burns should be of low intensity & preferably outside autumn & winter when preferred feed trees (Eucalypts etc) are in flower. • Turquoise parrot – frequent fires may reduce the number of low nesting hollows such as logs, stumps & posts preferred by this sp.
Ninox strenua Powerful Owl *(Vulnerable)* & *Tyto novaehollandiae* Masked Owl *(Vulnerable)* **FA15**	Species have fairly good dispersal ability, but may be affected by fire if fire occurs in canopy as sp. reliant on arboreal mammals (eg possums, gliders) for food, which attain their highest density under long intervals between fires. • Protection of nesting sites required year round, as sp. often uses same site year after year. • Avoid too frequent burning, esp in canopy with hollows – preferred shelter/roost. • Powerful owl breeds May - July. Masked owl breeds April – July. • Masked owl also preys on ground dwelling mammals, esp rats; Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.
Pachycephala olivacea Olive Whistler *(Vulnerable)* **FA16**	Occurs locally within moist gullies & dense wet heathland. Preferred shelter/roost, nesting & foraging is dense shrub vegetation & requires high moisture availability year round. • Avoid frequent low intensity burns within understorey of known habitat, or any high intensity burns within the understorey.
Pyrrholaemus sagittatus Speckled Warbler *(Vulnerable)* **FA17**	Ground feeder that requires leaf litter, fallen timber, & other ground debris, & nests on the ground, so sp potentially affected by even low intensity burns. • Either exclude fire from known habitat or only have very small low intensity patch burns. Avoid high intensity burns. • Avoid burning within known habitat during breeding season (August – January).
Tyto tenebricosa Sooty Owl *(Vulnerable)* **FA18**	Preferred habitat is rainforest & wet sclerophyll forest with a well developed mesomorphic understorey. Fire requirements unknown. • Avoid fires in gullies, especially where eucalypts occur on the edge of rainforest. • Avoid frequent burning in sheltered areas with an easterly & southerly aspect. • Protect large & hollow-bearing trees where species occurs. • Feeds on arboreal & ground dwelling mammals. • Breeds Feb – May.

Operational Guidelines

Refer to Strategy for Fire Management 2003 & Fire Management Manual

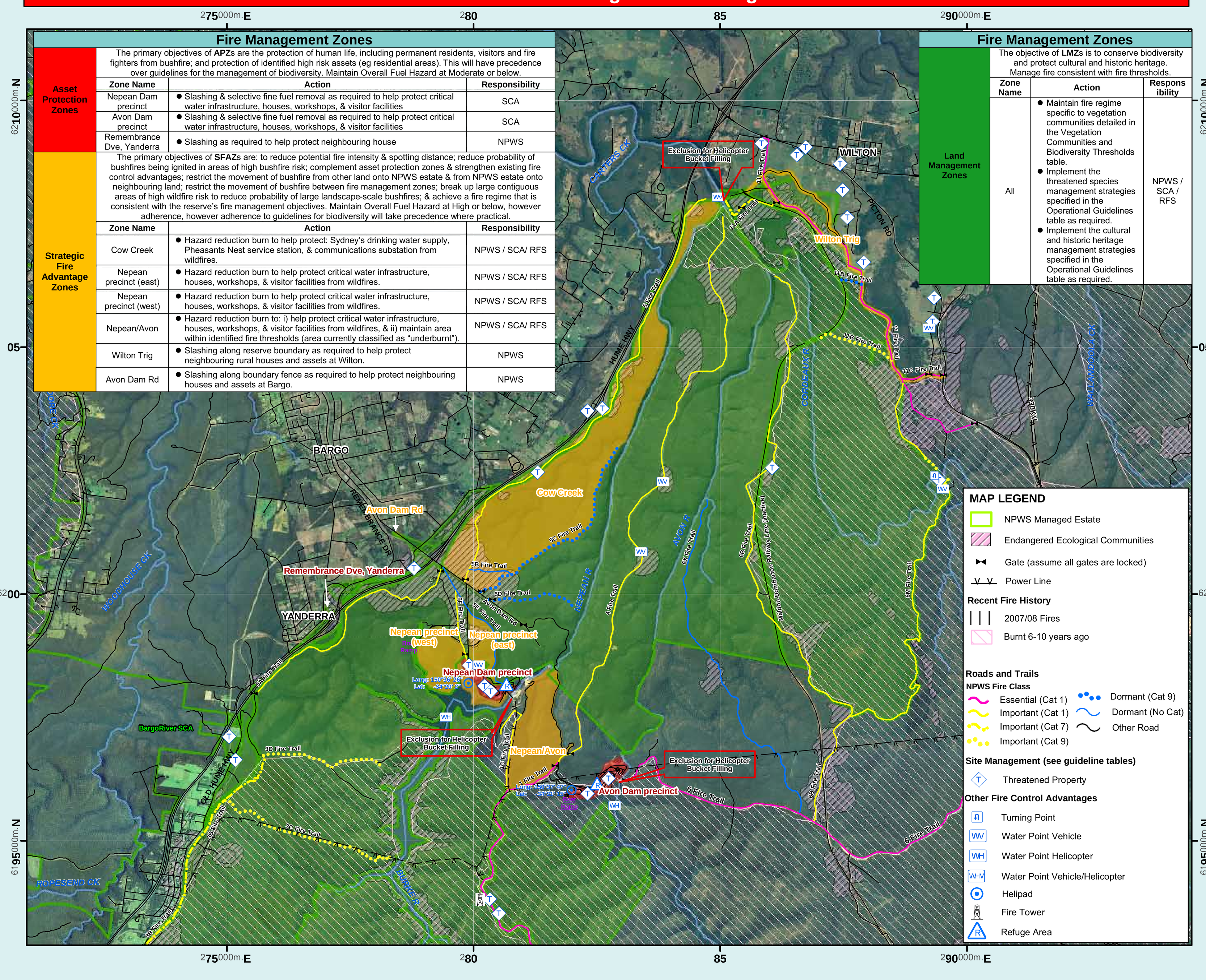
Brief all personnel involved in suppression operations on the following issues:

General	Guidelines
Aircraft Operations (general)	• For Class 1 and 2 fires, when the incident controller is not an NPWS officer and the fire is on NPWS lands, approval for the hire of aircraft must first be obtained from the NPWS. Where prior approval from the NPWS has not been obtained, responsibility for costs associated with these items will rest with the agency that ordered this plant. • Aircraft operators to be briefed on any known hazards • eg overhead transmission lines & restricted air space, as well as the location of ground crews. • Aerial reconnaissance should be conducted regularly during large, or potentially large, fires. • All ground crews to be advised of aircraft operations. • Where possible, air-to-ground comms to be used when aircraft operations are underway. • Liaise with reserve neighbours regarding water use/extraction from adjoining land.
Aerial Water Bombing	• Use of bombing aircraft should support containment operations by aggressively attacking hotspots and spot-overs. • Use of bombing aircraft without the support of ground based suppression crews should be limited to very specific circumstances. • Ground crews must be advised of water bombing operations.
Aerial Ignition	• Aerial ignition may be used but only with prior consent of NPWS Regional Manager or Section 44 delegate. • Pattern of aerial ignition to be specified in the incident action plan. • Aerial ignition will only proceed when designated control lines have been assessed as secure. • Aerial ignition will only be undertaken by accredited bombardiers. • Use of incendiary devices should be considered for deepening heavy and closed fuels, & in remote locations.
Backburning	• Temperature and humidity trends must be monitored carefully to determine the safest times to implement back-burns. Generally, when the FDI is Very High or greater, backburning should commence when the humidity begins to rise in the late afternoon or early evening. With a lower FDI backburning may be safely undertaken during the day. • Where practicable, clear a 1m radius around dead and fibrous barked trees adjacent to containment lines prior to backburning, or wet down these trees as part of the backburn ignition. • Avoid ignition of backburns at the bottom of slopes where a long and intense up slope burn is likely.
Command & Control	• The first combatant agency on site may assume control of the fire, but then must immediately notify the relevant land management agency. • On arrival of other combatant agencies, the initial incident controller will consult with other agencies regarding the ongoing command, control and incident management team requirements as per the relevant BFMC Plan of Operations. • For Class 1 and 2 fires, when the incident controller is not an NPWS officer and the fire is on NPWS lands, approval for the hire of major plant items (eg heavy machinery and aircraft) must first be obtained from the NPWS. Where prior approval from the NPWS has not been obtained, responsibility for costs associated with these items will rest with the agency that ordered this plant/equipment.
Containment Lines	• Priority will be given to use of existing constructed or natural fire control advantages. • Construction of new containment lines should be avoided, where practicable, except where they can be constructed with minimal environmental impact. New containment lines require the prior consent of a senior NPWS officer when the fire is on NPWS land. • All personnel involved in containment line construction should be briefed on both natural and cultural heritage sites in the area. • Where practicable, containment lines should be stabilised and rehabilitated as part of the wildfire suppression operation. • All containment lines not required for other purposes should be closed at the cessation of the incident.
Earthmoving Equipment	• Earthmoving equipment may only be used on NPWS land with the prior consent of a senior NPWS officer, and then only if the probability of its success is high. • Use of heavy machinery to be in accordance with an endorsed IAP. • Earthmoving equipment must always be guided and supervised by an experienced officer, & accompanied by a support vehicle. When engaged in direct or parallel attack this vehicle must be a firefighting vehicle. • Containment lines constructed by earthmoving equipment should consider the protection of drainage features, observe the Threatened Species and Cultural Heritage Operational Guidelines, and be surveyed, where possible, to identify unknown cultural heritage sites. • Earthmoving equipment should be washed down, where practicable, prior to it entering NPWS estate. • All machinery operators are to have some form of direct communications with fireground &/or fire incident management teams. • Where possible, heavy machinery is to be excluded from the Endangered Ecological Communities: • Cumberland Plain Woodland • O'Hares Creek Shale Forest • Robertson Rainforest • Robertson Basalt Tall Open Forest • Southern Highlands Shale Woodland • Shale/Sandstone Transition Forest
Fire Advantage Recording	• All fire advantages used during wildfire suppression operations must be mapped and where relevant added to the database/fire strategy.
Fire Suppression Chemicals	• The use of retardants will be avoided where alternatives are available. • Wetting and foaming agents are NOT permitted for use in wildfire control within upland swamp communities. • Retardant is not to be used within 200m of the stored water or within 100m of creeklines/tributaries. • Foam is not to be used within 200m of the stored water or within 20m of creeklines/tributaries. • Repeated use in an area is to be avoided. • Aircraft involved in dispersing foam and retardant must be briefed on the locations of any ground crews in the area, & ground crews must be briefed prior to commencement of any aerial work. • Areas treated with aerial applications of foam and retardants are to be mapped & recorded.
Water Extraction	• Water can be extracted from the stored water and creeklines/tributaries, but not within 200m of the inlet to the water filtration plant (ie not within 200m from the dam wall). • Only one-way valves to be used when drafting water from water filling points within the reserve & adjoining Special Area.
Rehabilitation	• The rehabilitation process should be identified in an Incident Action Plan and approved by the Incident Controller whilst the incident is still running. • A post-fire rehabilitation plan must be prepared if the suppression strategies and tactics have produced, or have the potential to produce, long-lasting impacts. The preparation of this plan is to commence as early as possible in the incident. A Situation Officer may be appointed to facilitate the rehabilitation planning process. • Rehabilitation activities should commence as soon as possible, and be monitored.
Smoke Management	• The potential impacts of smoke and possible mitigation tactics must be considered when planning for wildfire suppression and prescribed burning operations. • Liaise with the RTA, Council and Police where smoke is expected to occur near or over public roads, and liaise with reserve neighbours where necessary. Consider media release. • Ground crews to report changes in weather conditions and fire behaviour to IMT. • Liaise with the Bureau of Meteorology and the Environment Protection Authority on bush fire smoke emissions from current and planned fire operations, as necessary. • Liaise with mining companies as required
Visitor Management	• The reserve, or part of the reserve, may be closed to the public during periods of extreme fire danger or during wildfire suppression or prescribed burning operations. • The reserve is Schedule 1 land whereby there is no access by the public into the reserve, without written consent from either the NPWS or SCA. • The main public visitation area is the Nepean Dam precinct which has day use picnic areas, bbqs, car parks & toilet blocks. This area is outside the boundary of the reserve. Management of this area is the responsibility of the Sydney Catchment Authority.
Fauna Rescue	• Strategies for the rescue of injured fauna will be prepared as part of the fire rehabilitation planning process. • All volunteer/community wildlife rescuers and carers must already be licensed by the NPWS. • For Class 3 fires only - NSW Agriculture is responsible for the humane care of injured fauna during large-scale incidents (as per the NSW State Disaster Plan). The IMT will liaise with NSW Agriculture to coordinate the care of injured fauna. • For Class 1 and 2 fires – the NPWS has the legislative responsibility for native fauna, and duty-of-care obligations for other fauna. • All wildlife carers entering the fireground must be approved by the Incident Controller. These visitors must: • Wear approved protective clothing • Receive a full safety briefing prior to entering the fireground • Be accompanied by a competent, fire trained officer appointed by the Incident Controller • Always follow the directions of NPWS firefighters to ensure their safety • After an incident, obtain consent from the Regional Manager to enter the reserves • Submit written records (wildlife atlas cards) of all injured/orphaned fauna (alive or dead) to the NPWS, to be entered into the NSW Wildlife Atlas.
Litter	• All rubbish/litter to be removed from the reserve

Scale 1:50 000

0 500 1000 2000 Metres

Bushfire Risk Management Strategies



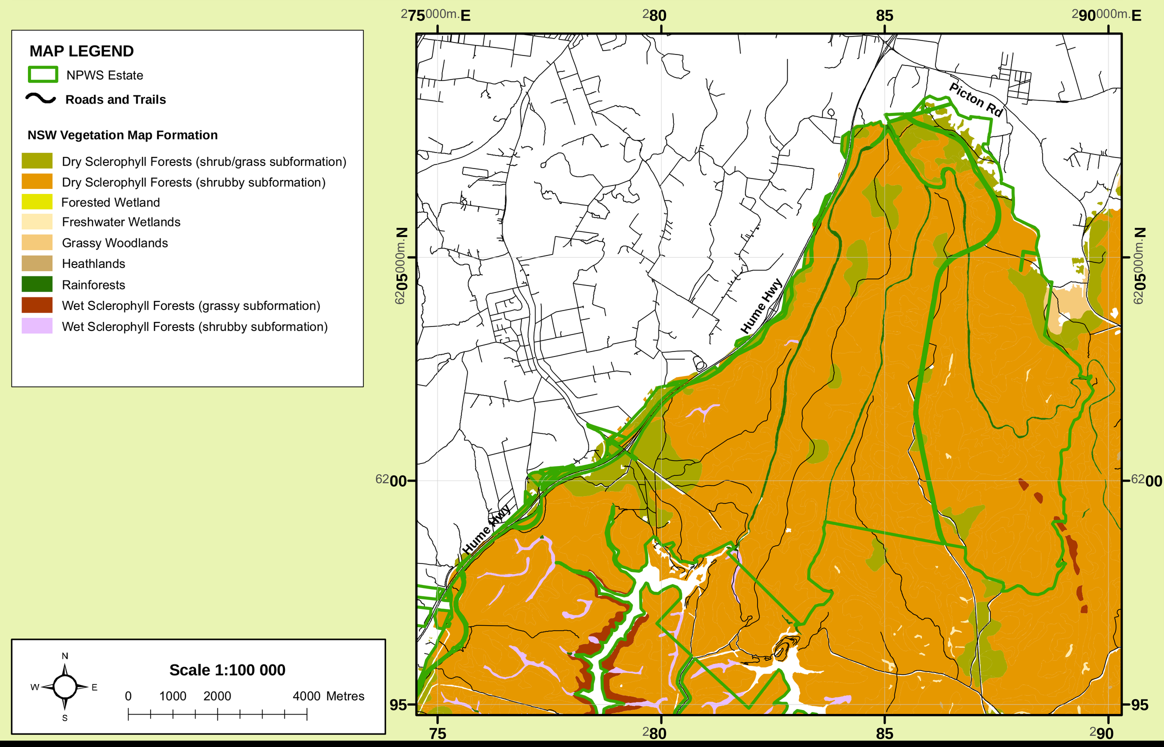
Fire Management Zones

Zone	Zone Name	Action	Responsibility
Asset Protection Zones	The primary objectives of **APZ**s are the protection of human life, including permanent residents, visitors and fire fighters from bushfire; and protection of identified high risk assets (eg residential areas). This will have precedence over guidelines for the management of biodiversity. Maintain Overall Fuel Hazard at Moderate or below.		
	Nepean Dam precinct	• Slashing & selective fine fuel removal as required to help protect critical water infrastructure, houses, workshops, & visitor facilities	SCA
	Avon Dam precinct	• Slashing & selective fine fuel removal as required to help protect critical water infrastructure, houses, workshops, & visitor facilities	SCA
	Remembrance Dve, Yanderra	• Slashing as required to help protect neighbouring house	NPWS
Strategic Fire Advantage Zones	The primary objectives of **SFAZ**s are: to reduce potential fire intensity & spotting distance; reduce probability of bushfires being ignited in areas of high bushfire risk; complement asset protection zones & strengthen existing fire control advantages; restrict the movement of bushfire from other land onto NPWS estate & from NPWS estate onto neighbouring land; restrict the movement of bushfire between fire management zones; break up large contiguous areas of high wildfire risk to reduce probability of large landscape-scale bushfires; & achieve a fire regime that is consistent with the reserve's fire management objectives. Maintain Overall Fuel Hazard at High or below, however adherence, however adherence to guidelines for biodiversity will take precedence where practical.		
	Cow Creek	• Hazard reduction burn to help protect: Sydney's drinking water supply, Pheasants Nest service station, & communications substation from wildfires.	NPWS / SCA/ RFS
	Nepean precinct (east)	• Hazard reduction burn to help protect critical water infrastructure, houses, workshops, & visitor facilities from wildfires.	NPWS / SCA/ RFS
	Nepean precinct (west)	• Hazard reduction burn to help protect critical water infrastructure, houses, workshops, & visitor facilities from wildfires.	NPWS / SCA/ RFS
	Nepean/Avon	• Hazard reduction burn to: i) help protect critical water infrastructure, houses, workshops, & visitor facilities from wildfires, & ii) maintain area within identified fire thresholds (area currently classified as "underburnt").	NPWS / SCA/ RFS
	Wilton Trig	• Slashing along reserve boundary as required to help protect neighbouring rural houses and assets at Wilton.	NPWS
	Avon Dam Rd	• Slashing along boundary fence as required to help protect neighbouring houses and assets at Bargo.	NPWS

Fire Management Zones

Zone	Zone Name	Action	Responsibility
Land Management Zones	The objective of **LMZ**s is to conserve biodiversity and protect cultural and historic heritage. Manage fire consistent with fire thresholds.		
	All	• Maintain fire regime specific to vegetation communities detailed in the Vegetation Communities and Biodiversity Thresholds table. • Implement the threatened species management strategies specified in the Operational Guidelines table as required. • Implement the cultural and historic heritage management strategies specified in the Operational Guidelines table as required.	NPWS / SCA / RFS

Vegetation



Hazard/Caution	Comments
Water supply	Limited available water in majority of reserve. Some creek crossings in the south, & north-east. Overhead filler hose immediately north of Nepean (CRAFT) Depot.
Telecommunications/ Utility/Water infrastructure	Many overhead powerlines, & below ground cables & pipelines, that provide critical infrastructure to broader community, esp in the south & along western boundary of the reserve. Extreme caution needed if considering using water near overhead powerlines, or heavy plant & equipment for proposed containment lines. Look for company signage.
Railway crossings	Many railway crossings for vehicles, & trails that run parallel to railway lines. Railway transports passengers & freight. Always stop vehicles before crossing. Mostly in south-east & along western boundary of reserve.
Dead end & narrow trails	Many trails were constructed for purposes other than fire management. Many trails finish at end of ridgetops, & some are narrow. Use extreme caution at nightime. Check fire trail classification & vehicle carrying capacity on map before traversing trails.
Old mine shafts	Use extreme caution, esp under smoky conditions & nightime. Known shaft locations have been mapped. Mostly in south-west of reserve.
Old fallen & intact fencelines	Many internal & boundary fencelines of varying condition. Some redundant fences have fallen down. Use extreme caution, esp under smoky conditions & nightime.
Steep slopes	Steep slopes & gorges associated with rivers & creeks, especially in northern part of reserve. Walk steadily, & use extreme caution, esp under smoky conditions & nightime.

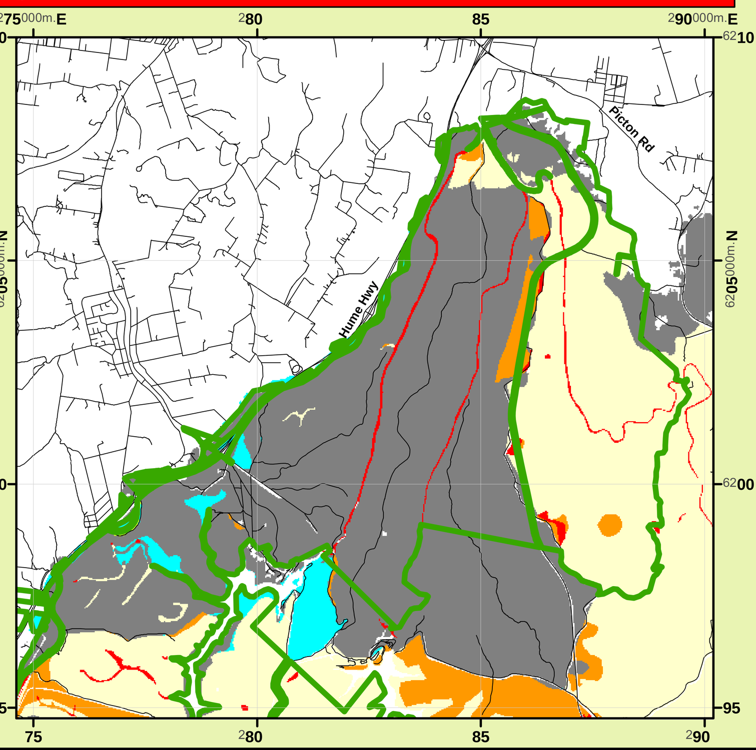
Current Vegetation Status (Fire Thresholds)

Fire Thresholds	
Overburnt	Fire thresholds have been exceeded. · *Protect from fire as far as possible.*
Vulnerable	The area will be Overburnt if it burns this year. · *Protect from fire as far as possible.*
Recently Burnt	Time since fire is less than the optimal interval, but before that it was within threshold. · *Avoid fires if possible.*
Within Threshold	Fire history is within the threshold for vegetation in this area. · *A burn is neither required nor should one necessarily be avoided.*
Almost Underburnt	The area is close to its threshold and may become underburnt with the absence of fire. · *A prescribed burn may be advantageous. Consider allowing unplanned fires to burn.*
Underburnt	Fire frequency is below fire thresholds in the area. · *A prescribed burn may be advantageous. Consider allowing unplanned fires to burn.*
Unknown	Insufficient data to determine fire threshold.

NB. Fire thresholds are defined for vegetation communities to conserve biodiversity

Scale 1:100 000

0 1000 2000 4000 Metres



UPPER NEPEAN STATE CONSERVATION AREA

Fire Management Strategy (Mapsheet 2 of 3)

2009

This strategy should be used in conjunction with aerial photography and field reconnaissance during incidents and the development of incident action plans.

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This strategy is a relevant Plan under Section 38 (4) and Section 44(3) of Rural Fires Act 1997.
The NSW National Parks and Wildlife Service is part of the Department of Environment and Climate Change.
Published by the Department of Environment and Climate Change June 2009.
Contact: NPWS SSR, PO Box 44, Sutherland 1499.
ISBN **978 1 74232 357 2** DEC **2009/466** **Approval Date: V1** 25/6/2009

Department of **Environment & Climate Change** NSW

SYDNEY CATCHMENT AUTHORITY

Endorsed By:

Executive Director,
Park Management Division

Date: / /

Communications Information

Service	Channel	Location and Comments
NPWS - VHF	2	● Good in most areas or gullies ● NPWS channel 2
NPWS – Car to car	36, 38, 41, 42	● Repeater located at High Range ● Only when unable to access repeater on car channel
NPWS mobile cross band repeater	15	● Allows communication between repeater ● Enables comms between NPWS & RFS native channels ● Located at Blue Mount Royal National Park and Nellie Area Office, Bristol Road
NPWS	66	● Contact NPWS Fire Management or Regional Duty Officer in order to access NPWS & SCA staff
SCA - VHF	1	● Contact NPWS Fire Management or Regional Duty Officer in order to access NPWS & SCA staff to communicate between each other
RFS – Wingecarribee GRN	G093	● Very good coverage ● Use to talk to other NPWS (Kennel 9) ● During the official fire season, SCA fire lower operators report weather conditions & fire reports via Wingecarribee RFS (Bundanoon Fire Control)
RFS – Wingecarribee Fire Ground VHF	Channels 1-7	● Good coverage
RFS – Wingecarribee FMR	P070, P082, P092, P152, P165	● Good coverage
RFS – Wollondilly Fire Ground VHF	Channels 8-15	● Good coverage
RFS – Wollondilly GRN	16	● Good coverage
RFS – Wollondilly FMR	Vide 95, 110, 233, 234	● Good coverage ● Available in most RFS vehicles & some NPWS staff have hand helds. ● Only to be used by NPWS where all other forms of communication have been exhausted. ● Choose channel on fire ground with RFS.
CMR - CB	1 - 40	● Average coverage, very poor in gullies ● Shouldn't be relied upon
Mobile Phone - GSM		● Moderate coverage on ridges, poor in gullies ● Shouldn't be relied upon
Mobile Phone - Next G		● Moderate coverage on ridges, poor in gullies ● Shouldn't be relied upon
Mobile Phone - 3G		● Moderate coverage on ridges, poor in gullies ● Shouldn't be relied upon

Contact Information

Agency	Position / Location	Phone
National Parks & Wildlife Service	Duty Officer (24 hour)	0419 428 054
	Sector	4223 3000 (ph)
	SSR Regional Duty Officer (24 hour)	4223 3009 (fax)
Sydney Catchment Authority	Illawarra Area Office	4821 2100
	Fire Management Officer	4821 2100
	Regional Operations Coordinator	9542 0644
	Incident Control (24 hour)	1800 061 069 or 9751 1988
	South-East Catchment Office – Campbelltown	4640 1280 (ph) 4640 1222 (fax)
Wollondilly NSW Rural Fire Service	Duty Officer (24 Hours)	(not for public use - finline)
	Business Hours	4677 1600 4677 1660 (ph) 4677 2999 (fax)
Wingecarribee NSW Rural Fire Service	Duty Officer (24 Hours)	(not for public use -finline)
	Business Hours	4871 3395 4871 2066 (ph) 4871 3756 (fax)
SES	Wollondilly	4677 1417
	Wingecarribee	4871 2433
Police	Bowral	4861 4699
	Picton	4677 8000
	Mittagong	4871 1222
	Braidwood	4842 5099
	Moss vale	4868 1222
	Robertson	4885 1244
Ambulance	Emergency	000
	Bookings	131 233
Hospital	Bowral	4861 2000
	Moss Vale	4868 7100 (24 hrs)
Council	Wollondilly Council	4677 2339 (fax)
	Wingecarribee Council	4868 0888 (ph) 4869 1203 (fax)
Rural Lands Protection Board	Moss Vale	4655 9165
RTA	Head office management transport	9810 0611
		131 700 (24 hours)
TransGrid	Head office control room	9620 0922
		1800 027 253 (24 hrs)
Integral Energy	Business Hours	131 087
	Emergency Service (24 hours)	131 003
Telstra Australia		1300 368 387
Optus	24 hrs	1800 505 050
Bureau of Meteorology	General	9296 1555 1300 659 033
	Special fire weather forecasts	9296 1558 (ph) 9296 1568 (fax)
Wildlife Rescue/Rehabilitation	WIRES - Wollondilly	4684 1656
	NANA - Picton	4681 9526

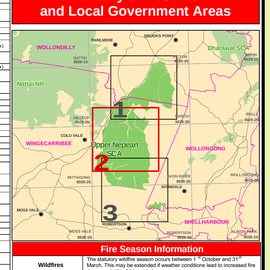
Related Documents

- Upper Nepean SCA Draft Plan of Management 2007
- Special Area Strategic Plan of Management (SASPoM) 2007
- Shale Hills Cumberland Plain Woodland Endangered Ecological Community Information, February 2007
- O'Hara Creek Shale Forest Endangered Ec. ological Community Information, February 2007
- Cumberland Plain Woodland Endangered Ecological Community Information, February 2007
- Southern Highlands Shale Woodland Endangered Ecological Community Information, January 2007
- Robertson Basalt Tall Open Forest Endangered Ecological Community Information, January 2007
- Robertson Rainforest Endangered Ecological Community Information, January 2007
- NPWS Native vegetation of the Woronora, O'Hara and Metropolitan Catchments 2003
- DECC Terrestrial vertebrate fauna of the Greater Southern Sydney Region' 2007
- Wingecarribee LEP 2010 Draft Environmental Management Plan 2008
- Wingecarribee BFMC S52 Bushfire Operations Coordination Plan 2008
- NSW Threatened Fauna Fire Response Database 2002
- NSW Flora Fire Response Database v 2002
- National Parks and Wildlife Service Fire Management Manual

Map Details

Datum: Australian Geodectic Datum of Australia (AGD) 1966
Projection: Australian Map Grid (AMG) Zone 56
Aerial Photography: NSW Department of Lands (2001)
1:25k Topographic Map: Avon River 9029-3-S; Bargo 9029-3-N

Locality of Reserve and Local Government Areas


WOLLONDILLY
SHELLHARBOUR
BROKEN HILL
BROKEN HILL
BROKEN HILL

UPPER NEPEAN STATE CONSERVATION AREA
Fire Management Strategy (Mapsheet 3 of 3)
2009

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Department of Environment & Climate Change NSW

Endorsed By: ______________________ Date: / /
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Communications Information

Service	Channel	Location and Comments
NPWS - VHF	2	• Good coverage on ridges; poor in gullies. • NPWS channel 2 • Repeater located at High Range
NPWS – Car to car	34, 36, 41, 42	• Only good using a designated car to car channel.
NPWS mobile cross band repeater	15	• Can be transported to accessible ridgetops. • Enables comms between NPWS & RFS radios • Repeaters stored at Royal National Park and Nattai Area Office, Picton • Contact NPWS Fire Management or Regional Duty Officer for release of repeater on 0419 428 054.
NPWS	95	• = SCA channel 1 & allows NPWS & SCA staff to communicate between each other.
SCA - VHF	1	• Very good coverage • SCA channel 1 = NPWS channel 95 • During the official fire season, SCA fire tower operators report weather conditions & fire reports via this radio channel to Wollondilly Fire Control.
RFS – Wingecarribee GRN	G093	• Good coverage
RFS – Wingecarribee Fire Ground VHF	Channels 1-7	• Good coverage
RFS – Wingecarribee PMR	P079, P080, P092, P107, P108	• Good coverage
RFS – Wollondilly Fire Ground VHF	Channels 8-15	• Good coverage
RFS – Wollondilly GRN	94	• Good coverage
RFS – Wollondilly PMR	Vote 95, 110, 222, 234	• Good coverage
UHF - CB	1 - 40	• Available in most RFS vehicles & some NPWS staff have hand helds. • Only to be used by NPWS where all other forms of comms fails & when approved by Operations. • Choose channel on fire-ground with RFS.
Mobile Phone - GSM	-	• Average coverage, very poor in gullies. • Shouldn't be relied upon
Mobile Phone – Next G	-	• Moderate coverage on ridges; poor in gullies. • Shouldn't be relied upon
Mobile Phone – 3G	-	• Moderate coverage on ridges; poor in gullies. • Shouldn't be relied upon

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- NPWS 'Native vegetation of the Woronora, O'Hares and Metropolitan Catchments' 2003
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- Wollondilly BFMC S52 Bushfire Operations Coordination Plan 2008
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Contact Information

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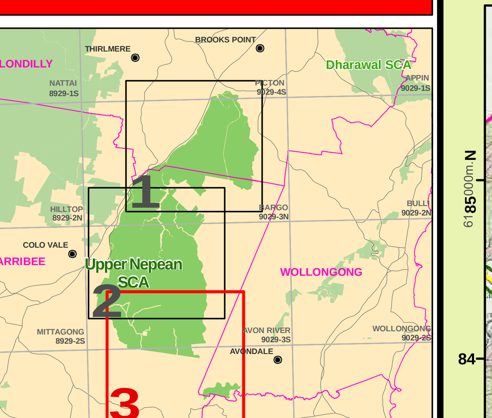
	Illawarra Area Office	4223 3000 (ph) 4223 3009 (fax)
	Fire Management Officer	9542 0636
	Regional Operations Coordinator	9542 0644
Sydney Catchment Authority	Incident Control (24 hour)	1800 061 069 or 9751 1988
	South-East Catchment Office - Campbelltown	4640 1280 (ph) 4640 1222 (fax)
Wollondilly NSW Rural Fire Service	Duty Officer (24 Hours)	(not for public use - fireline) 4677 1605
	Business Hours	4677 7000 (ph) 4677 2999 (fax)
Wingecarribee NSW Rural Fire Service	Duty Officer (24 Hours)	(not for public use -fireline) 4871 3765
	Business Hours	4871 2666 (ph) 4871 3756 (fax)
SES	Wollondilly	4677 1417
	Wingecarribee	4871 2433
Police	Emergency	000
	Picton	4677 8999
	Mittagong	4871 1222
	Bowral	4862 9299
	Moss vale	4868 1222
	Robertson	4885 1244
Ambulance	Emergency	000
	Bookings	131 233
Hospital	Bowral	4861 0200
Council	Wollondilly Council	4677 1100 (24 hrs) 4677 2339 (fax)
	Wingecarribee Council	4868 0888 (bh) 4869 1203 (fax)
Rural Lands Protection Board	Moss Vale	4655 9165
RTA	Head office management transport	9831 0911 131 700 (24 hours)
TransGrid	Head office control room	9620 0893 (bh) 1800 027 253 (24 hrs)
Integral Energy	Business Hours	131 081
	Emergency Service (24 hours)	131 003
Telstra Australia		1300 368 387
Optus	24 hrs	1800 505 050
Bureau of Meteorology	General	9296 1555 9269 8589
	Special fire weather forecasts	9296 1508 (ph) 9638 7956 (fax)
Wildlife Rescue/Rehabilitation	WIRES - Wollondilly	4684 1656
	NANA - Picton	4681 9526

Locality of Reserve and Local Government Areas



Fire Season Information

Wildfires	The statutory wildfire season occurs between 1st October and 31st March. This may be extended if weather conditions lead to increased fire danger outside of this period.
Prescribed Burning	Prescribed burning in this area is normally undertaken from Autumn until early winter.

Resource Management Guidelines

Resource	Guidelines
Threatened Flora Management	
Daphnandra sp. C Illawarra Illawarra Socketwood *(Endangered)* **FL1**	Medium sized tree that occurs in rainforest on rocky hillsides & gully slopes of the Illawarra escarpment & coastal lowlands. Limited information available on effects of fire on this species, but fire would be likely to cause a negative impact on the life cycle of this species. • Exclude fire & mechanical vegetation clearance from known habitat that supports this species.
Epacris purpurascens var purpurascens *(Vulnerable)* **FL2**	Shrub that occurs in a range of habitats • Recommended fire interval of 10-15 years. • Lifespan of plant is 5-20 yrs, with 2-4 yrs to set first seed. • Obligate seeder which is killed by 100% scorch. • Regenerates by seed. Seed stored in the soil. Propagule store exhausted (germinates or lost) at first disturbance. • Avoid winter & spring burns (flowering season). • Grows in a range of habitats.
Grevillea parviflora subsp parviflora Small-flower Grevillea *(Vulnerable)* **FL3**	Small shrub that occurs in heath & shrubby woodland & open forest. • Avoid too frequent burning. Limited information on recommended fire intervals, but minimum time needed between fires is that which plants become sexually mature & produce seed, which is at least 10 years. • Reproduces by seed. Seed stored in the soil. Germination rate from seed seems to be very low. Plant is usually killed by fire but sometimes regenerates by suckering from rhizomes. Propagule store exhausted (germinates or lost) at first disturbance. • Main flowering period is Winter-Spring, but has also been recorded flowering in Autumn.
Irenepharsus typherus Illawarra Irene *(Endangered)* **FL4**	Annual herb that occurs in steep rocky slopes and cliff lines at the ecotone of sclerophyll forest & rainforest. • Species likely to be killed by fire. • Exclude fire where species grows within rainforest habitats. • Occasional burning where species occurs in sclerophyll forests, but minimum fire interval of once every 25 years; may assist in maintaining the habitat's structure & floristics. • Avoid slashing/clearing/mechanical fuel reduction at known sites. • Reproduces by seed stored in the soil, depending on the intensity of the fire. • Recruitment of species occurs readily in the inter-fire period.
Melaleuca deanei Deane's Paperbark *(Vulnerable)* **FL5**	Large shrub/small tree that occurs in Sandstone Woodland (in heath). • Avoid too frequent burning. • Recommended minimum fire interval is 8 years. Indefinite lifespan, approximated to 100 years (=Maximum plant age at which senescence is expected to occur and seedbank longevity). • Limited capacity to regenerate from seed. Regenerates by resprouting from rhizomes/lignotubers. • Serotinous = most seed retained for a few years (released by fire, death, drying over time). Seed is stored in the canopy. Survives 100% scorch. Propagule store short-lived (transient or lost at senescence of plant). Intolerant of competition. Frequent fire regime leads to sp. decline. Sensitivity to infrequent fire regime leads to extinction. Plant age at first flowering is 3-4 years. Post-fire age at which flowering first occurs from resprouting material is less than 2 years.
Persoonia bargoensis Bargo Geebung *(Endangered)* **FL6**	Shrub that occurs in woodland & dry sclerophyll forest. • Avoid too frequent burning. • Recommended minimum fire interval is 7 years. • Obligate seeder which is killed by 100% scorch (or possibly even lower fire intensity). • Recruitment occurs by seed stored in the soil. Propagule store exhausted (germinates or lost) at first disturbance. • Flowers in Summer.
Persoonia hirsute Hairy Geebung *(Endangered)* **FL7**	Shrub that occurs in dry sclerophyll open forest, woodland, & heath on sandstone • Avoid too frequent burning. • Minimum fire interval is 7 years. • Obligate seeder which is killed by 100% scorch (or possibly even lower fire intensity). • Reproduces by seed stored in the soil. Propagule store exhausted (germinates or lost) at first disturbance. • Flowers in Spring-Summer.
Solanum celatum *(Endangered)* **FL8**	Shrub that occurs in rainforest clearings & wet sclerophyll forest. • Fire sensitive species – adults killed by fire. Avoid too frequent burning. • Recruitment occurs by seed stored in the soil. • Flowers from August – October & produces fruit in December.
Threatened Property	• Where possible property owners with assets at risk from a wildfire event should be kept informed regarding the progress of the fire; and asked for an assessment of their current level of asset protection preparedness

Resource Management Guidelines

Resource	Guidelines
Aboriginal Cultural Heritage Site Management	
A2	• As far as possible, protect site from moderate to high intensity fires (post-fire soil erosion may cause artefact movement and damage deposit). Low intensity fires unlikely to have an impact. • Avoid all ground disturbance including the use of earthmoving machinery, handline construction and driving over site. • Avoid water bombing which may cause ground disturbance. • If achievable and will cause less damage, consider using wetlines rather than clearing fuel.
A3	• Clearly identify site and avoid all ground disturbance including the use of earthmoving machinery, handline construction and driving over sites. • Avoid waterbombing which may cause ground disturbance. • Site may be burnt by wildfire, backburn or prescribed burn without damage.
Threatened Fauna Management	
Amphibians	
Heleioporus australiacus Giant Burrowing Frog *(Vulnerable)* **FA1**	• Avoid ground & hydrological disturbance in areas of known locations, eg watercourses & wetlands. • Be aware of this species when constructing hand tool lines & containment lines using heavy machinery that disturbs bare earth, especially in sandstone geology, incl near riparian areas in upper catchments. • Avoid too frequent burning. • Research generally indicates that as these mature frogs deep burrow & raise tadpoles in true riparian areas, they are not generally affected by prescribed fire, but could be sensitive to its habitat & associated food sources being burnt through too frequent burning. Tadpoles possibly at risk from the fallout of ash, & influx of sediments after heavy rainfall following fires, into waterholes. • Peak breeding season is summer & autumn, also tadpoles often over winter. Breeding dependant on weather conditions, ie heavy rainfall events.
Litoria littlejohni Littlejohns Tree Frog *(Vulnerable)* **FA2**	• Any fire potentially affects this species. • Avoid canopy fires & too frequent burning. • Threatened frog that is possibly most at risk because it is often arboreal (shrub layer) & only known to come to the ground to breed, & also likely to refuge in tree hollows. • Tadpoles possibly at risk from the fallout of ash, & influx of sediments after heavy rainfall following fires, into waterholes. • Peak breeding season is late Winter through to Autumn, also tadpoles often over winter. • Highly susceptible to spread of Chytrid fungus by personnel & machinery – wear footwear that is dry & clean of mud/dirt.
Mixophyes balbus Stuttering Frog **FA3**	• Semi-aquatic species in rainforest & wet sclerophyll forest utilising leaf litter. Possibly locally extinct. Limited information available on fire response. • Avoid burning of riparian areas within known habitat. • Tadpoles possibly at risk from the fallout of ash, & influx of sediments after heavy rainfall following fires, into waterholes. • Peak breeding season is late Summer, also tadpoles over winter. Breeding triggered by heavy rain events. • Highly susceptible to spread of Chytrid fungus by personnel & machinery – wear footwear that is dry & clean of mud/dirt.
Pseudophryne australis Red-crowned Toadlet **FA4**	• Avoid unnecessary clearing of rocks, fallen logs & other components of ground fuel which provide shelter/habitat for the species, especially in table & mitre drains adjacent to fire trails. • Autumn burns preferred over Spring burns, dependant on local breeding events. • Research generally indicates that the occasional fire does not impact on this species as they will often refuge in rock crevices, but that too frequent burning could cause detrimental impacts. Most at risk are juveniles & egg masses, which are deposited in leaf litter. • Peak breeding season is summer, but may occur at any time of the year. Breeding dependant on weather conditions, ie rainfall. • Highly susceptible to spread of Chytrid fungus by personnel & machinery – wear footwear that is dry & clean of mud/dirt.
Reptiles	
Hoplocephalus bungaroides Broad-headed Snake & *Varanus rosenbergi* Rosenberg's Goanna *(Vulnerable)* **FA5**	• Autumn burns preferred as less likely to affect nests & young individuals. • Requires fires of low intensity & frequency. • Avoid unnecessary clearing rocks, fallen logs & other large components of ground fuel that provide shelter/habitat for the species. • Avoid canopy fires & too frequent burning. • BH Snake - Species potentially at risk because it utilises tree hollows during summer months. Lives beneath slabs of sandstone during winter months. Generally not highly affected by prescribed burning activities of low fire intensity, but will be affected if the burns are of a high intensity & result in old hollow-bearing trees being killed &/or falling, esp in Summer & early Autumn. • R goanna - Protect termite mounds as these are important nesting & shelter sites.

Suppression Strategies

Current FDR	Forecast FDR	
Low – Mod	Low – Mod	• As far as possible, undertake indirect, parallel or direct attack along existing control lines. • As far as possible, maximise area burnt without threatening assets, including biodiversity. • Identify and survey backup control lines.
Low – Mod	= > High	• Undertake indirect, parallel or direct attack to minimise the time taken to contain the fire. • Construct new control lines if necessary to minimise the time to contain the fire. • Identify and survey backup control lines.
High	All	• Undertake indirect attack along existing or newly constructed control lines. • Secure and deepen control lines along the next predicted downwind side of the fire. • Identify and survey backup control lines .
All	All	• Ensure there is sufficient time to secure control lines before the fire gets to them. • If there is insufficient time to secure control lines, fall back to the next potential control line. • As far as possible, implement threatened species and cultural heritage management guidelines.

Resource Management Guidelines

Resource	Guidelines
Mammals	
Cercartetus nanus Eastern Pygmy Possum *(Vulnerable)* & *Isodon obesulus obesulus* Southern Brown Bandicoot (eastern) & *Potorous tridactylus* Long-nosed Potoroo *(Vulnerable)* **FA6**	• Avoid high intensity fires & too frequent burning. • Avoid frequent, low intensity fires/burns which remove dense shrub cover. • Avoid high intensity fires in known locations, eg moist sandstone gully forest, fringing eucalypt woodland, & upland swamp. • EPP – Avoid burning old growth Banksias, & try to maintain mosaic of older & younger stands. • Mosaic burn effect preferred to increase diversity & structural complexity of vegetation & protective cover, as well as mosaic of age classes. • Bandicoot - Avoid too frequent burning, but species may decline if extensive habitat is left too long unburnt. • Avoid fire in gullies, moist habitats & hollows (impt refuge/shelter). • Protect known den trees. • Autumn is preferred timing for prescribed burns. • Consider undertaking feral animal control programs (esp. foxes, wild dogs & deer) at known locations of this sp. after fires & prescribed burns.
Dasyurus maculatus Spotted-tailed Quoll *(Vulnerable)* **FA7**	• Relatively large home range suggests that quolls have good dispersal ability to avoid the direct effects of fire. Indirect affects can include competition with foxes. • Protect known den trees, fallen logs with hollows, & tree hollows (alive & dead), esp trees with hollow diameter greater than 20cm. • Avoid high intensity fires. • Autumn is preferred timing for prescribed burning (avoid spring burns), based on breeding season: mating occurs May-June; young in pouch June – late August; young in den August – September = most vulnerable time; & juveniles dispersing end Dec/Jan/Feb (summer).. • Avoid felling of known roost trees & potential roost trees (those with hollows).
Petaurus australis Yellow-bellied Glider *(Vulnerable)* & *Petaurus norfolcensis* Squirrel Glider *(Vulnerable)* **FA8**	• Protect den trees/feed trees & avoid high intensity fires in canopy. • Avoid too frequent burning, especially during winter months when preferred food sources are in flower eg Banksia, Allocasuarina & Ironbark. • Autumn is preferred timing for prescribed burning. • Avoid felling of known roost trees & potential roost trees (those with hollows).
Phascolarctos cinereus Koala *(Vulnerable)* **FA9**	• Prevent fires from reaching the canopy. • Avoid too frequent fire. • High frequency burning & consequent reduction in cover is likely to increase predation pressure, so feral animal control programs should occur immediately following any fires or prescribed burns in koala habitat. • Home range size vary, but female home ranges average 1 animal per 30ha, so burn patch size should be less than 10ha where possible. • Reports of all koalas (alive or dead) to be reported to the Koala Hotline on phone (02) 9962 9996 (& describe colour of ear tag if known). • Avoid frequent low intensity burning which removes dense shrub cover. • Avoid fire in gullies, moist habitats, & dense thickets – important refuge.
Chalinolobus dwyeri Large-eared pied bat *(Vulnerable)* **FA10**	• Occurs across a range of mostly drier vegetation types in both wet & dry sclerophyll forests, Callitris forest, sandstone outcropping, & wet gullies. Limited information available on fire response. • Potentially unaffected by fire when within preferred fire regimes as species often roosts in caves, but may be affected short-term by smoke within the caves.
Falsistrellus tasmaniensis Eastern False Pipistrelle *(Vulnerable)* & *Miniopterus schreibersii oceanens* Eastern Bentwing Bat *(Vulnerable)* & *Mormopterus norfolkensis* Eastern Free-tail Bat *(Vulnerable)* & *Scoteanax rueppellii* Greater Broad-nosed Bat *(Vulnerable)* & *Myotis adversus* Large-footed Myotis *(Vulnerable)* & *Pteropus poliocephalus* Grey-headed Flying Fox *(Vulnerable)* **FA11**	• Avoid interfire intervals of <10 years in locations where these species are known to occur. • Avoid felling of known roost trees & potential roost trees (those with hollows). • Large footed myotis - Exclude fires from riparian areas & moist forests. • More likely to be affected (suffocated) by smoke whilst in tree hollows. • Maintain a mosaic of age classes within known or potential foraging habitat. • Protect large & hollow-bearing trees where sp occurs, & avoid fire in fallen logs with hollows. • More likely to be affected (suffocated) by smoke whilst in tree hollows. • GH Flying Fox - Prevent canopy fires. Avoid too frequent burning (particularly larger Banksia sp. in the understorey). Avoid fire in near vicinity of roost within known or potential habitats where possible, esp during breeding season (March-October).

Resource Management Guidelines

Resource	Guidelines
Birds	
Callocephalon fimbriatum Gang-gang cockatoo *(Vulnerable)* **FA12**	Fire requirements unknown. Unlikely to be affected by fire as species has good dispersal ability. • Avoid fire in canopy with hollows – preferred nesting site. • Avoid winter burns in locations frequented by this species.
Calyptorhynchus lathami Glossy Black-cockatoo *(Vulnerable)* **FA13**	Species has good dispersal ability, but can be affected by wildfire as it's a specialised feeder which only eats Allocasuarina/Casuarina seeds. These forage species are sensitive to high intensity fire with a recurrent frequency of <10 years. • Avoid high intensity fires that consume canopies, sub-canopies, & fallen logs, particularly where Allocasuarina sp. are present, & have previously been burnt within the last 15 years (minimum time required for sp. to set seed). Protect large & hollow-bearing trees where species occurs. • Locations include creeklines.
Lathamus discolor Swift Parrot *(Endangered)* & *Neophema pulchella* Turquoise Parrot *(Vulnerable)* **FA14**	• Fire regime should create a mosaic of burnt & unburnt areas, & a mosaic of age classes within habitat. • Avoid frequent, high intensity burns within known or potential habitat. • Protect large & hollow-bearing trees where species occurs. • Burns should be of low intensity & preferably outside autumn & winter when preferred feed trees (Eucalypts etc) are in flower. • Turquoise parrot – frequent fires may reduce the number of low nesting hollows such as logs, stumps & posts preferred by this sp.
Ninox strenua Powerful Owl *(Vulnerable)* & *Tyto novaehollandiae* Masked Owl *(Vulnerable)* **FA15**	Species have fairly good dispersal ability, but may be affected by fire if fire occurs in canopy as sp. reliant on arboreal mammals (eg possums, gliders) for food, which attain their highest density under long intervals between fires. • Protection of nesting sites required year round, as sp. often uses same site year after year. • Avoid too frequent burning, esp in canopy with hollows – preferred shelter/roost. • Powerful owl breeds May - July. Masked owl breeds April – July. • Masked owl also preys on ground dwelling mammals, esp rats; Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.
Pachycephala olivacea Olive Whistler *(Vulnerable)* **FA16**	Occurs locally within moist gullies & dense wet heathland. Preferred shelter/roost, nesting & foraging is dense shrub vegetation & requires high moisture availability year round. • Avoid frequent low intensity burns within understorey of known habitat, or any high intensity burns within the understorey.
Pyrrholaemus sagittatus Speckled Warbler *(Vulnerable)* **FA17**	Ground feeder that requires leaf litter, fallen timber, & other ground debris, & nests on the ground, so sp potentially affected by even low intensity burns. • Either exclude fire from known habitat or only have very small low intensity patch burns. Avoid high intensity burns. • Avoid burning within known habitat during breeding season (August – January).
Tyto tenebricosa Sooty Owl *(Vulnerable)* **FA18**	Preferred habitat is rainforest & wet sclerophyll forest with a well developed mesomorphic understorey. Fire requirements unknown. • Avoid fires in gullies, especially where eucalypts occur on the edge of rainforest. • Avoid frequent burning in sheltered areas with an easterly & southerly aspect. • Protect large & hollow-bearing trees where species occurs. • Feeds on arboreal & ground dwelling mammals. • Breeds Feb – May.

Operational Guidelines

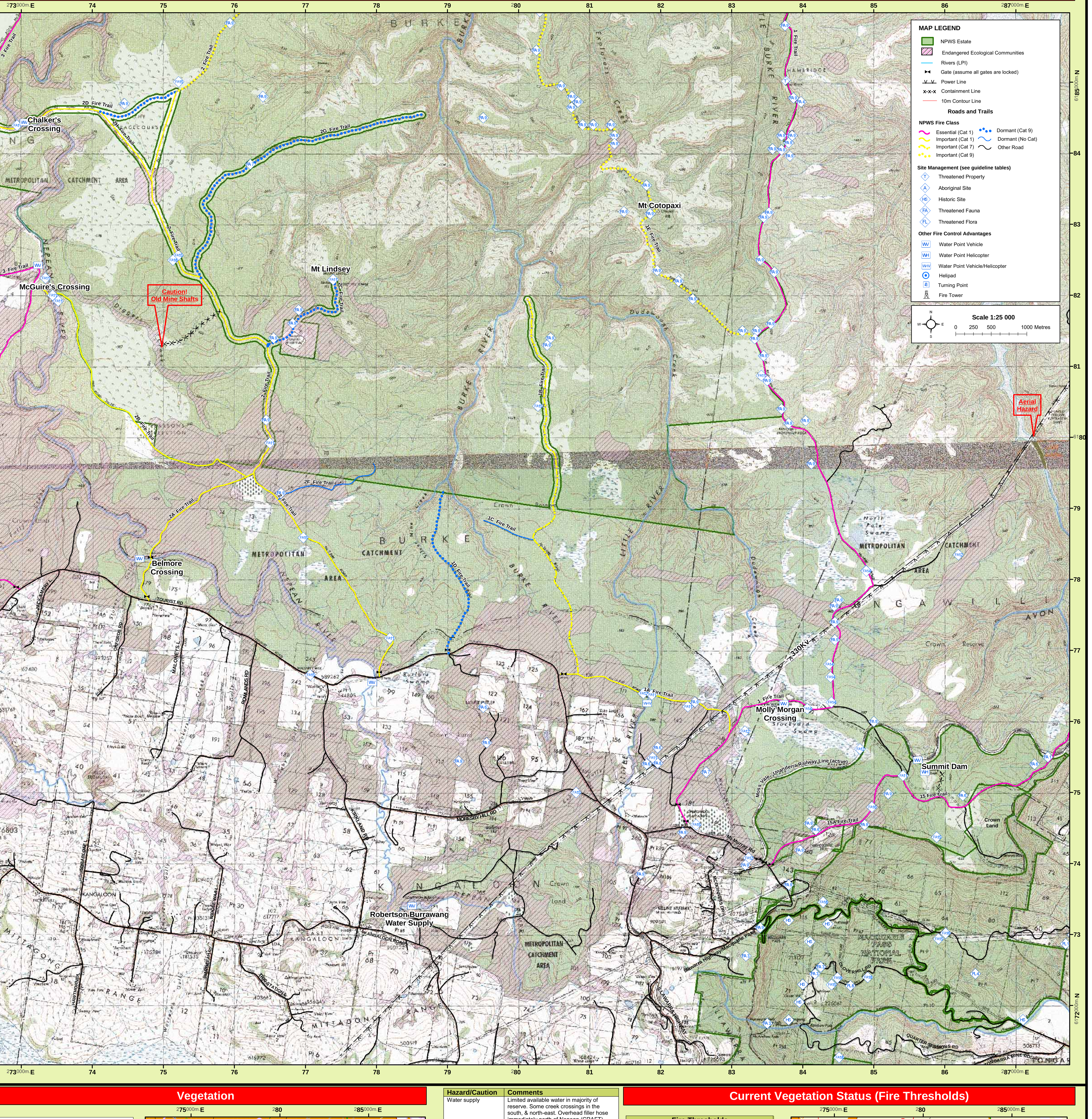
Refer to Strategy for Fire Management 2003 & Fire Management Manual
Brief all personnel involved in suppression operations on the following issues:

General	Guidelines
Aircraft Operations (general)	• For Class 1 and 2 fires, when the incident controller is not an NPWS officer and the fire is on NPWS lands, approval for the hire of aircraft must first be obtained from the NPWS. Where prior approval from the NPWS has not been obtained, responsibility for costs associated with these items will rest with the agency that ordered this plant. • Aircraft operators to be briefed on any known hazards • eg overhead transmission lines & restricted air space, as well as the location of ground crews. • Aerial reconnaissance should be conducted regularly during large, or potentially large, fires. • All ground crews to be advised of aircraft operations. • Where possible, air-to-ground comms to be used when aircraft operations are underway. • Liaise with reserve neighbours regarding water use/extraction from adjoining land.
Aerial Water Bombing	• Use of bombing aircraft should support containment operations by aggressively attacking hotspots and spot-overs. • Use of bombing aircraft without the support of ground based suppression crews should be limited to very specific circumstances. • Ground crews must be advised of water bombing operations.
Aerial Ignition	• Aerial ignition may be used but only with prior consent of NPWS Regional Manager or Section 44 delegate. • Pattern of aerial ignition to be specified in the incident action plan. • Aerial ignition will only proceed when designated control lines have been assessed as secure. • Aerial ignition will only be undertaken by accredited bombardiers. • Use of incendiary devices should be considered for deepening heavy and closed fuels, & in remote locations.
Backburning	• Temperature and humidity trends must be monitored carefully to determine the safest times to implement back-burns. Generally, when the FDI is Very High or greater, backburning should commence when the humidity begins to rise in the late afternoon or early evening. With a lower FDI backburning may be safely undertaken during the day. • Where practicable, clear a 1m radius around dead and fibrous barked trees adjacent to containment lines prior to backburning, or wet down these trees as part of the backburn ignition. • Avoid ignition of backburns at the bottom of slopes where a long and intense up slope burn is likely.
Command & Control	• The first combatant agency on site may assume control of the fire, but then must immediately notify the relevant land management agency. • On arrival of other combatant agencies, the initial incident controller will consult with other agencies regarding the ongoing command, control and incident management team requirements as per the relevant BFMC Plan of Operations. • For Class 1 and 2 fires, when the incident controller is not an NPWS officer and the fire is on NPWS lands, approval for the hire of major plant items (eg heavy machinery and aircraft) must first be obtained from the NPWS. Where prior approval from the NPWS has not been obtained, responsibility for costs associated with these items will rest with the agency that ordered this plant/equipment.
Containment Lines	• Priority will be given to use of existing constructed or natural fire control advantages. • Construction of new containment lines should be avoided, where practicable, except where they can be constructed with minimal environmental impact. New containment lines require the prior consent of a senior NPWS officer when the fire is on NPWS land. • All personnel involved in containment line construction should be briefed on both natural and cultural heritage sites in the area. • Where practicable, containment lines should be stabilised and rehabilitated as part of the wildfire suppression operation. • All containment lines not required for other purposes should be closed at the cessation of the incident.
Earthmoving Equipment	• Earthmoving equipment may only be used on NPWS land with the prior consent of a senior NPWS officer, and then only if the probability of its success is high. • Use of heavy machinery to be in accordance with an endorsed IAP. • Earthmoving equipment must always be guided and supervised by an experienced officer, & accompanied by a support vehicle. When engaged in direct or parallel attack this vehicle must be a firefighting vehicle. • Containment lines constructed by earthmoving equipment should consider the protection of drainage features, observe the Threatened Species and Cultural Heritage Operational Guidelines, and be surveyed, where possible, to identify unknown cultural heritage sites. • Earthmoving equipment should be washed down, where practicable, prior to it entering NPWS estate. • All machinery operators are to have some form of direct communications with fireground &/or fire incident management teams. • Where possible, heavy machinery is to be excluded from the Endangered Ecological Communities: • Cumberland Plain Woodland • O'Hares Creek Shale Forest • Robertson Rainforest • Robertson Basalt Tall Open Forest • Southern Highlands Shale Woodland • Shale/Sandstone Transition Forest
Fire Advantage Recording	• All fire advantages used during wildfire suppression operations must be mapped and where relevant added to the database/fire strategy.
Fire Suppression Chemicals	• The use of retardants will be avoided where alternatives are available. • Wetting and foaming agents are NOT permitted for use in wildfire control within upland swamp communities. • Retardant is not to be used within 200m of the stored water or within 100m of creeklines/tributaries. • Foam is not to be used within 200m of the stored water or within 20m of creeklines/tributaries. • Repeated use in an area is to be avoided. • Aircraft involved in dispersing foam and retardant must be briefed on the locations of any ground crews in the area, & ground crews must be briefed prior to commencement of any aerial work. • Areas treated with aerial applications of foam and retardants are to be mapped & recorded.

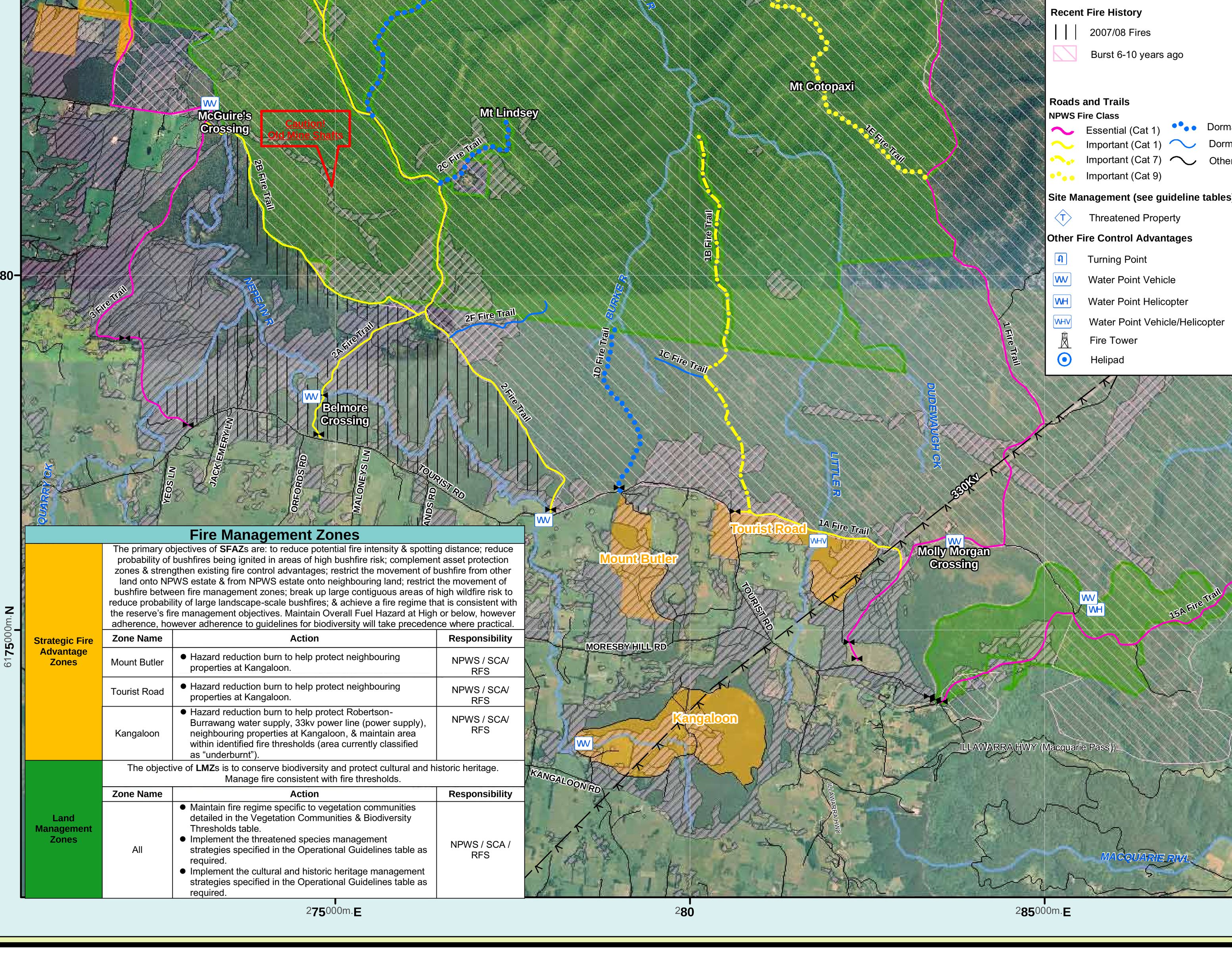
Water Extraction	• Water can be extracted from the stored water and creeklines/tributaries, but not within 200m of the inlet to the water filtration plant (ie not within 200m from the dam wall). • Only one-way valves to be used when drafting water from water filling points within the reserve & adjoining Special Area.
Rehabilitation	• The rehabilitation process should be identified in an Incident Action Plan and approved by the Incident Controller whilst the incident is still running. • A post-fire rehabilitation plan must be prepared if the suppression strategies and tactics have produced, or have the potential to produce, long-lasting impacts. The preparation of this plan is to commence as early as possible in the incident. A Situation Officer may be appointed to facilitate the rehabilitation planning process. • Rehabilitation activities should commence as soon as possible, and be monitored.
Smoke Management	• The potential impacts of smoke and possible mitigation tactics must be considered when planning for wildfire suppression and prescribed burning operations. • Liaise with the RTA, Council and Police where smoke is expected to occur near or over public roads, and liaise with reserve neighbours where necessary. Consider media release. • Ground crews to report changes in weather conditions and fire behaviour to IMT. • Liaise with the Bureau of Meteorology and the Environment Protection Authority on bush fire smoke emissions from current and planned fire operations, as necessary. • Liaise with mining companies as required
Visitor Management	• The reserve, or part of the reserve, may be closed to the public during periods of extreme fire danger or during wildfire suppression or prescribed burning operations. • The reserve is Schedule 1 land whereby there is no access by the public into the reserve, without written consent from either the NPWS or SCA. • The main public visitation area is the Nepean Dam precinct which has day use picnic areas, bbqs, car parks & toilet blocks. This area is outside the boundary of the reserve. Management of this area is the responsibility of the Sydney Catchment Authority.
Fauna Rescue	• Strategies for the rescue of injured fauna will be prepared as part of the fire rehabilitation planning process. • All volunteer/community wildlife rescuers and carers must already be licensed by the NPWS. • For Class 3 fires only - NSW Agriculture is responsible for the humane care of injured fauna during large-scale incidents (as per the NSW State Disaster Plan). The IMT will liaise with NSW Agriculture to coordinate the care of injured fauna. • For Class 1 and 2 fires – the NPWS has the legislative responsibility for native fauna, and duty-of-care obligations for other fauna. • All wildlife carers entering the fireground must be approved by the Incident Controller. These visitors must: • Wear approved protective clothing • Receive a full safety briefing prior to entering the fireground • Be accompanied by a competent, fire trained officer appointed by the Incident Controller • Always follow the directions of NPWS firefighters to ensure their safety • After an incident, obtain consent from the Regional Manager to enter the reserves • Submit written records (wildlife atlas cards) of all injured/orphaned fauna (alive or dead) to the NPWS, to be entered into the NSW Wildlife Atlas.
Litter	• All rubbish/litter to be removed from the reserve

Scale 1:50 000
0 500 1000 2000 Metres

Bushfire Suppression



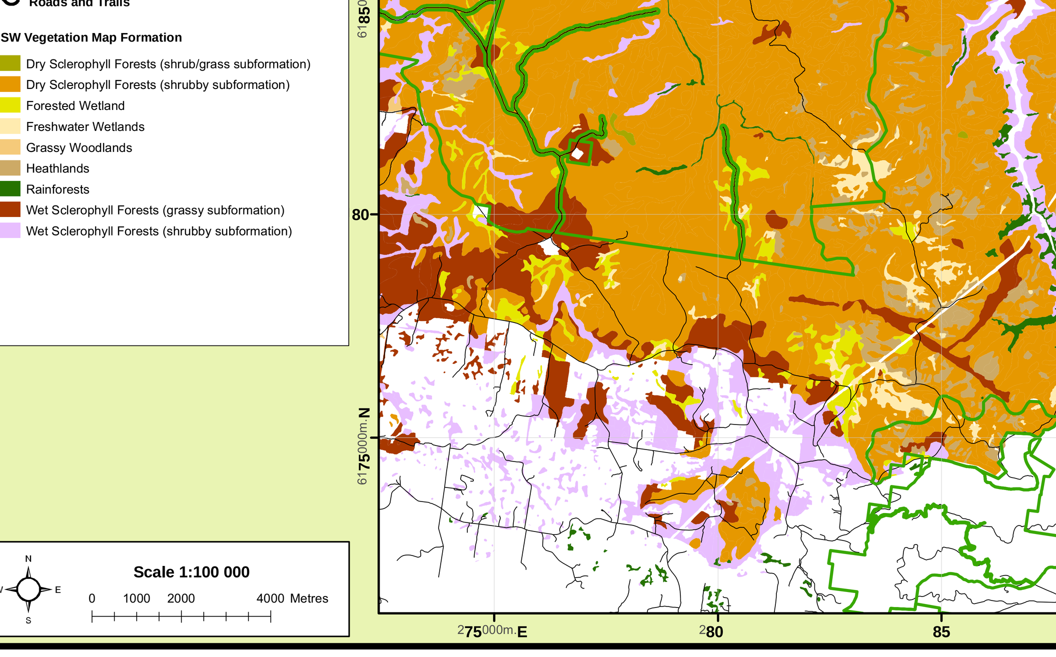
Bushfire Risk Management Strategies



Fire Management Zones

	Zone Name	Action	Responsibility
Strategic Fire Advantage Zones	The primary objectives of **SFAZ**s are: to reduce potential fire intensity & spotting distance; reduce probability of bushfires being ignited in areas of high bushfire risk; complement asset protection zones & strengthen existing fire control advantages; restrict the movement of bushfire from other land onto NPWS estate & from NPWS estate onto neighbouring land; restrict the movement of bushfire between fire management zones; break up large contiguous areas of high wildfire risk to reduce probability of large landscape-scale bushfires; & achieve a fire regime that is consistent with the reserve's fire management objectives. Maintain Overall Fuel Hazard at High or below, however adherence, however adherence to guidelines for biodiversity will take precedence where practical.		
	Mount Butler	• Hazard reduction burn to help protect neighbouring properties at Kangaloon.	NPWS / SCA/ RFS
	Tourist Road	• Hazard reduction burn to help protect neighbouring properties at Kangaloon.	NPWS / SCA/ RFS
	Kangaloon	• Hazard reduction burn to help protect Robertson-Burrawang water supply, 33kv power line (power supply), neighbouring properties at Kangaloon, & maintain area within identified fire thresholds (area currently classified as "underburnt").	NPWS / SCA/ RFS
Land Management Zones	The objective of **LMZ**s is to conserve biodiversity and protect cultural and historic heritage. Manage fire consistent with fire thresholds.		
	All	• Maintain fire regime specific to vegetation communities detailed in the Vegetation Communities & Biodiversity Thresholds table. • Implement the threatened species management strategies specified in the Operational Guidelines table as required. • Implement the cultural and historic heritage management strategies specified in the Operational Guidelines table as required.	NPWS / SCA / RFS

Vegetation



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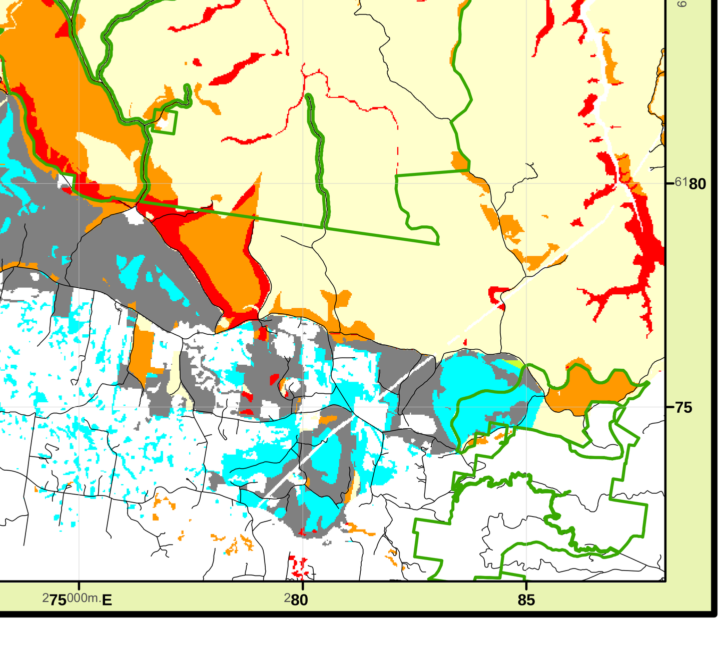
Hazard/Caution	Comments
Water supply	Limited available water in majority of reserve. Some creek crossings in the south, & north-east. Overhead filler hose immediately north of Nepean (CRAFT) Depot.
Telecommunications/ Utility/Water infrastructure	Many overhead powerlines, & below ground cables & pipelines, that provide critical infrastructure to broader community, esp in the south & along western boundary of the reserve. Extreme caution needed if considering using water near overhead powerlines, or heavy plant & equipment for proposed containment lines. Look for company signage.
Railway crossings	Many railway crossings for vehicles, & trails that run parallel to railway lines. Railway transports passengers & freight. Always stop vehicles before crossing. Mostly in south-east & along western boundary of reserve.
Dead end & narrow trails	Many trails were constructed for purposes other than fire management. Many trails finish at end of ridgetops, & some are narrow. Use extreme caution at nightime. Check fire trail classification & vehicle carrying capacity on map before traversing trails.
Old mine shafts	Use extreme caution, esp under smoky conditions & nightime. Known shaft locations have been mapped. Mostly in south-west of reserve.
Old fallen & intact fencelines	Many internal & boundary fencelines of varying condition. Some redundant fences have fallen down. Use extreme caution, esp under smoky conditions & nightime.
Steep slopes	Steep slopes & gorges associated with rivers & creeks, especially in northern part of reserve. Walk steadily, & use extreme caution, esp under smoky conditions & nightime.

Current Vegetation Status (Fire Thresholds)

Fire Thresholds	
Overburnt	Fire thresholds have been exceeded. *· Protect from fire as far as possible.*
Vulnerable	The area will be Overburnt if it burns this year. *· Protect from fire as far as possible.*
Recently Burnt	Time since fire is less than the optimal interval, but before that it was within threshold. *· Avoid fires if possible.*
Within Threshold	Fire history is within the threshold for vegetation in this area. *· A burn is neither required nor should one necessarily be avoided.*
Almost Underburnt	The area is close to its threshold and may become underburnt with the absence of fire. *· A prescribed burn may be advantageous. Consider allowing unplanned fires to burn.*
Underburnt	Fire frequency is below fire thresholds in the area. *· A prescribed burn may be advantageous. Consider allowing unplanned fires to burn.*
Unknown	Insufficient data to determine fire threshold.

NB. Fire thresholds are defined for vegetation communities to conserve biodiversity

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