4 FUTURE WORK

Every effort was made during the recent systematic fauna surveys to sample the full variety of habitat types and fauna groups within the Nattai and Bargo reserve, and hence obtain a comprehensive picture of terrestrial vertebrate fauna within the park. The surveys were, however, subject to a number of constraints, leading to limitations and a recommendation that further work by undertaken within the area in coming years. Most of the vegetation communities described and mapped in DEC (2004b) have been sampled for fauna. The steep, inaccessible escarpments underneath the East and West Nattai Walls and Buxton Plateau have been sampled the least. These comprise a mix of exposed open ironbark woodlands and sheltered Grey Gum gullies. Extensive sampling has occurred within the same communities on the Scotts Main Range. Similarly, a review of sampling of the communities of the Burragorang Valley floor indicates lower levels of effort than is desirable. However, again these communities have been sampled a number of times in the adjoining Yerranderie SCA. Some large spatial gaps remain evident on the inaccessible Wanganderry Tableland. The rocky heath complex that comprises pagoda like rock outcrops is certainly worthy of future investigation, particularly for threatened reptiles such as the Broad-headed Snake.

Areas of endeavour that should be targeted in the future include:

- Maintain a monitoring program for the Brush-tailed Rock-wallabies at Bullio in accordance with the Recovery Plan for the species. Consultation with the Recovery Team should be maintained particularly in relations to the management of feral predators.
- Undertake further surveys to estimate the abundance of the Koala population at High Range. Further research should examine the interconnectedness with other populations in the Wollondilly Catchment.
- Address the undersampling of frogs due to the prolonged and intense drought. Further work that assists in developing an understanding of the distribution and abundance of the Red-crowned Toadlet and the Giant Burrowing Frog would be a valuable contribution to the conservation management of the species across the region. Further frog sampling may also clarify the presence of Littlejohns Tree Frog (*Litoria littlejohni*).
- Further targeted survey effort in the Bargo SCA additions may confirm anecdotal evidence of Brush-tailed Rock-wallabies and Koalas.
- Even though all habitats had at least some survey effort, some areas would benefit from additional survey. The rocky habitats of the Wanganderry Tableland and the steep slopes of the Nattai Valley are two areas that are under-surveyed within the reserves, mainly due to difficulties of access. Further survey of these habitats may reveal additional records of such species as Broad-headed Snakes and Koalas within the reserves.
- Any systematic work undertaken in the future should be undertaken utilising the methods described in Section 2.3 and in NPWS (1997). Data entry into the BSS is the responsibility of the survey coordinator and time and resources for data entry should be included within the original survey proposal. This will ensure that the data is available to all staff and clients of DEC with accurate details and also the data to be included in any analysis of systematic data undertaken.

5 THREATENED SPECIES PROFILES

This section provides a profile of each of the threatened fauna species that are known or highly likely to occur within the Nattai and Bargo reserves. The aim of each of these profiles is to provide the following: a background on the species biology; a summary of threats to the species; an assessment of how well the species is protected in the region; a map of known records of the species in the study area; and an appraisal of the distribution and status of the species in the Nattai and Bargo reserves.

The list of threatened species contains records of various levels of reliability. For this reason, a species profile has not been generated for all of the threatened species listed on the Atlas of NSW Wildlife as occurring within the reserves. Only those species that have been directly or reliably observed or have habitat that can strongly be tied to the reserves have been included in the list of profiles. Table 4 provides the list of threatened species recorded within the Atlas of NSW Wildlife for the area, together with annotation for each species regarding the latest record, reliability of identification and a rationale for the generation of a species profile.

Table 4: Threatened fauna species recorded within the Nattai and Bargo reserves.

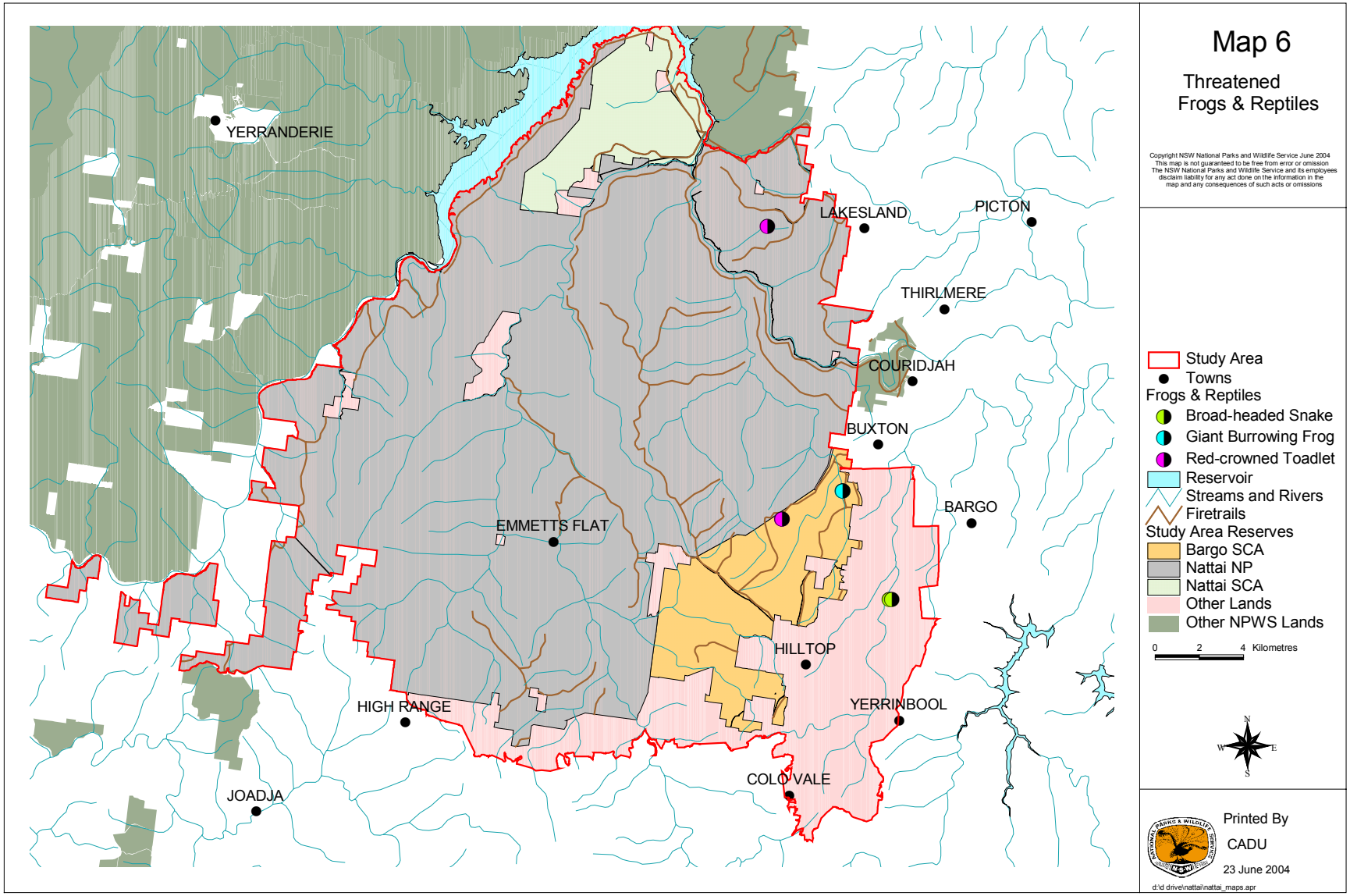
Scientific name	Common name	Status in NSW (TSC Act)	Status in Australia (EPBC Act)	No. of locations within study area[1]		Notes on reliability and date of last record	Species profile generated?
				DEC[2]	Other[3]		
Heleioporus australiacus	Giant Burrowing Frog	V	V	3	0	First record for the study area during this survey in the north east of Bargo SCA.	Y
Pseudophryne australis	Red-crowned Toadlet	V	-	3	0	First record for the study area during this survey in east in Nattai NP and Bargo SCA.	Y
Varanus rosenbergi	Rosenberg's Goanna	V	-	0	0	Not known from the study area, but records from Special Areas on either side, and potential habitat present.	Y
Hoplocephalus bungaroides	Broad-headed Snake	E	V	0	2	Known only from the Bargo River crown lands, though potential habitat throughout the reserves.	Y
Burhinus grallarius	Bush Stone-curlew	E	-	0	3	Only Australian Museum specimens from "Colo Vale" with most recent record 1906.	N
Calyptorhynchus lathami	Glossy Black-cockatoo	V	-	40	6	Regularly recorded within study area.	Y
Neophema pulchella	Turquoise Parrot	V	-	3	3	Most records in the Burragorang Valley, with the most recent 2002.	Y
Lathamus discolor	Swift Parrot	E	E	1	1	Records possibly refer to the same sighting during surveys in 1997. More recent records on western side of Wollondilly River.	Y
Ninox connivens	Barking Owl	V	-	0	0	Not recorded within study area, but records from surveys in 1997 in western Burragorang Valley. Heard calling in the Bullio area by local landholders.	Y
Ninox strenua	Powerful Owl	V	-	22	2	Regularly recorded within study area.	Y
Tyto novaehollandiae	Masked Owl	V	-	5	1	Scattered records from throughout the study area.	Y
Tyto tenebricosa	Sooty Owl	V	-	14	1	Most records from the north of the study area.	Y
Climacteris picumnus victoriae	Brown Treecreeper (eastern subsp.)	V	-	30	7	Most records from the Burragorang Valley.	Y
Pyrrholaemus sagittatus	Speckled Warbler	V	-	13	0	Records restricted to the Burragorang Valley.	Y
Xanthomyza phrygia	Regent Honeyeater	E	E	0	4	Scattered records in the west. Also reported on the western side of the Wollondilly River.	Y
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subsp.)	V	-	2	1	Only recorded in the Burragorang Valley.	Y
Melanodryas cucullata cucullata	Hooded Robin (south eastern subsp.)	V	-	13	1	Only recorded in the Burragorang Valley.	Y
Stagonopleura guttata	Diamond Firetail	V	-	11	2	Most records from the Burragorang Valley.	Y
Dasyurus maculatus	Spotted-tailed Quoll	V	E	0	1	Anecdotal records from various locations in the reserves (not yet in the Atlas of NSW Wildlife).	Y
Dasyurus viverrinus	Eastern Quoll	E	-	0	6	Presumed extinct on the Australian mainland. All Museum specimens from prior to 1900 at "Colo Vale."	N
Phascolarctos cinereus	Koala	V	-	15	8	Most records in the south, with scattered individuals elsewhere.	Y
Cercartetus nanus	Eastern Pygmy-possum	V	-	0	0	Recorded in the Bargo Crown Lands, though record not in Atlas of NSW Wildlife.	Y

Scientific name	Common name	Status in NSW (TSC Act)	Status in Australia (EPBC Act)	No. of locations within study area[1]		Notes on reliability and date of last record	Species profile generated?
				DEC[2]	Other[3]		
Petaurus australis	Yellow-bellied Glider	V	-	83	4	Regularly recorded within study area.	Y
Petaurus norfolcensis	Squirrel Glider	V	-	0	0	Not recorded from study area, though known to the west and north.	Y
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	3	9	Population discovered during current survey in south western section of Nattai NP.	Y
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	0	0	No records within the Atlas of NSW Wildlife, but known to occur at orchards in private land within the study area.	Y
Mormopterus norfolkensis	Eastern Freetail-bat	V	-	4	0	Recorded using Anabat in the western and southern sections during this survey.	Y
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	14	0	Widespread in the western half of Nattai NP.	Y
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	2	0	Only identified by Anabat (identification probable) to the south west of Nattai NP.	Y
Miniopterus schreibersii oceanensis	Eastern Bent-wing Bat	V	-	35	0	Regularly recorded within study area.	Y
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	2	0	First recorded in the study area during the current survey, in the Burragorang Valley	Y

[1] Numbers indicate the number of records for the species, rather than the number of individuals. Only includes records on the Atlas of NSW Wildlife.

[2] Includes all records collected during CRA, SCA and Biodiversity Survey Priorities fauna surveys.

[3] Includes records on the Atlas of NSW Wildlife obtained from sources other than DEC systematic survey.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YERRINBOOL
HIGH RANGE
COLO VALE
JOADJA
Map 6
Threatened
Frogs & Reptiles
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This map is not guaranteed to be free from error or omission
The NSW National Parks and Wildlife Service and its employees
disclaim liability for any act done on the information in the
map and any consequences of such acts or omissions
Study Area
Towns
Frogs & Reptiles
Broad-headed Snake
Giant Burrowing Frog
Red-crowned Toadlet
Reservoir
Streams and Rivers
Firetrails
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GIANT BURROWING FROG

Species Profile

The Giant Burrowing Frog (*Heleioporus australiacus*) is a rotund ground-dwelling frog. It can attain a maximum length of over ten centimetres. Its powerful limbs are used to excavate burrows where they can aestivate for long periods of time during unfavourable conditions. This species has a large black tadpole with a purple ventral surface that takes up to eleven months to metamorphose (Anstis 2002). The species has two disjunct populations, with one restricted to sandstone geology of the Sydney Basin as far south as Jervis Bay, and the other to the south between Narooma and eastern Victoria (NPWS 2001b).

©Andrew Claridge/DEC

Threats

The primary threat to the Giant Burrowing Frog is development of the sandy ridgetops that are its preferred habitat (NPWS 2001b). Other threats to this species are not well known. Some threats that might be relevant within the reserves include fire, road mortality, feral predators, and alterations to the drainage patterns of the plateau.

Local and Regional Conservation Status

The Giant Burrowing Frog is listed as a Vulnerable species on the NSW TSC Act (1995) and Vulnerable under the Commonwealth EPBC Act (1999). The Sydney Basin population is thought to have declined considerably, with tadpoles being encountered far less frequently than in the past (Anstis 2002). There is suitable habitat for the species across a large number of Sydney Sandstone reserves including Royal, Ku-ring-gai Chase and Brisbane Waters National Parks with fewer records obtained in Blue Mountains and Wollemi National Parks. They have also been recorded in the Woronora and Cataract Catchments on the Woronora Plateau (DEC 2004a). However, despite extensive areas of habitat and sustained survey effort over the last few years in the Sydney Basin, the species is rarely recorded.

Both tadpoles and adult frogs were observed during the current surveys in Bargo State Conservation Area at a track crossing Moore Creek upstream from Little River (Map 6). Individuals were detected by their distinctive owl-like hooting and were heard calling from under a rock ledge. Tadpoles were also seen nearby in the same stream.

These locations adjoin major roads and tracks through Bargo SCA. The river crossings within Bargo State Conservation Area remain heavily used by four-wheel drives. These records are significant, because even though this species has been recorded at a number of locations on the Woronora Plateau, it is the first time it has been recorded west of the Sydney to Canberra Freeway. Consideration should be given to ensuring that the species continues to persist by conducted monitoring surveys during the appropriate season and weather conditions.

RED-CROWNED TOADLET

Species Profile

The Red-crowned Toadlet (*Pseudophryne australis*) is a small (20 to 25 millimetres), strikingly coloured litter-dwelling frog. It is fairly restricted in its distribution, only occurring on the sandstone geologies of the Sydney Basin and within this range some morphological and genetic variation exists. The Red-crowned Toadlet lays its eggs in moist leaf litter, relying on rain to wash the eggs into a temporal pond where they can complete their development (NPWS 2001c).

©Dave Hunter/DEC

Threats

Development of ridgetop land is the primary threat to the Red-crowned Toadlet. Other threats may include habitat alteration due to fire, bush rock removal, water pollution and Chytrid fungus (NPWS 2001c). Due to their size and morphology, this species has only a limited ability to disperse. This probably makes them vulnerable to local extinction.

Local and Regional Conservation Status

The Red-crowned Toadlet is listed as Vulnerable on the NSW TSC Act (1995). Suitable habitat for this species is widespread across the sandstone plateaux of the Sydney Basin Bioregion, with the major populations occurring in the upper Blue Mountains, around the mouth of the Hawkesbury River and the Woronora Plateau extending to Royal National Park. Throughout its range it has been recorded in numerous National Parks, including a number within the Sydney urban area (DEC 2004a, 2004c). DEC surveys in the Sydney Basin Bioregion during the last five years have revealed that the species is perhaps more common in the region than previously thought (DEC, in prep.).

There are no documented historical records of this species on the Nattai Tableland. The recent surveys have confirmed for the first time that the species occurs within both Nattai National Park and Bargo State Conservation Area (Map 6). One location was discovered in each of the reserves, with one in a small moist gully off the Western Break Fire Trail in Bargo State Conservation Area and the other in deep sandy alluvium off Hoddles Track. Further records for the species could be anticipated because the prevailing drought of the last few years has restricted surveyor's ability to confirm the presence of the species in otherwise suitable habitats. Such habitats including gully heads and sandy depressions on ridgelines are widespread in the Nattai and Bargo reserves. Future surveys should be conducted during appropriate weather conditions.

ROSENBERG'S GOANNA

Species Profile

Rosenberg's Goanna (*Varanus rosenbergi*) (also known as Heath Monitor) is a large, powerful lizard with an unusual distribution. It is superficially similar to the commonly encountered Lace Monitor (*V. varius*) though morphologically and taxonomically it is closer to the Sand Monitor (*V. gouldii*). It can be distinguished from the Lace Monitor by the fine barring on its lips and tail and the spots on its legs. Within NSW it occurs in the Greater Sydney Basin and in the Southern Highlands, but then occurs discontiguously through Victoria, South Australia and south western Western Australia. The population on the Sydney Sandstone may or may not be genetically distinct. The lizard is well known to associate with sandstone environments, and is usually found in heath and woodlands where it shelters in burrows, hollow logs and rock crevices (Cogger 1996).

©Nick Corkish/DEC

Threats

Rosenberg's Goanna is particularly threatened in urban fringes, where the species is subject to pressure from development of the flat sandstone ridgetops that are its preferred habitat. Road mortality is also of concern (NPWS 2002a). Goannas have been identified as taking baits placed for Foxes (*Vulpes vulpes*) (Thomson and Kok 2002) and this species may consume baits placed during Fox and Dog (*Canis lupus*) eradication programs.

Local and Regional Conservation Status

Rosenberg's Goanna is listed as Vulnerable on the NSW TSC Act (1995). It is a poorly understood species and researchers are still learning about its distribution. Recent DEC survey work has found the species to be more widespread through the greater Sydney Basin than previously thought, particularly in heaths and woodlands at lower elevations (DEC 2004a, DEC in prep.). However, populations are sparse compared to the larger and more common Lace Monitor. Confirmed localities in the Sydney Basin include the Woronora Plateau, upper Blue Mountains and Wollemi National Parks and the Hornsby Plateau near Ku-ring-gai Chase National Park (DEC 2004a).

There are no confirmed records of Rosenberg's Goanna in the Nattai and Bargo reserves. However, there are records of this species to both the east (Metropolitan Catchments) and west (Blue Mountains National Park). Based on these records and the presence of suitable habitat on the sandstone plateaux of the study area, it is likely that this species does occur. Survey of suitable habitat in remote areas such as the Wanganderry Tableland may confirm the species presence.

BROAD-HEADED SNAKE

Species Profile

The Broad-headed Snake (*Hoplocephalus bungaroides*) is a semi-arboreal species that spends a portion of the year under sandstone exfoliations, and a part of the year in tree hollows. It averages about 60 centimetres in length and is recognisable by its black and yellow patterning. It is restricted to the sandstone environments of the Sydney Basin between Wollemi National Park and the Clyde River catchment, south west of Nowra. Within this range it has disappeared from such areas as Port Jackson and Middle Harbour, and on the western edge of its distribution around Bathurst. It is primarily a nocturnal ambush predator (NPWS 1999a) and is known to prey on Lesueur's Velvet Gecko (*Oedura lesueurii*).

©Alex Dudley

Threats

The key threat to the Broad-headed Snake is likely to be the collection of bush rock for landscaping (Shine and Fitzgerald 1989). This activity, although now either prohibited or requiring permits in most local government areas, is still widely practiced illegally. Removal of rock not only threatens this species directly, but removes habitat for its main prey species, Lesueur's Velvet Gecko. In addition, the Broad-headed Snake is colourful, rare and venomous, making it prized by snake-collectors. Collection of specimens from the wild is also likely to be a threat to this species (NPWS 1999a), particularly on the peripheries of urban areas, such as Picton and Mittagong. Within the Nattai Reserves there are many areas that exhibit signs of disturbance by collectors on many of the large rock plates and outcrops. Other potential threats include urbanisation of sandstone ridgetops, impacts of feral animals, through both predation and disturbance, and altered fire regimes that may effect the snake when it is utilising tree hollows (NPWS 1999).

Local and Regional Conservation Status

The Broad-headed Snake is listed as Endangered on the NSW TSC Act (1995) and Vulnerable on the Commonwealth EPBC Act (1999). It is restricted to the Sydney Basin and has disappeared from many locations where they have been previously well known to occur. Its remaining strongholds appear to be the upper Blue Mountains and Wollemi National Parks, Royal National Park extending on to the Woronora Plateau, and eastern Morton National Park west of Nowra. Its rarity is exemplified by the fact that three years of intensive systematic survey in suitable habitat on the Woronora Plateau has only recorded this species at one location (DEC in prep.).

Historical records of this species in Nattai National Park do not occur in the Atlas of NSW Wildlife, although there is a confirmed record of the species in the area in the 1960's (R. Wells pers. comm.). Despite the extensive search effort for this species, no individuals have been recorded during any of the DEC led surveys in the Nattai and Bargo reserves over the last seven years. This is disappointing given the extensive areas of suitable habitat and the density of Lesueur's Velvet Gecko, a preferred prey species found in the same habitat. An NPA led survey in the Bargo crown lands found an individual on a west facing rock outcrop overlooking the Bargo River Gorge (Map 6).

GLOSSY BLACK-COCKATOO

Species Profile

The Glossy Black-cockatoo (*Calyptorhynchus lathami*) is a medium-sized black cockatoo, which has a diagnostic black-brown head, with yellow patches in the female, and red tail panels. It is usually seen in pairs or trios (with dependant young) in eucalypt woodland or forest, where it nests in hollows. This species feeds almost exclusively on Sheoaks (*Allocasuarina* species including *A. verticillata, A. torulosa* and *A. littoralis*) (Higgins 1999). Two subspecies are restricted to eastern Australia between Queensland (Eungella) and eastern Victoria, with the nominate *lathami* found in NSW, and a third, isolated, endangered subspecies on Kangaroo Island (South Australia) (Higgins 1999).

©Peter Ekert

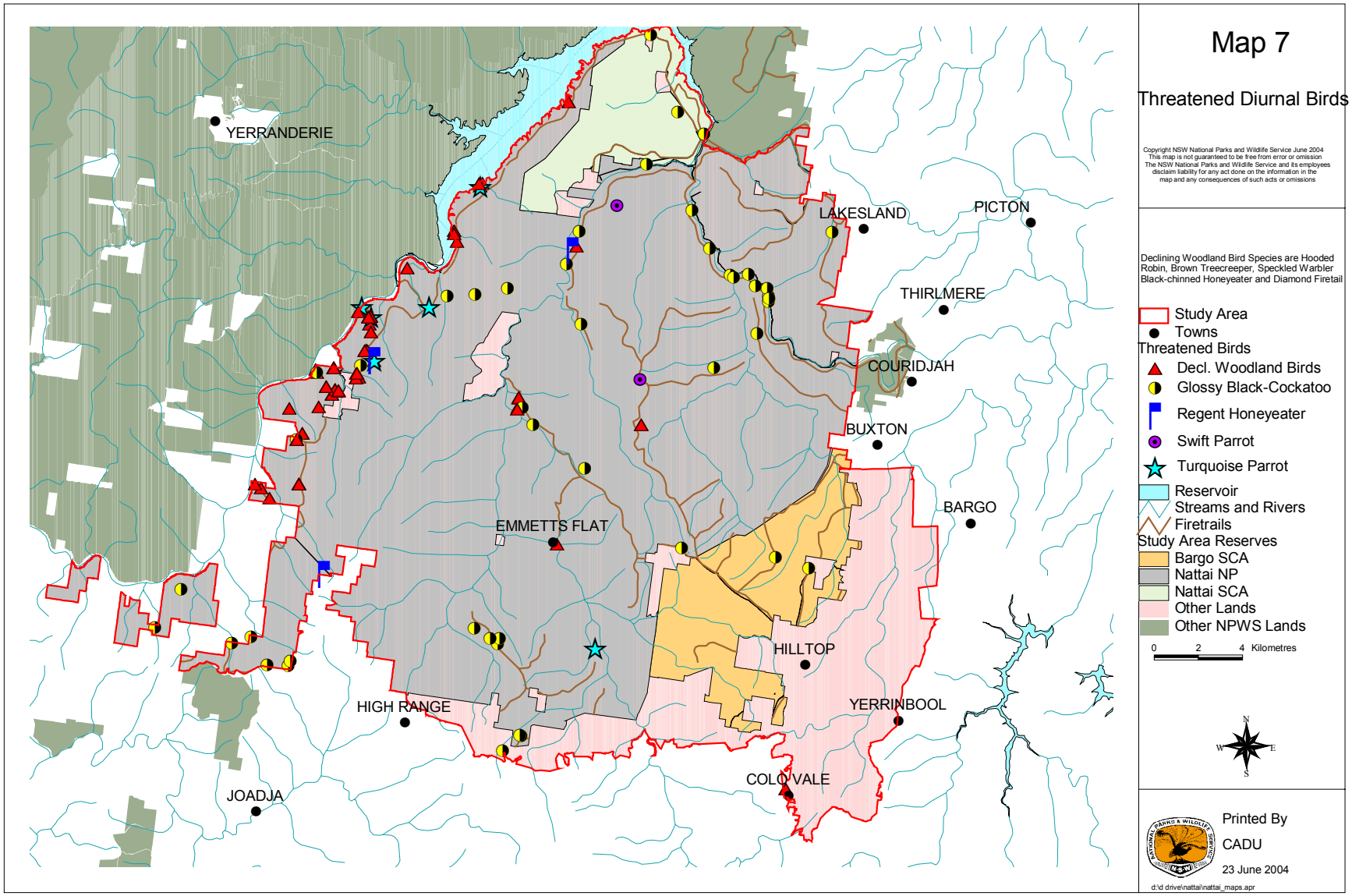
Threats

Habitat destruction for agriculture or residential development appears to be one of the main threats, due to both removal of nesting and feeding sites, and also from competition from more open habitat species such as Galahs (*Eolophus roseicapillus*). Because many *Allocasuarina* species are fire sensitive, inappropriate burning regimes may effect food supplies. Illegal trapping for aviculture may be a localised, minor threat (Garnett and Crowley 2000).

Local and Regional Conservation Status

The Glossy Black-cockatoo is listed as Vulnerable on the NSW TSC Act (1995). Relatively large areas of the Sydney Basin provide suitable habitat for Glossy Black-cockatoos and there are a large number of records for this species throughout the Bioregion (DEC 2004a). The habitat is well protected, occurring in numerous NPWS reserves, including Morton, Blue Mountains, Ku-ring-gai Chase and Wollemi National Parks.

The Nattai Reserves provide outstanding high quality habitat for Glossy Black-cockatoos, with three main areas supporting high numbers of the species. Locations of records are shown on Map 7. Sheltered escarpment slopes that plunge down from the sandstone tableland support an abundance of Forest Oak (*Allocasuarina torulosa*). Chewed *Allocasuarina* cones from feeding Glossy-black Cockatoos are regularly observed on the forest floor in these environments. Some of the more sheltered sandstone gullies in the eastern band of Nattai National Park also feature this tree, although evidence of Black cockatoo feeding is not as prevalent. The dry rainshadow valley of the Wollondilly River supports the large-fruited Drooping She-oak (*A. verticillata*) in the understorey across much of the Box-Red Gum woodlands found on the richer porphyry soils. Dense regenerating thickets of this species are often found near former grazing country and supply an abundant food resource for the cockatoos. In the south of Nattai National Park on the sandstone tableland near High Range and Mt. Wanganderry, Black She-oak (*A. littoralis*) is prominent as a small tree amongst open woodlands and forests. Again, individuals have been regularly observed and evidence of feeding is widespread. This pattern is somewhat unusual in that Black She-oak is common in many other areas in the Nattai and Bargo reserves but lacks the obvious signs of heavy feeding that are found in the southern area of the Nattai National Park. The presence of these three feed tree species over such a large area makes these reserves important for the Glossy Black-cockatoo as it allows individuals to move between different areas if feed resources are altered by such events as wildfires. It also reinforces the contribution the reserves make to the protection of suitable habitat for the species in the Bioregion.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BUXTON
BARGO
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HILLTOP
YERRINBOOL
HIGH RANGE
COLO VALE
JOADJA
Map 7
Threatened Diurnal Birds
Copyright NSW National Parks and Wildlife Service June 2004
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disclaim liability for any act done on the information in the
map and any consequences of such acts or omissions
Declining Woodland Bird Species are Hooded
Robin, Brown Treecreeper, Speckled Warbler
Black-chinned Honeyeater and Diamond Firetail
Study Area
Towns
Threatened Birds
Decl. Woodland Birds
Glossy Black-Cockatoo
Regent Honeyeater
Swift Parrot
Turquoise Parrot
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TURQUOISE PARROT

Species Profile

The Turquoise Parrot (*Neophema pulchella*) is a small, brightly coloured parrot, distinguished by its bright green upper parts, yellow under parts and blue face and shoulder patch. The male is considerably brighter than the female, and also has a red shoulder band. Usually occurs in pairs or small family parties in eucalypt woodlands and open forests that have a ground cover of grasses. It nests in tree hollows, and has a usual clutch size of two to five eggs (Higgins 1999). It is restricted to eastern Australia, where its range has contracted by over 50 percent since the 1890s (Garnett and Crowley 2000).

©DEC

Threats

Garnett and Crowley (2000) summarise the main threats as: past clearing for agriculture, which has greatly reduced the overall distribution; predation by cats and foxes; loss of hollows that are used for nesting in managed forests; and inappropriate burning regimes that may favour a shrubby rather than a grassy understorey.

Local and Regional Conservation Status

The Turquoise Parrot is listed as Vulnerable on Schedule 2 of the NSW TSC Act (1995). In the Sydney Basin Bioregion, the species is most commonly found within dry grassy woodland environments that are prominent in the Hunter and Capertee Valleys and to a lesser extent the Cumberland Plain. They are also frequently recorded in dry sclerophyllous shrub woodlands of Wollemi and Goulburn River National Parks and Munghorn Gap Nature Reserve (DEC 2004a). Individuals do turn up in areas of less typical habitat such as the Woronora Plateau (NPWS 2002a).

The Burragorang Valley, of which Nattai National Park forms part, is an area in which the species has been frequently observed (Map 7). The dry grassy box woodlands that are found on the valley floor and adjoining hills support a number of recent observations, with records on both sides of the Wollondilly River. The only other record in the study area is a single bird seen west of Hilltop in 1984, indicating that this species may occasionally be seen away from the Burragorang Valley.

SWIFT PARROT

Species Profile

The Swift Parrot (*Lathamus discolor*) is a medium-sized, green parrot with distinctive red and blue head markings. It favours open eucalypt forest and woodland where it feeds on nectar and lerp. It breeds only in Tasmania, and migrates to the mainland as far north as southern Queensland during autumn and winter. During the non-breeding season it is nomadic, with small to large flocks congregating at suitable food sources. Favoured food trees in NSW include Swamp Mahogany (*Eucalyptus robusta*), Mugga Ironbark (*E. sideroxylon*), White Box (*E. albens*) and Spotted Gum (*Corymbia maculata*) (Higgins 1999).

©DEC

Threats

The Swift Parrot has a small population of approximately 2000 individuals (Tzaros 2002) which may still be declining (Garnett and Crowley 2000). Outside the breeding area the main threat is from habitat destruction (Garnett and Crowley 2000). Due to the variable nature of the flowering of its favoured feeding trees during the non-breeding season it is nomadic and is sensitive to clearance of areas that it may rely on once every few years. Due to its rapid flight, the species often is killed in collisions with windows, vehicles and fences, though this occurs more regularly in Tasmania (Garnett and Crowley 2000).

Local and Regional Conservation Status

The Swift Parrot is listed as Endangered on the NSW TSC Act (1995) and as Endangered on the Commonwealth EPBC Act (1999). Most of the records of Swift Parrots in the Sydney Basin Bioregion are in coastal habitats, particularly the Central Coast, but they have also been regularly recorded in drier areas of the Hunter and Capertee Valleys and the Cumberland Plain. Within these areas it has been recorded in small numbers in a number of reserves, including Botany Bay and Wyrrabalong National Parks, and Castlereagh Nature Reserve (DEC 2004a). Intensive surveys in recent years have greatly increased understanding of habitat usage by Swift Parrots in their wintering grounds in NSW (D. Saunders pers. comm.).

Swift Parrots have been recorded in the Burragorang Valley since 1941 (Chafer *et al.* 1999) and most recently near the Jooriland Homestead as recently as 2002, feeding on lerps in the Red Gum-Box Woodlands. A flock of seven was also observed flying over the Wild Goat Plateau in May 1997. These records are shown on Map 7. The Box Woodlands in the Burragorang Valley, however provide the highest quality habitat in the reserves for this species with the presence of winter flowering eucalypts (White Box) providing a prominent, though irregular, food resource during winter migration.

BARKING OWL

Species Profile

The Barking Owl (*Ninox connivens*) is an owl of intermediate size between the larger Powerful Owl (*N. strenua*) and the Southern Boobook (*N. boobook*). It has dark brown upper-parts and a white underbody with coarse brown streaking (Higgins 1999). It is often identified by its call, which is a distinctive, dog-like barking that can be confused with Fox (*Vulpes vulpes*) or Dog (*Canis lupus*) barks. It usually inhabits dry open eucalypt forests and woodlands, where it is associated with hydrological features such as rivers and swamps (Taylor *et al.* 2002a). It nests in hollows, usually of large eucalypts, where it lays one to three eggs. It is an opportunistic feeder, eating more insects than other large forest owls, but consumes small terrestrial and arboreal mammals and birds during the breeding season. The race *connivens* occurs east of a line connecting Cooktown (Queensland) and the Flinders Ranges (South Australia) with an isolated population in the south west of Western Australia. Other races occur across northern Australia, in New Guinea and the Moluccas (Indonesia) (Higgins 1999).

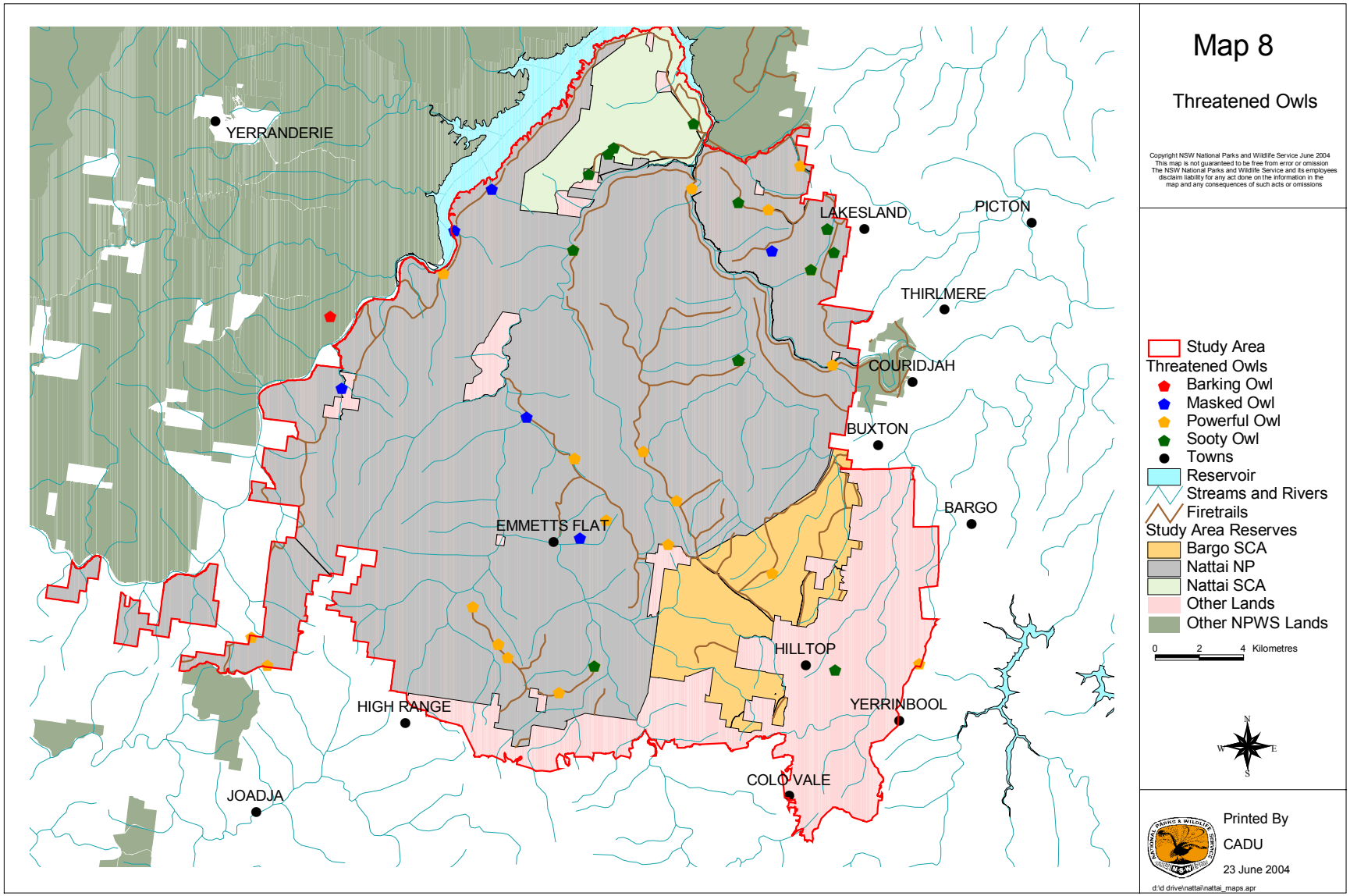
Threats

The main identified threat to the species is habitat destruction, particularly the removal of woodlands and forests from more low-lying fertile areas for agriculture (Taylor *et al.* 2002b). Remaining habitat is also subject to further degradation through forestry and collection of firewood, which often involves the removal of large hollows. The owl is often located, however, at the edge of forest blocks adjacent to cleared land, possibly due to increased prey availability at such locations (Taylor *et al* 2002b). The owl may also suffer some competition from feral honeybees (*Apis mellifora*) (Garnett and Crowley 2000). The long generation time (ten years) means that the species may take a long time to recover after suffering a decline (NSW Scientific Committee 1998b).

Local and Regional Conservation Status

The Barking Owl is listed as Vulnerable on the NSW TSC Act (1995). It is the rarest owl species known to occur in the Sydney Basin Bioregion, with most records associated with drier woodlands. Recent work by DEC across the southern Blue Mountains and Woronora Plateau have confirmed how rare this bird is. Only four individuals were recorded in over 300 systematic owl playback sites. This compares to a 30-40% positive response rate for other large forest owls. It has been identified in Yengo and Wollemi National Parks, amongst others, although there appear to be more records outside the reserve system in the dry grassy woodlands of the Capertee and Hunter Valleys, and the north-western suburbs of Sydney. Much the vegetation of these environments has been cleared for agriculture or urbanisation.

An individual has been recorded in 1997 just outside Nattai National Park on the western side of the Wollondilly River in lightly timbered country (Map 8). The grassy woodlands here are typical habitat for this species. The species almost certainly would make use of similar habitat found on the eastern side of the river. Another more recent observation has been made by a landholder in the Bullio area.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PICTON
THIRLMERE
COURIDJAH
BUXTON
BARGO
EMMETTS FLAT
HILLTOP
YERRINBOOL
HIGH RANGE
COLO VALE
JOADJA
Map 8
Threatened Owls
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Study Area
Threatened Owls
Barking Owl
Masked Owl
Powerful Owl
Sooty Owl
Towns
Reservoir
Streams and Rivers
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POWERFUL OWL

Species Profile

The Powerful Owl (*Ninox strenua*) is the largest owl in Australia and is distinguished by its relatively small, round head and long tail. It is dark brown above with prominent off-white barring, and paler underneath with diagnostic dark chevrons. It inhabits various forest habitats, though it usually breeds and roosts in closed forest, including rainforest and wet sclerophyll forest. It hunts in more open forests, where it feeds mainly on arboreal mammals, particularly Common Ringtail Possums (*Pseudocheirus peregrinus*) and Greater Gliders (*Petauroides volans*). This species usually nests in a hollow in a eucalypt within or below the canopy, and normally lays two eggs. They usually maintain a territory of between 300 and 1500 hectares, with size dependent on habitat quality and prey density. It is endemic to eastern Australia, being recorded between Eungella (Queensland) to near the South Australia-Victoria border (Higgins 1999).

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Threats

Past land clearance for agriculture has reduced the area of habitat available for the Powerful Owl (Garnett and Crowley 2000), particularly the availability of roost sites. It can, however, manage to survive in areas with some levels of disturbance, such as in selectively logged forests (Kavanagh 1997) and it is also still recorded in suburban areas of Brisbane, Sydney and Melbourne (Garnett and Crowley 2000, DEC 2004c). Two of the determining factors for the species persistence in disturbed areas is the presence and suitable abundance of prey species (Chafer 1992) and nesting/roosting sites (Debus and Chafer 1994).

Local and Regional Conservation Status

The Powerful Owl is listed as Vulnerable on the NSW TSC Act (1995). It occurs throughout the Sydney Basin Region across extensive areas from the rural-urban fringes of Sydney Metropolitan area to west of the Dividing Range into the Central Tablelands. Most reserves within the region support known territories of this species. Recent DEC surveys within the Warragamba Special Area, and the neighbouring Blue Mountains and Kanangra-Boyd National Parks have found Powerful Owls to be relatively abundant and widespread in the region (DEC in prep.).

The Nattai and Bargo reserves support many territories, with a large number of records found across the sandstone plateau as well as the deeply incised valleys of the Nattai and Little River valleys (Map 8). Surveys revealed a tendency for the species to respond to owl-call playback in taller forests associated with the sandstone gullies or with the taller open forests that are found on the shale enriched forests on ridges and plains in the east and south of the reserves. The species is clearly a habitat generalist, roaming over a variety of habitats. Both preferred prey species, the Common Ringtail Possum and the Greater Glider are common in the reserves. The number of Powerful Owl found during this survey supports growing evidence (DEC, in prep.) that the species is more common than once thought across the sandstone environments of the Sydney Basin.

MASKED OWL

Species Profile

The Masked Owl (*Tyto novaehollandiae*) is a large 'barn' owl, which has three colour morphs (with intermediates), but is distinguished from the similar Barn Owl (*T. alba*) by its larger size, more thickset and hunchbacked appearance, fully feathered legs and larger feet (Higgins 1999). It inhabits a wide range of woodland habitats with large hollows for roosting and open areas for hunting. It feeds mostly on ground-dwelling mammals, such as rats (*Rattus*) and Antechinus (*Antechinus*), and occasionally on diurnal birds, Sugar Gliders (*Petaurus breviceps*) and insects. The owl has a home range of 800 to 1200 hectares (Kavanagh 2002). It nests in hollow trees, usually eucalypts, where two to three eggs are the normal clutch. The nominate subspecies *novaehollandiae* was formerly found around the southern coast of Australia between Fraser Island (Queensland) and Carnarvon (Western Australia), though its range has contracted, particularly in Western Australia (Garnett and Crowley 2000). Other subspecies occur in Tasmania, northern Australia and in New Guinea and adjoining islands, some of which are sometimes considered separate species (Higgins 1999).

Threats

Clearance of native forest for agriculture and urban development, and the resulting fragmentation of habitat, has negatively affected the abundance of Masked Owls (Kavanagh 2002, Garnett and Crowley 2000). The species does not persist within fragments of forest less than 200 hectares (Kavanagh 2002). The species may be affected by logging, through removal of hollows or reduction in foraging habitat due to vigorous regrowth (Garnett and Crowley 2000), though it has been suggested that modern mosaic logging operations do not cause major changes to the abundance of the species (Kavanagh 2002).

Local and Regional Conservation Status

The Masked Owl is listed as Vulnerable on the NSW TSC Act (1995). It is not frequently recorded in the sandstone environments of the Sydney Basin Bioregion. By contrast the open woodlands of the coastal plains between Wyong and Port Stephens are known to support high numbers of the species and represent the best habitat in the region. Most of the records in this area are outside NPWS estate, but scattered locations are known from Yengo, Blue Mountains and Murramarang National Parks, and Berowra Valley Regional Park (DEC 2004a).

The Masked Owl is known to occur in the Nattai and Bargo Reserves (Map 8), and along with the Barking Owl (*Ninox connivens*) was far less frequently recorded than either the Sooty (*Tyto tenebricosa*) or Powerful (*N. strenua*) Owls. There are only five records of the species in the reserves, with most associated with the drier escarpment woodlands of the Nattai and Wollondilly Valleys. One unusual, though confirmed response, was elicited from a Masked Owl in a sandstone gully in the Couridjah area, indicating that the species habitat preference may be more varied than is sometimes suggested. The low response rate to playback techniques for the Masked Owl are consistent with that achieved elsewhere in the southern sandstone plateaux (DEC, in prep.), confirming that the species genuinely occurs at very low abundance in this region.

SOOTY OWL

Species Profile

The Sooty Owl (*Tyto tenebricosa*) is a medium to large 'barn' owl, with sooty grey plumage that is finely spotted and flecked with white. It is found in tall wet forests, including wet sclerophyll and rainforest, where it is often first detected by its distinctive 'falling bomb' call. It roosts and breeds in hollows, often located in emergent trees, which may be greater than 100 years of age. Pairs probably maintain permanent territories that are between 200 and 800 hectares in area (Higgins 1999). It feeds on a wide range of arboreal and terrestrial mammals (Kavanagh 2002). In Australia the subspecies *tenebricosa* is distributed along the east coast between the Conondale Ranges (Queensland) to north east of Melbourne (Victoria). A smaller subspecies (*arfaki*) occurs in New Guinea (Higgins 1999).

Threats

Garnett & Crowley (2000) list the main threat as habitat clearance for agriculture, with additional fragmentation or degradation caused by logging, burning, dieback and urbanisation. The effects of logging have been particularly well studied, though the overall effect is not entirely clear (Higgins 1999). Due to its nocturnal habits, the Sooty Owl is not often recorded using established bird detection methods. Recent improvements in survey technique have greatly improved the detectability of this and other owl species (Kavanagh 1997).

Local and Regional Conservation Status

The Sooty Owl is listed as Vulnerable on the NSW TSC Act (1995). The distribution of this species in the Sydney Basin Bioregion is strongly tied to the presence of wet sclerophyll forests and rainforests. Habitats of this type are most extensive in areas of high rainfall and richer soil. The Illawarra escarpment behind Wollongong and the Watagan Ranges between the Central Coast and Newcastle support the largest areas of high quality habitat (NPWS 2002a). In these areas it has been recorded in Illawarra Escarpment and Jilliby State Conservation Areas, with other records in Royal, Blue Mountains and Bouddi National Parks. Habitat becomes increasingly restricted to protected slopes and gullies as distance from the coast increases until near the western arm of the Dividing Range the environment is too dry to support this species.

The distribution of suitable habitat is patchy across the Nattai and Bargo reserves and is restricted to deep, protected sandstone gullies and south facing escarpment slopes (Map 8). In these locations a mosaic of narrow rainforest gullies and tall Eucalypts occur, forming ideal habitat for the Sooty Owl. Playbacks in or near these locations frequently returned positive responses for the species. There are now over twelve confirmed locations within the reserves. Like the Powerful Owl (*Ninox strenua*), these surveys are revealing that the species is perhaps more common in sandstone environments than once thought (DEC, in prep.). However, unlike the Powerful Owl, the Sooty Owl is a habitat specialist, and suitable habitat is confined to small areas in the reserves.

BROWN TREECREEPER

Species Profile

The Brown Treecreeper (*Climacteris picumnus*) is a medium-sized brown bird that is superficially similar in appearance to the Red-browed (*C. erythrops*) and White-throated (*Cormobates leucophaeus*) Treecreepers. It is distinguished from both by its slightly larger size, distinctive pale supercilium (eyebrow stripe) and by call. Typically a bird of eucalypt woodlands with a grassy or open shrub understorey, and abundant fallen timber and/or dead trees. Unlike most treecreepers, they spend approximately half of the time on the ground where they feed on insects, particularly ants and beetles, taken from live and dead trees, fallen branches and off the ground. It occurs in pairs or small groups in permanent territories where tree hollows are utilised for breeding (Higgins *et al.* 2001). The eastern subspecies (*victoriae*) occurs along the coast and ranges in Victoria, New South Wales and south-east Queensland, with the other two subspecies occurring either west (*picumnus*) or north (*melanotus*) (Schodde and Mason 1999).

Threats

The eastern subspecies of the Brown Treecreeper is one of a suite of woodland birds that have declined throughout their range due to habitat clearance (Reid 1999). Traill and Duncan (2000) stated that the population was estimated to have declined by at least twenty percent in the last fifteen years. Studies have shown that populations can not persist in habitat fragments smaller than 300 hectares, mostly because females either disperse or suffer from preferential mortality. As with most treecreepers, once extinction occurs in a remnant, natural recolonisation is unlikely (Garnett and Crowley 2000). The lack of hollows may also be the limiting factor as known to compete with introduced species like the Common Starling (*Sturnus vulgaris*) (Higgins *et al.* 2001) and European Honeybees (*Apis mellifora*) (NSW Scientific Committee 2001a). Grazing also has impacts by decreasing the diversity of ground-dwelling invertebrates which reduces the levels of food availability (NSW Scientific Committee 2001a).

Local and Regional Conservation Status

The eastern subspecies of the Brown Treecreeper is listed as Vulnerable on the NSW TSC Act (1995). Though it is found through all the eastern Bioregions in New South Wales, it is least common in the South East Coast and Australian Alps, and has declined significantly within the Sydney Basin and NSW North Coast. Within the Sydney Basin Bioregion, the species is restricted to open woodlands of the central tablelands and open coastal plains and valleys such as the Cumberland Plain and Hunter Valley (DEC 2004a). The species has virtually disappeared from the Cumberland Plain in the last 30 years (NSW Scientific Committee 2001a, DEC 2004a). These environments are all characterised by agricultural and urban clearing with small isolated fragments of native vegetation common.

Brown Treecreepers are regularly observed in Nattai National Park in the Burragorang and Nattai Valleys where there are extensive areas of grassy box woodlands present. The records of this species have been combined with the other declining woodland bird species in Map 7. This habitat is certainly some of the most contiguous and protected habitat for the species in the Bioregion. Historically, it may have once occurred in the eastern parts of the study area, but this population appears to be extinct.

SPECKLED WARBLER

Species Profile

The Speckled Warbler (*Pyrrholaemus sagittata*) is a small, ground-dwelling scrubwren-like bird. It is similar in size and shape to the Buff-rumped Thornbill (*Acanthiza reguloides*) but can be identified by its boldly streaked underbody, distinctive facial pattern and noticeably longer tail. The female differs from the male by having a chestnut, rather than black, streak in the eyebrow. It usually occurs in the grassy understorey of dry sclerophyll forests and woodlands dominated by eucalypts, often with scattered shrubs. They feed on insects and seeds with most foraging occurring on the ground. Pairs, and occasionally trios, live permanently in large (up to twelve hectares) territories where a well concealed domed nest is built on the ground in grass tussocks. Two to four (usually three) eggs are laid though breeding success can be low. The Speckled Warbler is endemic to south eastern Australia, being found between Maryborough (Queensland) and the Grampians (Victoria) (Higgins and Peter 2002).

Threats

The Speckled Warbler is one of a number of woodland birds that has declined in density throughout its range due mainly to agricultural land clearing (Reid 1999). Speckled Warbler populations are estimated to have declined by at least twenty percent in the last fifteen years (Traill and Duncan 2000). Small isolated patches may result in local extinction due to natural fluctuations (Garnett and Crowley 2000) with extinction occurring in areas with no patches over 100 hectares (NSW Scientific Committee 2001b). Weed invasion, nest predation by exotic mammalian predators and a loss of ground cover by grazing by stock, kangaroos and rabbits are other notable threats (NSW Scientific Committee 2001b, Garnett and Crowley 2000).

Local and Regional Conservation Status

The Speckled Warbler is listed as Vulnerable on the NSW TSC Act (1995). It is widespread in the eastern Bioregions of the state, extending as far west as the Cobar Peneplain, but is scarce or absent from the South East Coast and Australian Alps. Within the Sydney Basin Bioregion the species is closely tied to the Hunter and Capertee Valleys, Burragorang and Wollondilly Valleys and the north western Cumberland Plain. This latter location is one of the areas that is known to have a declining population (NSW Scientific Committee 2001b). Within these areas, most records in NPWS reserves are restricted to the north, with Goulburn River National Park and Munghorn Gap Nature Reserve being particularly important.

The Nattai National Park is one of the few reserves in the region that supports both good numbers of the species and extensive areas of habitat. This species has been combined with the other declining woodland birds in Map 7, but all the records are restricted to the Burragorang Valley. Here, it has been observed sheltering amongst Native Blackthorn (*Bursaria spinosa*) and nests have also been located.

REGENT HONEYEATER

Species Profile

The Regent Honeyeater (*Xanthomyza phrygia*) is a medium-sized honeyeater with a striking black and yellow plumage. It typically favours box-ironbark woodland, though it also utilises River Oak (*Casuarina cunninghamiana* subsp. *cunninghamiana*) Forests and coastal habitats such as Swamp Mahogany (*Eucalyptus robusta*) or Spotted Gum (*Corymbia maculata*). The population seems to undertake complex movements, generally dependent on where flowering food trees are available. It feeds mainly on nectar, and nests in the crowns or eucalypts where usually lays two or three eggs. It is endemic to south-eastern Australia, formerly between Rockhampton (Queensland) and Adelaide, though it is now rare in Queensland and probably extinct in South Australia, with a general contraction of range in the other two states (Higgins *et al.* 2001).

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Threats

Land clearance for agriculture has removed about three-quarters of the suitable habitat of the Regent Honeyeater. The remaining vegetation is fragmented, and is still being affected by the removal of larger trees. Habitat alteration may also advantage more aggressive honeyeaters, such as miners (*Manorina* spp.) and friarbirds (*Philemon* spp.) with resulting competition. The population is estimated to be no more than 1500 individuals (Garnett and Crowley 2000; Higgins *et al.* 2001).

Local and Regional Conservation Status

The Regent Honeyeater is listed as Endangered on the NSW TSC Act (1995) and as Endangered on the Commonwealth EPBC Act (1999). Compiling records was one of the priorities of the Draft Regent Honeyeater Recovery Plan (Menkhorst *et al*. 1999) and so a number of records are included in the Atlas of NSW Wildlife. Many of these are within the Sydney Basin Bioregion with important areas appearing to be the Capertee and lower Hunter Valleys, the northern Cumberland Plain and the Central Coast. Most of these records are outside formal reserves, but there are occasional observations made in Goulburn River National Park and Munghorn Gap and Cockle Bay Nature Reserves.

The species is an occasional visitor to Nattai National Park with several individuals recorded in or adjoining the reserve over the last seven years (Map 7). All are associated with the drier grassy woodlands in the Burragorang Valley, with White Box (*Eucalyptus albens*) providing an important flowering resource for the migrating species during the winter months. The habitat present in the Burragorang Valley ranks alongside a small number of areas considered vital for the ongoing persistence of the species in the region.

BLACK-CHINNED HONEYEATER

Species Profile

The Black-chinned Honeyeater (*Melithreptus gularis*) is a medium-sized, rather stocky and short-tailed honeyeater. It is distinguished from other *Melithreptus* honeyeaters by its relatively larger size, bright blue or jade green eye-wattle and distinctive call. They occupy the dry eucalypt woodlands that feature ironbark and/or box species with low to moderate rainfall levels, where they are usually found in pairs or small groups of up to twelve. They feed on insects, nectar and lerp usually in the upper canopy and outermost flowers and leaves. There are two subspecies which have in the past been named as two separate species; the eastern, nominate subspecies (*gularis*) is found between south east Queensland and Victoria, while the 'Golden-backed Honeyeater' (*laetior*) is widespread across northern Australia (Higgins *et al.* 2001).

Threats

The eastern subspecies of the Black-chinned Honeyeater is one of a suite of woodland birds that have declined throughout their range due to habitat clearance (Reid 1999). They are threatened by clearance and the fragmentation of woodland habitat and don't appear to survive in remnants less than 200 hectares (NSW Scientific Committee 2001e). The species appears to occur naturally at low densities (NSW Scientific Committee 2001e) and is relatively mobile, so the reason for this absence in small fragments is unknown (Garnett and Crowley 2000). They are also likely to experience high levels of competition from aggressive honeyeater species associated with smaller fragments and may suffer increased nest predation from such species as Pied Currawongs (*Strepera graculina*) (NSW Scientific Committee 2001e).

Local and Regional Conservation Status

The Black-chinned Honeyeater is listed as Vulnerable on the NSW TSC Act (1995). Scattered records for this species occur in the eastern half of the state, though with the highest number of records in the Nandewar, Sydney Basin and NSW South West Slopes Bioregions and a complete absence from the South East Corner and Australian Alps. In the Sydney Basin region most records come from drier areas such as western Sydney, the Capertee and Hunter Valleys. All of these areas have been heavily cleared in the past and remain subject to ongoing threatening processes. Most of the records are also outside DEC reserves, though it has been recorded in a number, notably Goulburn River and Werakata National Parks and Munghorn Gap Nature Reserve (DEC 2004a).

In Nattai National Park, the Burragorang Valley supports extensive areas of good quality habitat for the species, where it is closely associated with the Red Gum-Box Woodlands on Devonian soils. This species has been mapped with the other declining woodland bird species in Map 7. There have been a number of records of the species in the Jooriland area and in the Nattai Valley. The species is rarely recorded further east with other observations made on the shale country near Bargo and Wilton. Flowering events of feed trees, particularly White Box (*Eucalyptus albens*) and Mugga Ironbark (*E. sideroxylon*) would be particularly important for this highly nomadic species.

HOODED ROBIN

Species Profile

The Hooded Robin (*Melanodryas cucullata*) is a medium-sized bird that usually occurs in eucalypt woodland or *Acacia* shrubland. The adult male is distinctive and has a black hood and upper body with a white stripe on the shoulder. The adult female is mostly grey with a dark-brown wing. Both sexes have a white wing stripe and underparts and a prominent white side-panel on the tail, which along with their larger size, distinguish this species from the Jacky Winter (*Microeca fascinans*) and female *Petroica* Robins. They utilise dead or fallen timber as perches when foraging where it feeds mainly on insects. Usually occurs as pairs, though cooperative breeding is also common, with normally two or three eggs laid in a cup-shaped nest placed in a horizontal fork (Higgins and Peter 2002). There are four subspecies covering most of Australia, with the two subspecies in New South Wales being *picata,* which extends from north western NSW through to the Kimberleys in Western Australia, and the nominate (*cucullata*) which is south and east of this subspecies (between Queensland and South Australia) (Schodde and Mason 1999).

Threats

The south eastern subspecies of the Hooded Robin has been identified as one of a number of birds that have declined significantly in range and population in the sheep-wheat belt of central west NSW due to the degradation and fragmentation of woodland habitats. (Reid 1999). Populations do not appear to persist even in large fragments of remaining habitat although the precise reason for this is as yet unknown (Garnett and Crowley 2000). Habitat modification and reduction of food availability through grazing by stock and weed invasion may also be a threat (NSW Scientific Committee 2001c). Eggs and young have been known to be predated by native avian predators and possibly by Foxes (*Vulpes vulpes*) (Higgins and Peter 2002).

Local and Regional Conservation Status

The south eastern subspecies of the Hooded Robin is listed as Vulnerable on the NSW TSC Act (1995). It has been recorded in most subcoastal areas of New South Wales, though is rare in the Australian Alps Bioregion. Within the Sydney Basin Bioregion it is virtually restricted to the Hunter, Capertee and Burragorang Valleys, though it formerly occurred on the Cumberland Plain (DEC 2004a, Keast 1995). In these it is closely tied to the drier woodlands, which are generally poorly reserved, with the only reserves with more than one record being Munghorn Gap Nature Reserve, Nattai National Park and Yerranderie State Conservation Area (DEC 2004a).

Good numbers of this species have been recorded in the Burragorang and Wollondilly Valleys. Extensive areas of grassy box woodlands are present in a mosaic of open and timbered country. Nattai National Park protects large areas of this habitat on the eastern arm of the Wollondilly River, which makes it one of the most important areas for this species in the Bioregion.

DIAMOND FIRETAIL

Species Profile

The Diamond Firetail (*Stagonopleura guttata*) is an attractive finch, which is distinguished by its bold black breast band and white-spotted black flanks. The eye, beak and rump are red, with the latter contrasting strongly with the black tail in flight (Pizzey and Knight 1997). It is most frequently encountered in Eucalypt dominated communities that have a grassy understorey, where it feeds mainly on grass seeds (Garnett and Crowley 2000). Usually encountered as pairs, though sometimes forms small flocks in autumn and winter. They nest in trees or sometimes mistletoe, building bottle-shaped nests and usually produce four to six eggs (Pizzey and Knight 1997). It is endemic to south-eastern Australia, with records extending from Rockhampton (Queensland) to the Eyre Peninsula and Kangaroo Island (South Australia) (Pizzey and Knight 1997).

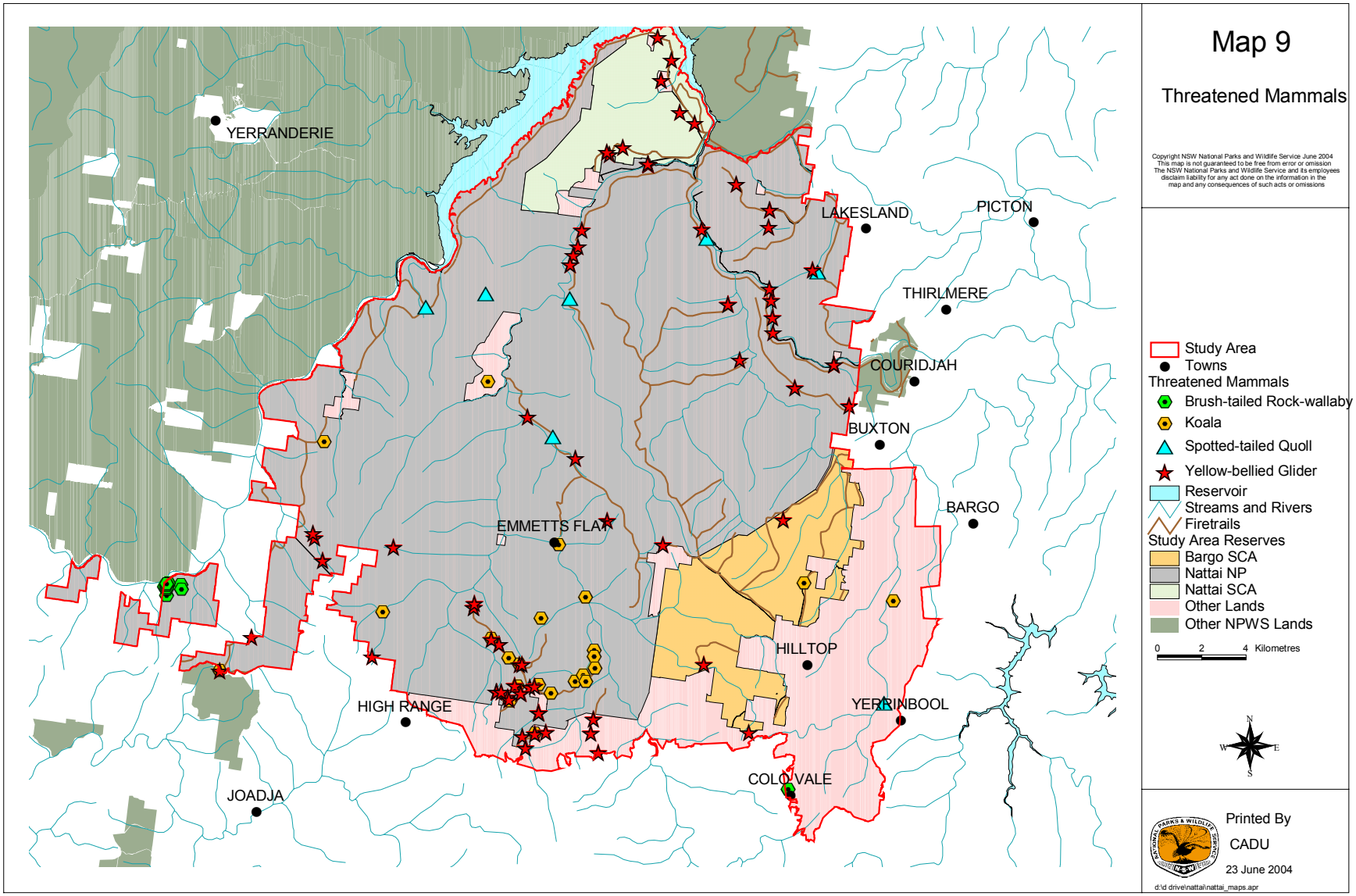
Threats

The Diamond Firetail has been historically recorded in all types of timbered country (Smith *et al*. 1995) but much of its habitat has been cleared and it is therefore included in the suite of woodland birds that have declined in south-eastern Australia (Reid 1999). They appear to be unable to survive in areas with no remnants larger than 200 hectares (NSW Scientific Committee 2001d). Clearing and habitat degradation by over-grazing and the spread of exotic grasses may also result in the loss of key food plants and possibly competition from flock-foraging Red-browed Finches (*Neochmia temporalis*) (Garnett and Crowley 2000). Predation by foxes and cats may be another threat (Smith *et al.* 1995).

Local and Regional Conservation Status

The Diamond Firetail is listed as Vulnerable on the NSW TSC Act (1995). It is widely recorded in the eastern two thirds of the state, with scattered records in the far west, although it is less widely recorded in the three coastal Bioregions and in the high country of the Australian Alps. Within the Sydney Basin Bioregion the species is closely associated with grassy box woodlands found on the more fertile soils on the inland valleys, including the Capertee, upper Hunter and Burragorang, and occasionally on the Cumberland Plain. These environments are generally poorly conserved throughout the region, though records are known from Goulburn River and Wollemi National Parks and Munghorn Gap Nature Reserve (DEC 2004a).

This species has been recorded quite widely in and around the Burragorang Valley and is mapped with the other declining woodland species in Map 7. The valley supports extensive areas of grassy box woodlands and as a result provides some of the best available habitat within the Bioregion. Immature Diamond Firetails have also been observed, indicating that breeding populations occur in the valley.


Map 9
Threatened Mammals
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EMMETTS FLAT
HILLTOP
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JOADJA
Study Area
Towns
Threatened Mammals
Brush-tailed Rock-wallaby
Koala
Spotted-tailed Quoll
Yellow-bellied Glider
Reservoir
Streams and Rivers
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SPOTTED-TAILED QUOLL

Species Profile

The Spotted-tailed or Tiger Quoll (*Dasyurus maculatus*) is a medium-sized marsupial carnivore that is identified by its rufous to dark brown fur and white spots which are present on the body and tail. It is essentially terrestrial, but is also an agile climber. It feeds on a wide variety of birds, reptiles, mammals and invertebrates and it uses several 'latrines' within its territory for defecation (NPWS 1999b). There are three populations of this species. The first is in far north Queensland, the second extends from Southern Queensland to Victoria, and a final genetically distinct population occurs in Tasmania (Firestone *et al.* 1999).

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Threats

The main problems confronting the Spotted-tailed Quoll are believed to be habitat loss, habitat degradation, predation and competition by introduced cats (*Felis catus*) and foxes (*Vulpes vulpes*), and direct mortality at the hands of humans (Mansergh 1984). Quolls were heavily persecuted as killers of domestic fowl, and have been hunted and trapped to extinction in many parts of the country. In more recent years, baiting for foxes, dogs and dingoes may have taken a toll on this species (D. Andrew pers. comm.).

Local and Regional Conservation Status

The Spotted-tailed Quoll is listed as Vulnerable on the NSW TSC Act (1995) and as Endangered on the Commonwealth EPBC Act (1999). The southern populations are believed to have declined in range by up to fifty percent (Maxwell *et al.* 1996). The distribution of potential habitat within the Sydney Basin Bioregion is extensive although the occupancy rate of this habitat is likely to be very low. Regional habitat models suggest there are a number of core areas for Spotted-tailed Quolls including the area around the Hawkesbury River mouth, north through the Watagan Ranges, the area to the south of Port Stephens, the central Blue Mountains Region and the Budderoo Plateau (NPWS 2000). A reasonable percentage of this land is protected in reserves, though most of the recent records have only been from Blue Mountains and Brisbane Waters National Parks, and Barren Grounds Nature Reserve (DEC 2004a).

The Spotted-tailed Quoll is amongst one of the most cryptic ground mammals, as densities are generally very low and individuals are likely to roam over very large areas. A relocated individual has been known to travel over ten kilometres to return to its site of capture at Lakesland (D. Ashton pers. comm.). There have been chance observations of this species in or near the Nattai reserves at Sheeys Creek Road, Nattai River near Martins Flat, Lakesland (D. Ashton pers. comm.) and records from campers at the top of Beloon Pass (Map 9). There are additional records held by DEC staff of occurrences on the Nattai Road near the escarpment edge and the species is infrequently observed harassing chicken coops on the bush interface between Colo Vale and Picton. This species has not been observed during recent surveys, although it is notorious for being difficult to trap and requiring immense effort to detect in the wild using standard survey techniques (Lunney and Matthews 2001). Nevertheless, the fact that no individuals were observed opportunistically despite the large amount of time in the field suggests that the species occurs at very low abundance. It is likely to be using a wide variety of habitats within the reserves. Intensive cage trapping effort would be required to obtain a more accurate picture of species abundance and habitat use throughout the reserves.

KOALA

Species Profile

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The Koala (*Phascolarctos cinereus*) is a distinctive, iconic arboreal mammal of eucalypt forest and woodland. It feeds on a wide range of eucalypt and other tree species, though in a local area a few species will be preferred almost exclusively. Individuals spend most of the day resting in the forks of trees, and are most active following sunset (NPWS 1999c). They generally move about a home range, the size of which varies on the density of food trees and population size, though individuals, particularly dispersing juveniles, are known to travel up to 50 kilometres (Martin and Handasyde 1995; NPWS 1999c). Three subspecies occur between north Queensland and the Eyre Peninsula in South Australia. However, the distribution is now fragmented and introductions, such as to Phillip Island, have possibly altered the genetic diversity of many of the populations (Martin and Handasyde 1995).

Threats

NPWS (1999c) summarises the threats to the Koala as follows: destruction of habitat by clearing for urban development, agriculture and mining; degradation of habitat through fragmentation and disturbance such as fire or weed invasion; direct mortality from dogs and motor vehicles; and infection by *Chlamydia* which causes keratoconjunctivitis (an infection of the eyes) and infertility. The latter appears to occur naturally in Koalas in NSW, and symptoms are displayed when animals are stressed (NPWS 2003c). In Victoria, populations that have been transferred from Phillip Island appear to have lost their immunity and rates can be high, but it does not appear to be a major threat (Menkhorst 1995a). Throughout its entire range, loss, fragmentation and degradation of habitat is its greatest threat (NPWS 2003c). Reed *et al*. (1990) reported on a survey in 1986-87 that found that the Koala had disappeared from 50 to 75 percent of its known range in NSW and populations had been lost from many localities, particularly on the southern and western edges of their distribution.

Local and Regional Conservation Status

The Koala is listed as Vulnerable on the NSW TSC Act (1995). As an easily recognisable species, there are a number of records throughout the Sydney Basin Bioregion. Concentrations appear to be located around the Central Coast, Blue Mountains and the fringes of the Cumberland Plain including within the Metropolitan Catchment. Records from reserves within this distribution are less common, though sightings have been made in Dharug, Wollemi and Morton National Parks. A local population of Koalas was discovered near High Range at the south end of Nattai National Park during DEC surveys in November 2003. Three individuals were observed at different locations during spotlight transects and male Koalas were heard bellowing at a number of others (Map 9). Koala scats were also positively identified under a number of Grey Gums (*Eucalyptus punctata*). These results strengthen the validity of some incidental observations made by casual observers in the Russells Needle area and between this location and Emmetts Flat where a dead individual was recently found. Other isolated observations have been made near the Wollondilly Lookout near the border of Joadja Nature Reserve, on the escarpment footslopes beneath Bonnum Pic and on west road fire trail in Bargo State Conservation Area. These observations indicate that Koalas make widespread use of Nattai National Park. Areas of high densities are united by their proximity to enriched soils that are associated with shale cappings, igneous intrusions and alluviums on valley flats. Most sites are associated with the prevalence of Grey Gum or Forest Red Gum (*Eucalyptus tereticornis*). A broader review of the regional distribution highlights that Koalas have been observed in the upper Nattai Valley behind Mittagong and around the villages of Hilltop and Balmoral (DEC,2004a). These Southern Highland records are isolated by the Sydney to Canberra Freeway from other Koala populations known in the Nepean and Avon Catchments and further north at Wedderburn (DEC 2004a, DEC in prep.). Intermixing between populations is likely to be prevented by the barrier urban areas place on dispersal.

EASTERN PYGMY-POSSUM

Species Profile

The Eastern Pygmy-possum (*Cercartetus nanus*) is a small (between 14 and 21 centimetre) possum that is found in a wide variety of habitats, including rainforest, sclerophyll forest and heaths. It is generally nocturnal, and is an opportunistic omnivore, including nectar, pollen, insects, seeds and fruit in its diet. Each individual has a number of nests, which are usually constructed in tree hollows, throughout their territory, and will move up to 125 metres, through tree, shrub and ground layers (Turner and Ward 1995). It is distributed between extreme south east Queensland and South Australia, and Tasmania, though it is only found at higher at higher altitudes in northern New South Wales and is generally commoner in southern latitudes (Bowen and Goldingay 2000, Menkhorst 1995b).

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Threats

The NSW Scientific Committee (2001f) listed the potential threats to the Eastern Pygmy-possum. They include isolated sub-populations with little dispersal potential which increase the risk of local extinction, habitat loss and fragmentation by clearing, inappropriate fire regimes that may effect understorey plants, the loss of nest sites through intensive forestry and firewood collection, and predation by foxes and cats.

Local and Regional Conservation Status

The Eastern Pygmy-possum is listed as Vulnerable on the NSW TSC Act (1995). This listing appears to be chiefly based on Bowen and Goldingay (2000), which showed that despite intensive survey effort throughout the known distribution, relatively few individuals have been detected. The survey techniques used in many of these surveys, however, may have underestimated the abundance of this species. Over a two week period in early 2000, 22 individuals were removed from a ten kilometre stretch of trench dug as part of a natural gas pipe laying procedure between Cataract and Cordeaux dams (NPWS 2002a). Broadscale regional habitat mapping for this species (NPWS 2000) indicate that most of the suitable habitat occurs in the sandstone areas surrounding the Sydney metropolitan area. Recent records of this species have been located in Royal, Ku-ring-gai Chase and Morton National Parks.

This species has not been recorded in the Nattai and Bargo reserves, probably because intensive trap effort has not been employed. Belik and Close (1997) captured an individual using pit traps in the Bargo River crown lands, though this record is not in the Atlas of NSW Wildlife as the exact details of the site are unknown. However, the habitat was described as “Drier open woodland” and on the basis of similar habitat being present in the reserves, the species is likely to be captured using the appropriate survey method.

YELLOW-BELLIED GLIDER

Species Profile

©Joel Winter/DEC

The Yellow-bellied Glider (*Petaurus australis*) is a nocturnal mammal found in tall open sclerophyll forests of eastern Australia. As an arboreal species, it requires mature hollow bearing trees within which to den during the day, and at night from which to leap and glide using a membrane that extends from the wrists to the ankles (NPWS 1999d). It is characterised by grey fur above and a whitish to orange fur underneath with large bare ears. The species is more often heard than seen, as it frequently emits a distinctive throaty shriek, which can be heard from some distance. It feeds on eucalypt nectar, sap, manna and invertebrates found under shedding bark. Its feeding habits to extract sap can leave deep V-notched incisions in the bark of eucalypts, with individuals and families demonstrating preference for repeated use of individual trees for many seasons (Mackowski 1988). Yellow-bellied Gliders are known to utilise a home range of between 30 and 65 hectares (Goldingay and Kavanagh 1991). The southern, nominate subspecies ranges between Portland (Victoria) and central coastal Queensland with a separate subspecies isolated in north Queensland in the vicinity of the Herbert River (Russell 1995).

Threats

Yellow bellied Gliders are known to be greatly affected by the reduction of nesting resources when the availability of hollow bearing trees are lost through clearing, fragmentation or timber extraction (NPWS 1999d). Predation by cats and foxes are also thought to contribute to the species vulnerability. Impacts of fire regimes are poorly understood, although some suggest that availability of food is reduced after fire (NPWS 1999d).

Local and Regional Conservation Status

The Yellow-bellied Glider is listed as a vulnerable species on the NSW TSC Act (1995). The species appears to have a patchy distribution within the Sydney Basin Bioregion (DEC 2004a) with most localities restricted to taller moist forests associated with incised sandstone gullies. The locations of populations of this species suggest a coastal preference with elevated, cold environments exhibiting a total absence of records in the region. Typical examples of population strongholds include the tall moist forests of the Central Coast and Watagan Ranges, Blue Mountains Escarpments and gullies (DEC in prep.). Numerous records are known from reserves including Morton, Wollemi, Blue Mountains and Jervis Bay National Parks (DEC 2004a).

Within the Nattai and Bargo reserves Yellow-bellied Gliders are commonly heard in the tall moist forests that feature in the sandstone gullies and on the sheltered escarpment slopes. Throughout Nattai National Park the most aggressively targeted feed tree species appear to be Grey Gum (*Eucalyptus punctata*) and Mountain Blue Gum (*E.deanii*) and Mountain Grey Gum (*E. cypellocarpa*). Forests on ridges that support residual shale soils also support very high numbers of these gliders. Grey Gum is often profuse in these environments, with taller forests on the ridges of Hoddles Track in the north and those near High Range in the south being typical examples. All locations within the study area are shown on Map 9. Yellow-bellied Gliders appear to be more common than previously thought with the species regularly recorded in gullies and taller forests right across the sandstone plateaux of the Blue Mountains (DEC 2004a).

SQUIRREL GLIDER

Species Profile

©DEC

The Squirrel Glider (*Petaurus norfolcensis*) is a nocturnal mammal that inhabits dry sclerophyll forests and woodlands and builds leaf-lined nests in tree hollows. It is similar in appearance to the smaller and more common Sugar Glider (*Petaurus breviceps*). However, the Squirrel Glider has a longer more pointed face, longer and narrower ears and a bushier tail and also lacks the persistent yapping call of the smaller species. It has a varied diet, including insects, nectar, pollen, seeds, *Acacia* gum and sap from Eucalypts (Suckling 1995). It usually occurs in family groups of up to ten, consisting of one male, one or more females and their dependant young. Home ranges are thought to vary between 0.65 and 8.55 hectares, depending on habitat quality, and individuals have been known to move up to 500 metres in one night. It is sparsely distributed along the east coast and inland slopes of between north Queensland and Victoria (NPWS 1999e) in habitats that comprise sufficient numbers of hollow-bearing trees for shelter and winter flowering plant species for food (Quinn 1995).

Threats

NPWS (1999e) lists the following threats to the Squirrel Glider. They are known to be greatly affected by the loss of nesting resources when the availability of hollow bearing trees are lost through clearing, fragmentation or timber extraction. Predation by cats and foxes are also thought to contribute to the species vulnerability and individuals have been rescued by the Wildlife Information and Rescue Emergency Service (WIRES) after getting caught on barbed-wire fences. Impacts of fire regimes are poorly understood although the availability of food resources may be reduced or lost after fire.

Local and Regional Conservation Status

The Squirrel Glider is listed as a Vulnerable species on the NSW TSC Act (1995). Within the Sydney Basin Bioregion the dry woodlands of the Central Coast provide very high quality habitat for the species. This area has been well documented as a stronghold for the species (Smith and Murray 2002). Elsewhere the species has only been recorded at very low densities, including within Wollemi and Blue Mountains National Parks (DEC 2004a).

The species has never been observed in the Nattai and Bargo reserves. However, hair and bone fragments have been identified from Powerful Owl pellets in the south of Burragorang State Conservation Area to the north of the study area (D. Ashton pers. comm.). Individuals have also been seen west of the Wollondilly River (DEC in prep.). Given that similar open woodland habitats occur within the study area it is probable that the Squirrel Glider exists at very low densities.

BRUSH-TAILED ROCK-WALLABY

Species Profile

The Brush-tailed Rock-wallaby (*Petrogale penicillata*) is a medium sized macropod, characterised by its distinctive facial markings, black paws and high levels of agility (NSW Scientific Committee 2003). The tail is often used to aid identification, being long and thickly furred with a distinctive brush-like appearance near its tip (NPWS 2002b). Habitats occupied by this species tend to take one of three forms: loose piles of large boulders containing a maze of subterranean holes and passageways; cliffs (usually over fifteen metres high with many mid level ledges covered by overhangs; or isolated rock stacks, usually sheer sided and often girdled with fallen boulders (NPWS 2002b). Vegetation forms a vital component of the habitat, especially as refugia near major rock outcrops. The species typically exhibits low migration rates between colonies, impeding persistence and recovery of populations affected by threatening processes. Its range formerly extended between south east Queensland to the Victoria, but is was thought to be extinct in the latter state until small populations were rediscovered in the Grampians and near the Snowy River (Eldridge and Close 1995).

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Threats

Historical decline of the Brush-tailed Rock-wallaby is attributed to three factors: hunting for bounty and fur; predation by introduced predators; and competition with introduced herbivores (feral Goat (*Capra hircus*), Rabbit (*Oryctolagus cuniculus*) and stock) (NSW Scientific Committee 2003). The major threats continuing to impact on the species include ongoing predation and competition with feral species such as Fox (*Vulpes vulpes*) and wild Dogs (*Canis lupus familiaris*), habitat modification by fire, vegetation clearing, disease transmission (toxoplasmosis and hydatosis) by feral carnivores (NSW Scientific Committee 2003) and inbreeding (Environment ACT 1999).

Local and Regional Conservation Status

Brush-tailed Rock-wallabies are listed as Endangered on the NSW TSC Act (1995) and as Vulnerable on the Commonwealth EPBC Act (1999). In the Sydney Basin Bioregion they form part of one of the three Evolutionary Significant Units (ESU) that summarise genetically distinctive metapopulations within their distribution. These cover the sites at Kangaroo Valley, Jenolan Caves and Broke in the Hunter Valley. This central ESU is one of the most fragile in NSW and all sites are of very high conservation significance (NSW Scientific Committee, 2003). Other than Nattai, recent records from reserves are mostly within Yengo, Wollemi and Morton NP's.

This survey revealed that a population of the Brush-tailed Rock-wallaby persists on the Bullio portions of the Nattai National Park (Map 9). It is estimated that up to twenty individuals (C. Rummery pers. comm.) occupy a major rock outcrop on a site that adjoins private property. These sightings confirm recent scat evidence that has been collected in the last few years by DEC survey teams at nearby sites in the Wollondilly Valley. The exciting find points to the Wollondilly Valley as perhaps once providing extensive habitat across its steep precipitous valleys and scree slopes that mark the area between Wombeyan Caves and Jooriland. There is further historical evidence of the species occurring at cliffs above Sheeys Creek (Hoddles Head) although animals have not been seen in this area for many years. There are also additional records further north at the Warragamaba Dam wall. Surveys of this habitat during this project and by SCA staff (D. Ashton pers. comm.) failed to find evidence at these sites. There is an abundance of steep rocky cliffs across the study area that might have once provided suitable habitat for the species. Map 9 also shows an old Australian Museum specimen from "Colo Vale" but populations that existed in the Nepean and Bargo catchments are probably extinct (DEC in prep.).

Given the conservation significance of the Brush-tailed Wallaby site management and monitoring should be undertaken in close consultation with the Statewide recovery plan for the species.

GREY-HEADED FLYING-FOX

Species Profile

©Linda Broome/DEC

The Grey-headed Flying-fox (*Pteropus poliocephalus*) is a large fruit bat that has dark grey body fur, a slightly paler grey head and a russet collar. It is the largest bat in the study area, with a wingspan of up to one metre. It is a highly mobile species and numbers roosting at specific camps may vary depending on season and food availability. They feed on nectar and pollen of various trees including *Eucalyptus, Melaleuca* and *Banksia* as well as fruits, originally of rainforest species, but now including commercial and garden crops. They can travel up to twenty kilometres to a food source, and are an important pollinator and disperser of native plants. It is endemic to the east of Australia between Melbourne, Victoria and Bundaberg in Queensland, though it formerly ranged as far north as Rockhampton (NPWS 2001d).

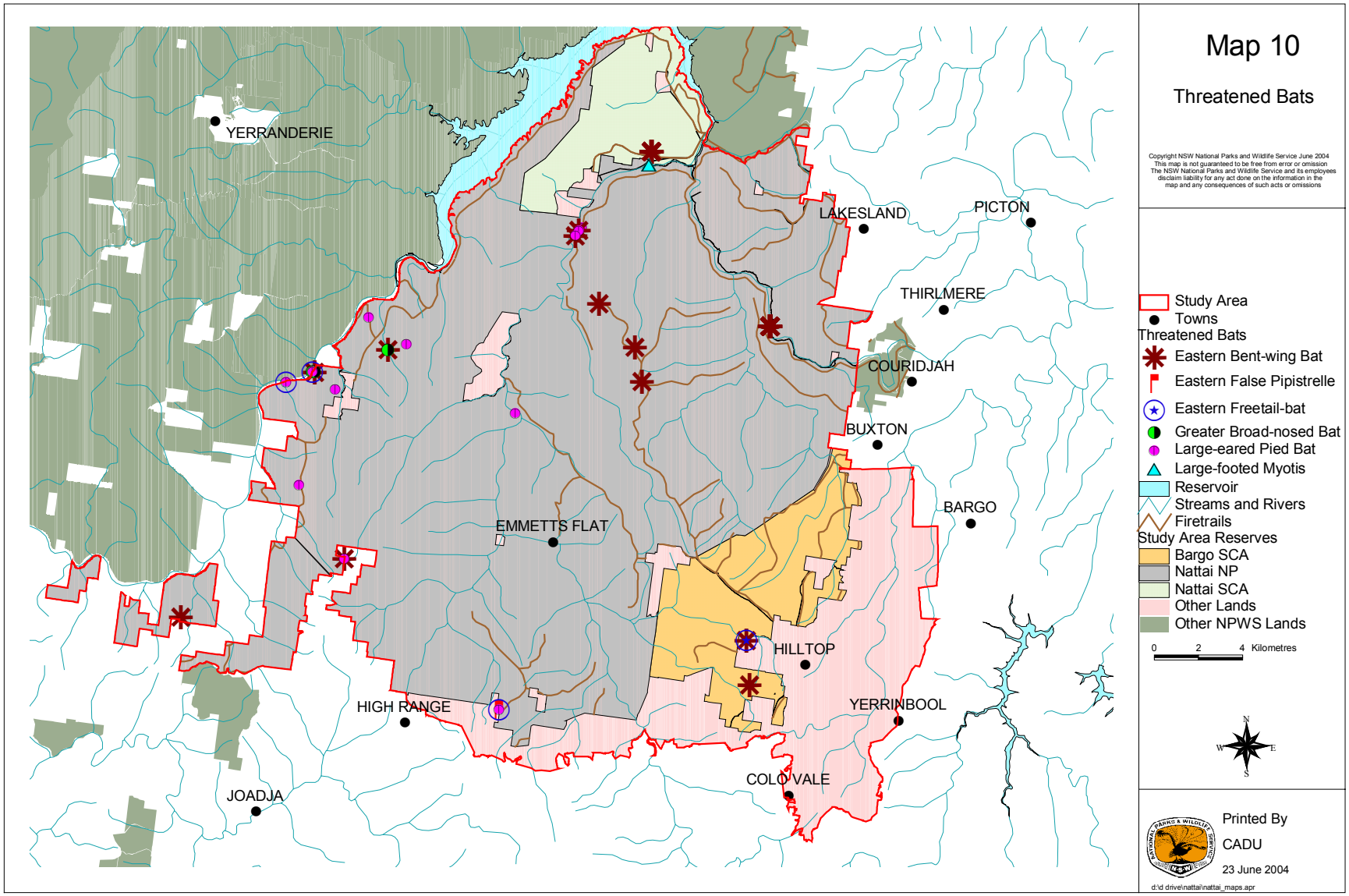
Threats

The main threats to the Grey-headed Flying-fox are destruction of habitat, particularly of foraging habitat, by clearing for urban development and agriculture, disturbance at roosting sites, particularly of pregnant females, unregulated shooting, particularly when feeding on commercial crops and electrocution on power lines, particularly in urban areas (NPWS 2001d).

Local and Regional Conservation Status

The Grey-headed Flying-fox is listed as Vulnerable on the NSW TSC Act (1995) and is also listed as Vulnerable on the Commonwealth EPBC Act (1999). Eby *et al.* (1999) estimated that there are approximately sixteen camps within the Sydney Basin Bioregion, three of which were occupied in July 1998. Current locality data suggests that the species is primarily distributed across the coastal and hinterland environments although this may likely to reflect reporting bias in the data. This includes records from Royal, Wyrrabalong and Seven Mile Beach National Parks (DEC 2004a)

At present there are no records of the Grey-headed Flying-fox from the Nattai and Bargo reserves on the Atlas of NSW Wildlife. This is surprising as the species is commonly perceived as a threat to orchard crops between Mittagong and Warragamba, and licences are issued by DEC each year to allow culling. Monitoring of the properties that have been issued licences may indicate whether the species does occur in large numbers, and if not then the issue of these permits may need to be reconsidered. The species is likely to make use of the Nattai and Bargo reserves on occasion, most probably during major Eucalypt flowering events.


Map 10
Threatened Bats
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This map is not guaranteed to be free from error or omission
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YERRANDERIE
LAKESLAND
PICTON
THIRLMERE
COURIDJAH
BUXTON
BARGO
EMMETTS FLAT
HILLTOP
YERRINBOOL
HIGH RANGE
COLO VALE
JOADJA
Study Area
Towns
Threatened Bats
Eastern Bent-wing Bat
Eastern False Pipistrelle
Eastern Freetail-bat
Greater Broad-nosed Bat
Large-eared Pied Bat
Large-footed Myotis
Reservoir
Streams and Rivers
Firetrails
Study Area Reserves
Bargo SCA
Nattai NP
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EASTERN FREETAIL-BAT

Species Profile

©Narawan Williams

The Eastern Freetail-bat (*Mormopterus norfolkensis*) is a member of a complex group of bats that retain considerable taxonomic uncertainty. Within this group the species is readily distinguished by its long forearm, upright ears and robust build (Allison and Hoye 1995, Parnaby 1992a). Reinhold *et al.* (2001) describes the ultrasonic call as "a pattern of alternating pulses", making it unique among *Mormopterus*, though it can also call without this pattern. There are very few specimens of this species on record, but it seems to be restricted to east of the Great Dividing Range between approximately Brisbane (Queensland) and Picton (New South Wales) (Duncan *et al.* 1999; Parnaby 1992a). It appears to favour dry eucalypt forest and woodland, though it has also been captured in rainforest (Churchill 1998). It usually roosts in tree hollows (Gilmore and Parnaby 1994), though it has been recorded in the roof of a hut and under the metal caps of telegraph poles (Churchill 1998).

Threats

The threats to this species are poorly known, though it is suspected that clearing for agriculture, development and logging, may pose serious threats. Threats may be heightened because the species' entire known distribution lies within an area of concentrated population density. More research in such areas as taxonomy, field identification and habitat requirements would allow better understanding of the species' conservation status (Duncan *et al.* 1999).

Local and Regional Conservation Status

The Eastern Freetail-bat is listed as Vulnerable on the NSW TSC Act (1995). Most records for the species in NSW are contained within the NSW North Coast, South East Corner and Sydney Basin Bioregions (DEC 2004a). Broad-scale habitat models predicted dry inland valleys and hinterlands to be the highest quality habitat for the species, such as occur within Goulburn River, Wollemi and Yengo NPs (NPWS 2000). These models were based on very limited information about the species, however, and most records for the species come from the Cumberland Plain and Central Coast areas, with scattered records (usually from call analysis) from reserves like Blue Mountains National and Western Sydney Regional Park. This disparity probably reflects the low levels of knowledge about this species. Recent DEC surveys across the Warragamba Special Area have collected vital information on the distribution and habitat of the Eastern Freetail-bat, which will be modelled and the results presented in the final report for the project (DEC in prep.).

There are five records of this species in or adjoining the Nattai and Bargo reserves (Map 10). The highest number of records exists in the Burragorang Valley, although, as mentioned previously, its habitat requirements are poorly known. Continued survey and modelling of little-known species such as this is crucial to the conservation management of threatened bat species.

LARGE-EARED PIED BAT

Species Profile

©Narawan Williams

The Large-eared Pied Bat (*Chalinolobus dwyeri*) is readily recognisable from other members of its genus by the combination of large ears and overall black colour, with bands of white fur along the sides of the body, that join to form a V-shape (Parnaby 1992a; Churchill 1998). The call (undetectable by the human ear) is an alternate pattern made at a low frequency, which is readily distinguishable from all other species (Reinhold *et al.* 2001). Originally described from Copeton in 1966, it has been recorded from a number of scattered locations on either side of the Great Dividing Range between Rockhampton (Queensland) and Bungonia (New South Wales) (Hoye and Dwyer 1995). It has been found in a wide range of habitats, including wet and dry eucalypt forest, Cypress (*Callitris*) forest and sub-alpine woodland (Duncan *et al.* 1999). It is a cave-roosting species, though it has also been detected roosting in disused mine shafts, overhangs and once in an abandoned Fairy Martin (*Petrochelidon ariel*) nest (Churchill 1998). It seems to prefer the 'twilight' areas of caves, and may be dependent on sandstone outcrops (Duncan *et al.* 1999, Hoye and Dwyer 1995).

Threats

The only confirmed threat to this species is the destruction or interference of roost sites. Other potential threats include mining induced subsidence (particularly coal-mining in sandstone areas) which may destroy roost sites, habitat destruction for agriculture and urban development, and predation by feral animals (Duncan *et al.* 1999).

Local and Regional Conservation Status

The Large-eared Pied Bat is listed as Vulnerable on the NSW TSC Act (1995) and also as Vulnerable on the Commonwealth EPBC Act (1999). It appears that the Sydney Basin Bioregion may support a significant proportion of the distribution of this species, though records are known to the north and west (DEC 2004a). Though there is a concentration of records across the Blue Mountains plateaux, particularly within Blue Mountains and Wollemi National Parks, there are records scattered through the Bioregion, including Kanangra-Boyd, Royal and Morton National Parks. Despite this wide distribution, they are infrequently captured, suggesting that they occur in low abundance.

This species has been captured at a number of locations near both the Burragorang Valley and in the Nattai River Valley. Other locations include the Mt. Wanganderry area and Nattai Tableland (Map 10). The presence of numerous sandstone overhangs, particularly within Nattai NP, suggests that this area would be used for roosting as well as feeding.

EASTERN BENT-WING BAT

Species Profile

The Common Bent-wing Bat (*Miniopterus schreibersii*) is the most widely distributed bat in the world, occurring through Europe, Africa and Australasia (Churchill 1998), though recent research suggests that there may be three taxa in Australia (Duncan *et al.* 1999). The subspecies *oceanensis* (often referred to as the Eastern Bent-wing Bat) is the relevant taxa for New South Wales and extends at least between central Victoria and Cape York Peninsula, Queensland (Duncan *et al.* 1999). This species is distinguished from most others by the long last bone in the third wing digit and from the Little Bent-wing Bat (*M. australis*) by the longer forearm (greater than 44 millimetres) (Parnaby 1992a). The call can be distinctive, however it is often inseparable from *Vespadelus darlingtoni* and *V. regulus* (Reinhold *et al.* 2001). It utilises a wide variety of habitats where it usually roosts in caves, though it has been known to use mines and road culverts (Churchill 1998). It is a fast flying species that usually feeds above the canopy (Churchill 1998) and has been known to travel up to 65 kilometres in a night (Dwyer 1966 in Ayers *et al.* 1996). Though individuals often use numerous roosts, they congregate en masse at a small number of caves to breed and hibernate (Churchill 1998).

©Stefan Eberhard/DEC

Threats

Damage and disturbance to roosting sites are the greatest threats to this species. Because only relatively few nursery caves are used, significant population changes can occur if these sites are damaged (Dwyer 1995). Disturbance of hibernating colonies can lead to starvation due to loss of energy reserves (Gilmore and Parnaby 1994). Disturbance of smaller roosts by recreational caving and tourism may also be significant, as may modification to feeding habitat by agriculture and urban development (Gilmore and Parnaby 1994). Some individuals are preyed upon by feral Cats (*Felis catus*) and, less often, foxes (*Vulpes vulpes*) (Dwyer 1995).

Local and Regional Conservation Status

The Eastern Bent-wing Bat is listed as Vulnerable on the NSW TSC Act (1995). Records are widespread within the Sydney Basin Bioregion and appear to be commonly encountered wherever ultrasound bat surveys are undertaken. Strong clusters of records are present in the Lower Hunter and Central Coast, Cumberland Plain, Woronora Plateau and across the southern Blue Mountains. Many of these records are on reserves including Royal, Blue Mountains and Wollemi National Parks.

This species was captured at several locations along Nattai River and Blue Gum Creek during surveys in 1997. A number of individuals were caught near the No.3 Colliery near a disused mine entrance. Adjoining mine entrances were examined for roosting activity though none were found. Other locations of the species include the Bargo SCA, Burragorang Valley and Wild Goat Plateau (Map 10). Roosting is known to occur in Colong Caves to the west (DEC 2004d), though the closest maternity cave is probably more distant.

LARGE-FOOTED MYOTIS

Species Profile

©Ray Williams

The Large-footed Myotis (*Myotis adversus*) is another bat species for which the taxonomy is currently undergoing review. The Australian specimens are now considered to consist of two or three species. The southern species (*M. macropus*) is recorded coastally and along the Murray River from south eastern South Australia to south east Queensland. However, the northern limit of this species and the area of overlap with *M. moluccarum* are poorly known (Duncan *et al.* 1999, Churchill 1998). Even though it can be recorded from up to 20 metres using Anabat, it can be difficult to identify from *Nyctophilus* species (Reinhold *et al.* 2001). It is easily distinguished from other species by its disproportionately large feet, which it uses to rake its prey of insects and small fish from the surface of water (Churchill 1998). It occurs in a wide variety of habitats as long as water is nearby. It normally roosts in caves, though will also use tree hollows, vegetation, and man-made structures, such as bridges and mines (Churchill 1998).

Threats

The threats to this species are poorly known, but it is probably most sensitive to changes in water quality. These may be sedimentation (from vegetation clearing and logging), eutrophication (sewage and fertiliser run-off), pollution and altered flow regimes (Duncan *et al.* 1999). Roosting sites may be susceptible to disturbance by such activities as recreational caving or roadworks (Duncan *et al.* 1999, Gilmore and Parnaby 1994).

Local and Regional Conservation Status

The Large-footed Myotis is listed as Vulnerable on the NSW TSC Act (1995). In the Sydney Basin region known locations are strongly tied to the coastal and hinterland environments of the Central Coast, Cumberland Plain and the Southern Highlands. The representation in NPWS reserves is relatively poor, with most of the captures on park occurring in Nattai, Royal and Popran National Parks (DEC 2004a).

Both the Wollondilly and Nattai Rivers are known to support good numbers of this species with ten individuals caught on the Wollondilly and nine on the Nattai River in 1997. There are other records of this species adjoining the reserves, with one individual recorded within the Bargo area (Belik and Close 1997) and another in the Burragorang State Conservation Area. Because it is usually only trapped directly over water (N. Williams pers. comm.), it may be more widespread than current records suggest. Roosting locations have not been detected in the reserves, though it is highly likely that they do occur.

GREATER BROAD-NOSED BAT

Species Profile

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The Greater Broad-nosed Bat (*Scoteanax rueppellii*) is a large microchiropteran bat that can only be confused with the Eastern False Pipistrelle but can be separated by having only one pair of upper incisors and smaller ears (Parnaby 1992a). Its ultrasonic calls can also be confused with this species, and with species of the genus *Scotorepens* (Reinhold *et al*. 2001). It is usually found in gullies draining east from the Great Dividing Range between south east New South Wales and north Queensland (Atherton Tablelands), where it utilises creeks and clearings for hunting (Churchill 1998; Hoye and Richards 1995). It is often said to be a lowland species, though Ayers *et al.* (1996) mention several examples of this species being recorded at higher altitudes and it has recently been caught up to 1250 metres in Kanangra-Boyd National Park (DEC 2004d). It usually roosts in tree hollows, though it may also utilise old buildings (Churchill 1998).

Threats

The threats to this species are poorly known, though they probably include habitat clearance for agriculture and urban development, and logging, which may removal suitable hollows (Duncan *et al.* 1999).

Local and Regional Conservation Status

The Greater Broad-nosed Bat is listed as Vulnerable on the NSW TSC Act (1995). The majority of records for the species in NSW occur in the NSW North Coast, South East Corner and Sydney Basin, with some records in the New England Tableland Bioregion and South-eastern Highlands Bioregion. Within the Sydney Basin the species is mainly restricted to the eastern half of the Bioregion, with the greatest density of records on the Central Coast and the Cumberland Plain. The species is reasonably well reported from DEC reserves, including Blue Mountains, Wollemi, Wyrrabalong National Parks (DEC 2004a). Recent DEC surveys have found this species to be widespread across the southern Blue Mountains. Species-habitat analyses planned for this region may elucidate a clearer picture of habitat preference (DEC in prep.).

There are four confirmed localities in or adjoining the Nattai and Bargo reserves (Map 10). These occupy vastly different environments from the Burragorang Valley to the Thirlmere Lakes area. Continued survey of poorly known species such as these is crucial to their conservation management (DEC in prep.).