

**DISTRIBUTION SURVEYS AND  
MANAGEMENT RECOMMENDATIONS FOR  
THE KOALA (*Phascolarctos cinerius*)  
IN THE NUMERELLA AREA**

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## CONCLUSIONS

Koala evidence was found in all eight survey areas. This success demonstrates the effectiveness of the search methods when undertaken by an experienced team such as those participating in this survey. This success, and the extensive nature of the anecdotal evidence gathered by the survey team, suggest that numbers may be higher than in any other of the known populations in the Southern and Eden districts. This is probably because in recent decades the level of disturbance encountered by these Koalas, including intensive logging, is lower than that experienced by any other known population in SENSW.

The data from this study suggests that the Numerella Koala population spreads least from the Numerella/Countegany Road southwards for approximately 15 km. Other evidence suggests it is likely that there is a low density Koala population stretching from north to south for at least 50 km. The rugged terrain, the scattered nature of the active sites in most areas searched, and the low activity levels at almost all of the active sites assessed, all suggest that breeding associations are small and widely scattered and that some, or indeed most of the active sites located in the survey may be those of dispersing young.

The Numerella forest is part of the Tableland forest and woodlands vegetation that extends contiguously northwards throughout the Southern region. There is almost a contiguous woodland and forest link to the east, through the Kybean range to the Wadbilliga Wilderness. A further 20 km to the east is the Dignam's Creek and Wandella areas where consistent Koala records suggest a further breeding association. The lower reaches of the Dignam's Ck area is in the Wallaga Lake National Park where the same survey team that undertook the Numerella surveys recently located evidence of a breeding female Koala. This location is approximately 10 km from the breeding population in the Murrah/Bermagui Forests.

The above suggests that the Numerella population of Koalas, particularly if numbers are higher than elsewhere, is a key long term resource for the conservation of the species in SENSW.

## RECOMMENDATIONS

1. The area should be considered for status as a nature reserve.
2. Discussion with the Regional Fire Service should explore ways in which the severity and frequency of fire in Koala areas can be minimised and whether a Rapid Response Unit can be established. No broadscale hazard reduction burns should be undertaken except, perhaps, in some areas around the perimeter of the forested area. A study of changes in fuel loads should be initiated. Searches for injured Koalas should be mounted in the event of fire.
3. The Koala management strategies should be developed in consultation with local people and should be carefully undertaken so as to minimise conflict. These should aim to foster a greater awareness of the importance of the population, encourage a sense of responsible community ownership and highlight ways in which local people can help conserve Koalas and their habitat.
4. The Koala Recovery Plan should describe strategies to establish strategically-placed and ecologically-appropriate farm shelterbelts that enable farm productivity to be enhanced and additional habitat for Koala to be provided. These should be developed in close consultation with the Numerella Landcare Association and be supported by government departments.
5. More surveys should be undertaken to increase knowledge of the distribution of this population and to gather further data for robust statistical analysis of preferred browse species. Genetic studies should be undertaken to assess the relationship between this population and others in SENSW and Victoria and to ascertain the level of inbreeding.

## **Project Scope**

The scope of the project was to gain a greater understanding of the current distribution and population status of the Koala in the Numerella area to assist the preparation of a species recovery plan. Specific objectives were to:

- undertake Koala faecal pellet searches in selected survey areas;
- undertake tree species preference assessment at active sites within the survey areas;
- concurrent with all field work collect predator scats for analysis and assess predator activity;
- provide a preliminary assessment of habitat and identify actual and potential threats to Koalas; and,
- provide management recommendations that could be incorporated into a regional recovery plan for Koalas.

## **Survey methods**

### ***Site selection***

A preliminary site inspection of the area was undertaken by the Project Manager, the NPWS Liaison Officer, and volunteers on the 6/11/99. This was guided by Mr Simon Lang, who is a local landholder and member of the Numerella Landcare Association who has lived in the area for 45 years.

On the basis of the preliminary site inspection and the distribution of previous Koala records, eight areas were selected for sweep surveys for Koala faecal pellets (Figures 1a & 1b). This included the main drainage system to the west of Numerella Mountain (Search Area 1). Surveys in April and May 1997 by the same survey team had located pellets just before and after a severe fire had swept through this area.

### ***Sweep searches***

Two survey teams, each consisting of four people, undertook sweep searches for Koala faecal pellets in the areas selected (Figures 1a & 1b). The teams walked through the forest in a line scanning the ground under the canopy trees that were greater than 100mm diameter at breast height over bark (DBH). Predator scats were collected when encountered

### ***Assessment of active sites***

Sites where Koala faecal pellets were located were designated as active sites. Because of budget and time limitations a maximum of two of these were assessed in each search area except Search Area 1, where no further sites were assessed. The assessment methods used were developed by the Australian Koala Foundation (Phillips and Callaghan submitted) and is described as follows.

The tree under which the pellets (or Koala) were first found was recorded as the centre tree of the plot. The plot size had a minimum radius of 10m, but extended further if necessary to include the nearest 25 trees with a DBH of 100mm or greater. A 'tree' was defined as *a live woody stem of any plant species (excepting palms, cycads, tree-ferns and grass-trees)*. These trees were marked with flagging tape.

The survey team undertook a thorough search for Koala faecal pellets that extended out for at least one meter around the base of each taped tree. This firstly involved scanning the area to be searched and then carefully raking away ground litter, looking for pellets. Where a single Koala faecal pellet was found it was scored against the tree under which it was located. If a pellet was found within the search areas of one or more trees, it was scored against each tree respectively. The DBH and species of each tree in the plot was measured and recorded, along with the presence or absence of pellets. The tape was then removed except for that which was around the centre tree. Other physical characteristics of the site, the plot radius and botanical data were also recorded (Appendix 1).

## Results

### ***Eight survey areas***

The results from each of the survey areas are described below and the location of a active sites is presented in Table 1. The completed data sheets are provided in Appendix 1.

1. Survey area 1 was in the main drainage system to the west of Numerella Mountain. The predominant eucalypts are *E. dives*, *E. mannifera*, *E. rossi* and *E. viminalis*. The area was badly burnt in May 1997. Koala faecal pellets were located by staff from the South East Forests Koala Research Project throughout this area just before and after the fire. Data from seven sites were recorded then. The current survey detected fresh and old Koala pellets at six locations in Survey area 1. Because of lack of time and the fact that data on active sites had been collected from this area previously (1997), no further assessment of these sites was undertaken.
2. Survey area 2 was a spur, saddle and hilltop approximately 1.5 km north-east of Numerella Mountain. A Koala was sighted here in May 1997 (Fran Robertson pers. comm.). The predominant eucalypt is *E. dives*. *E. viminalis* is also common. *E. mannifera* and *E. sieberi* are also present. Three active sites were found and two of these were assessed using the methods described above.
3. Survey area 3 was along the Kydra East Fire Trail which, along the lower slopes, follows a main drainage system approximately 2 km west of the confluence of the Kybean and Numerella Rivers. Much of this area is regrowth from earlier clearing, presumably for agriculture. Serious erosion is evident in places. The predominant eucalypt in the gullies is *E. viminalis*. *E. dives*, and *E. pauciflora* and *E. rubida* are also present, particularly away from the gullies. At least eight active sites were found and a Koala was sighted at one of these. All except one were in the main gully. Two of these were assessed. The skull of a young Koala was found between the two active sites that were assessed.
4. Survey area 4 was at the top of the main drainage system to the west of Numerella Mountain, approximately 2.5 km north of Search Area 1, which is also in the same drainage system. The predominant eucalypts are *E. dives*, *E. rubida* and *E. viminalis*. *Acacia falciformis* is also present. Two active sites were found and assessed. A koala skull was found at the first of these sites.
5. Survey area 5 was on the northern side of the Kybean River, 0.5 km west of where the river enters cleared agricultural land. *E. viminalis* is the predominant species on the flats while *E. viminalis*, *E. rossi*, *E. dives* and *E. mannifera* are present on the slopes. No faecal pellets were located on the river flats but 2 active sites were located on the slopes and assessed.
6. Survey area 6 was on the northern side of the Kybean River, 0.75 km west of where the river enters cleared agricultural land. It includes river flats on the Kybean River and both sides of a major south-flowing drainage system. *E. viminalis* is the dominant species on the flats, *E. viminalis* and *E. pauciflora* on the easterly slopes and *E. viminalis*, *E. dives*, *E. pauciflora* and *E. rubida* on the westerly slopes. Evidence of past agricultural clearing is apparent with the presence of old-growth open forest on the mid and upper slopes while only younger trees are found on the lower slopes. Again, no Koala evidence was located on the river flats but two active sites were located on the slopes. Both sites were assessed.
7. Survey area 7 was on the western side of the Kydra West Fire Trail approximately 6 km south of the confluence of the Kybean and Numerella Rivers. It is on a north west-flowing drainage system where *E. dives*, *E. macrorhyncha*, and *E. mannifera* are present. A young male Koala was located in this area and an active site assessment was undertaken at this location.
8. Survey area 8 was on both sides of the Kydra West Fire Trail approximately 8.5 km south of the confluence of the Kybean and Numerella Rivers. It is on a north west-flowing drainage system where *E. rossi*, *E. viminalis*, *E. mannifera* and *E. dives* are present. No active sites were located in the *E. viminalis* dominated creek flats. One active site was located on the south western portion of the search area and assessed.

## **KOALAS SIGHTED DURING SURVEYS**

*Koala in Search Area 3*

*Koala in Search Area 7*

## Location of active sites

Table 1 shows the location and physical characteristics of active sites found during the earlier surveys (6 & 23 May 1997) and those of this project (16 & 17 April 1999).

**Table 1:** Location of active sites in the Numerella area and their physical characteristics

Survey area	Survey date	Eastings	Northings	Altitude	Aspect	Slope	Slope position
1	6/5/97	715375	5993100	840m	320	12	Lower
	6/5/97	715350	5992900	850m	202	15	Lower
	23/5/97	715375	5992600	860m	280	24	Lower
	23/5/97	715375	5992500	870m	270	16	Lower
	23/5/97	715425	5992350	880m	230	12	Gully
	23/5/97	715400	5992300	900m	40	18	Lower
	23/5/97	715450	5992750	870m	280	18	Mid-
2	16/4/99	717300	5992500	1005m	306	10	Ridge
	16/4/99	717100	5992200	1035m	350	20	Ridge
3	16/4/99	714300	5989250	890m	120	23	Mid
	16/4/99	713500	5989300	820m	180	2	Gully
4	16/4/99	715100	5990100	1150m	55	22	Lower
	16/4/99	715100	5989950	1180m	65	16	Lower
5	17/4/99	713950	5987800	760m	320	10	Mid
	17/4/99	714100	5987700	800m	340	24	Mid
6	17/4/99	714250	5982850	760m	82	30	Lower
	17/4/99	714380	5988100	780m	205	20	Mid
7	17/4/99	711300	5981900	920m	250	3	Gully
8	17/4/99	710700	5979700	950m	240	21	Lower

## Tree Species Preferences

Table 2 shows the total number of eucalypts sampled from the active site assessments conducted during the April 1999 survey and the number of those with Koala faecal pellets. The "strike rate" (percentage of each species with pellets compared with the total number sampled) is also provided. The data on tree species preferences from the 6 & 23 May 1997 surveys are not included because of it was later realised that *E. rossi* and *E. mannifera* had probably not been accurately identified at all sites assessed during these surveys.

**Table 2:** Preferred tree species in Numerella Koala survey April 1999

Tree species	Total sampled	No. with kfp	Strike rate
<i>E. dives</i>	103	8	0.08
<i>E. macrorhyncha</i>	18	1	0.056
<i>E. mannifera</i>	18	0	0
<i>E. pauciflora</i>	16	3	0.188
<i>E. rossi</i>	50	8	0.16
<i>E. rubida</i>	3	1	0.33
<i>E. viminalis</i>	92	12	0.13

## Tree size preferences

The data on the dbh of the trees under which Koala faecal pellets were found during the earlier surveys (6 & 23 May 1997) and those of this project (16 & 17 April 1999) is in Table 3.

**Table 3: Dbh of the trees under which Koala faecal pellets were found in the Numerella area**

Dbh	Number with pellets
100-199 mm	10
200-299 mm	13
300-399 mm	8
400-499 mm	7
500-599 mm	9
>500 mm	8

## Predators

Predator scats were collected in or near to Search Areas 1,2,4,5 & 6 (Figures 1&2). The majority of these were probably those of foxes. The location of scats found, the species depositing the scats and the identification of the remains of animals in the scats are shown in Table 4.

**Table 4: location and identification of predator scats and their contents**

Location	Scat identification	Content identification
713500/5913500	?Fox <i>Vulpes vulpes</i>	Rabbit <i>Oryctolagus cuniculus</i>
716500/5993500	?Fox <i>Vulpes vulpes</i>	Rabbit <i>Oryctolagus cuniculus</i>
715300/5989700	?Fox <i>Vulpes vulpes</i>	Rabbit <i>Oryctolagus cuniculus</i>
715100/5990100?	Fox <i>Vulpes vulpes</i>	Swamp Wallaby <i>Wallabia bicolor</i>
715600/5993200	Fox <i>Vulpes vulpes</i>	Rabbit <i>Oryctolagus cuniculus</i>
717000/5990100	Fox <i>Vulpes vulpes</i>	Possum <i>Trichosurus sp.</i>
717100/5992200	Dog <i>Canis sp</i>	Echidna <i>Tachyglossus aculeatus</i> Rabbit <i>Oryctolagus cuniculus</i>
717400/5992600	Pig <i>sus scrofa</i>	Pig <i>sus scrofa</i> (fur hair)
715000/5990100	Dog <i>Canis sp</i>	Swamp Wallaby <i>Wallabia bicolor</i>
787500/5992600	Dog <i>Canis sp</i>	Echidna <i>Tachyglossus aculeatus</i>
713800/5967600	?Fox <i>Vulpes vulpes</i>	Possum <i>Trichosurus sp.</i>

## Discussion

### Survey methods

The areas selected for survey were primarily those that the Project Contractor believed were most likely to yield evidence of Koalas. The selection was based on the following criteria: 1) limited amount of anecdotal Koala evidence and small number of Koala records; and, 2) the assumption that Koalas would be more likely to be found in the larger and least disturbed drainage systems.

Koala evidence was found in all survey areas selected. Whether these results reflect that the survey area selection criteria was correct or that Koalas are spread evenly throughout the study area could only be validated by a randomly selected stratified survey. The costs of such a study may be prohibitive at least in the near future.

The success in locating evidence in all survey areas demonstrate the effectiveness of the search methods when undertaken by an experienced team such as those participating in this survey.

## **Activity levels**

Activity levels at active sites can be measured “strike rates”; ie. the number of trees of each species with Koala faecal pellets compared with those without. Although the data is too limited to draw anything but tentative conclusions, the Koalas in Numerella appear to have very low activity levels. Of the more frequently sampled trees in the pooled dataset (Table 2) *E. rossi* had a strike rate of 0.16; *E. viminalis* was 0.13; and *E. dives* was 0.08. These strike rates are slightly lower than those found in Murrumbidgee/Bermagui Forest where those from the primary dataset varied from 0.214 for *E. longifolia* to 0.080 for *E. tricarpa* (South East Forests Conservation Council 1998). These Bermagui/Murrumbidgee Forest strike rates were lower than any encountered by the Australian Koala Foundation (Phillips pers. comm.)

Apart from Search Area 3 the active sites in all search areas were widely scattered and some, or indeed most of them may have been those of dispersing young. This suggests that a low density population exists in the Numerella area, and that individuals have relatively large home ranges.

## **Habitat Assessment**

The tree species preference data indicate that *E. viminalis*, *E. dives*, and *E. rossi* are all browsed by Koalas. *E. mannifera*, *E. pauciflora*, *E. rubida* and *E. macrorhyncha* may also be important but these species were inadequately sampled.

When ranking koala feed trees the Australian Koala Foundation uses the following food tree categories (Phillips and Callaghan submitted):

### Primary food tree

*A tree species that returns a statistically significant strike rate of approximately 50% or greater when compared to other congeners on the basis of a random and stratified sampling protocol, and which demonstrates a level of utilisation which can also be shown to be independent of, but commensurate with density.*

### Secondary food tree

*A tree species that returns a strike rate which is generally less than 50% but which is significantly higher when compared to other congeners on the basis of a random and stratified sampling protocol, and which demonstrates a level of utilisation which is clearly density dependent.*

### Supplementary food tree

*A tree species that similarly returns a strike rate of less than 50% and cannot be necessarily isolated as the subject of significantly higher levels of utilisation, when compared to other congeners, on the basis of a random and stratified sampling protocol and which similarly demonstrates a density dependent level of utilisation.*

The data from the Numerella survey suggest that none of the eucalypts sampled are primary feed species and that *E. viminalis* and *E. rossi* may be secondary feed tree species. Some of the others may either be secondary or supplementary feed tree species. Further statistical analyses of a larger dataset, including an unplanned test of heterogeneity, would be needed to confirm this.

A greater number of Koala faecal pellet sites were found both in Search Area 1 (in 1997 and in April 1999) and Search Area 3. In these areas the terrain is dominated by lower slopes and gullies. However, Koala faecal pellets were not found on river and creek flats in other search areas. This suggests that the eucalypt vegetation in the gully and lower slope areas of the larger and steeper drainage systems is currently important for Koalas and that the flatter creek and river areas are not, at present, being greatly used by the species. One explanation for this is that past clearing of the latter areas has reduced the species diversity and structural complexity of this habitat. Another could be that Koalas are more vulnerable to predation in these relatively clearer and flatter areas.



## ***Predator activity***

Scats of foxes or dogs were found in or near to most survey areas. The results suggest that there may be larger numbers of foxes than dogs. No evidence of predation of Koalas was revealed in the analysis but this is not surprising given the limited number of predator scats collected and the probable low numbers of Koalas in the area.

The distribution of the predator scats suggests a greater concentration of predators in the north of the study area. Simon Lang reports that wild dog activity has been low in the southern portion of the study area but recently this has increased.

## ***Fire of 1997***

In May 1997 a wildfire commenced off the northern side of the Numerella/Countegany Road and extended through a large portion of the drainage system where near Search Area 1 is located. The SEFCC Koala survey team surveyed this area within days of the fire. Koala faecal pellets were located. These had been deposited both before and after the fire indicating that, at least initially, one or more animals had survived the fire event. Extensive canopy scorch had occurred and many old trees were killed. It is likely that many of these would have been Koala feed trees, particularly as the data from the Numerella surveys suggest larger eucalypts are important for Koalas in this area (Table 3).

Search Area 1 was surveyed again in April 1999. The foliage of many of the burned trees had only epicormic growth and no Koala faecal pellets were found under any of these trees. All of those under which Koala faecal pellets were found did not show evidence of severe damage from the fire.

This suggests that, although Koalas have persisted in the area, the amount of preferred browse has been reduced by the 1997 fire. The severity of the fire was such that Koalas might have been killed or injured and that the breeding abilities of females might have been impaired.

Extensive back-burning was also undertaken during this wildfire, including aerial incendiary bombing. One of the areas burnt in these operations was Search Area 3. Few trees now show evidence of epicormic growth, indicating that the back-burning operation in this area was not as severe as the fire in Search Area 1. However, the greater number of active sites were found in this area than any other during the April 1999 surveys suggests that the 1997 back-burning operations targeted an important Koala area. This highlights the need for managers of firefighting crews to be given the best information available on both the distribution of Koalas in the Numerella area and the vulnerability of the species to fire.

## ***Socio-ecology of low-density populations***

Studies of Koalas (Allen 1992, Jurskis and Potter 1997, South East Forests Conservation Council 1998) indicates that Koalas form a low density population in the nearby Eden region. Breeding associations are probably widely scattered but may be linked by dispersing young.

Norton and Allen (submitted) reviewed published and unpublished information on the socio-ecology of Koalas. These indicate that breeding associations are structured around a polygynous society (Mitchell, 1990a) with a strong female bias. This revolves around a matrix of overlapping home range areas (Lee & Martin, 1988; Mitchell, 1990b). Male dominance hierarchies are a significant feature (Mitchell, 1990a; 1990b), with breeding activity generally presided over by an "alpha male" (Lee & Martin, 1988; Mitchell, 1990a). Long term fidelity to the home range area is also maintained, with exceptionally high site philopatry demonstrated by lactating females (Mitchell, 1990; Krockenberger, 1995). At the population level there is a significant male biased mortality which is primarily restricted to non-breeding males (Martin & Handasyde, 1990; Phillips, unpublished data). Consistent with the concept of a polygynous society and long term home range fidelity, breeding aggregations tend to be clustered throughout areas of suitable habitat, rather than uniformly distributed. Male dominance is not transferable and there is some evidence to suggest that status is commensurate with the ability to control key food resources (Gordon et al., 1990b; Melzer, 1996, Phillips, unpublished data).

There have been no studies of the socio-biology of low-density populations of Koalas in SENSW. However, the species in these regions probably have similar social systems to those described above, although breeding associations are likely to be smaller, the cluster of home range areas used by breeding animals are likely to be larger and dispersing young will probably travel greater distances in search of other associations.

The data derived from the Numerella study is consistent with this view. The rugged terrain, the scattered nature of the active sites in most areas searched, and the low activity levels at almost all of the active sites assessed all suggest that breeding associations are small and widely scattered and that some, or indeed most of the active sites located in the survey may be those of dispersing young.

### ***Distribution of the Numerella Koala population***

The data from this study suggests that the Numerella Koala population occupies an area that spreads least from the Numerella/Countegany Road southwards for approximately 15 km.

The higher number of faecal pellet sites that were relatively easily located in Search Area 3, and the presence of the skull of a young Koala, suggests that a breeding association may be present here. Widespread and frequently encountered active sites in the catchment of Search Area 1 suggests either that the association in Search Area 3 may extend into this area or that another breeding association exists there. Anecdotal evidence was also gathered during the surveys that Koalas are usually seen “around Christmas”. A possible explanation for this is that Koala habitat in the area is fully occupied and that younger animals are being pushed to the edges of forest areas during the breeding season.

However the May 1997 fires may have so severely impacted on the habitat of some breeding females that they may not have been able to breed since then.

Anecdotal evidence gathered from local people during these surveys suggests that the population extends at least as far as the Peak Hill district, approximately 10 km to the north of this area and probably extends into the Badger State Forest to the north east. R. Pietsch (pers comm.) reports records from the Bredbo River area which is another 20 km to the north. It is likely therefore that there is a low density Koala population stretching from north to south for at least 50 km in the forested tableland areas of the Numerella/Cowra Creek districts.

### ***Estimate of population size***

With such limited data it is not possible to estimate Koala numbers. However, the success in finding Koala evidence in each of the eight areas searched, and the extensive nature of the anecdotal evidence gathered by the survey team, suggest that numbers may be higher than any other of the known populations in the Southern and Eden districts.

The Tablelands habitat contains different eucalypt species and forest structure than those encountered in Koala habitat in the coastal and hinterland areas of SENSW. It may be argued that Koala numbers could be higher in the Numerella area because the habitat is more open forest than that encountered at lower altitudes to the south east. For example, Braithwaite in SFNSW (1995) argued that woodland habitat is more suitable for Koalas than forests. However, the available evidence suggests that both woodlands and forests are important for the species. There is a substantial cline in the morphological characteristics of the koala over its range (Martin and Handasyde 1991) and the species has evolved to utilise a wide range of forest and woodland ecosystems across eastern Australia (Norton and Allen submitted). Records from the early years of European occupation suggest that they were more likely to be found in forest rather than woodland (eg Warneke (1978), even though koala sightings in the latter ecosystems would have been much easier. The apparent increase in abundance of the species in more open areas may have been, at least partially, a response to the cessation of hunting by aborigines after European occupation. The explanation that the apparently higher numbers in the Numerella area is because of the characteristics of the Koala habitat therefore appears unlikely.

Another explanation for the apparently higher numbers is that in recent decades the level of disturbance encountered by these Koalas appears to be lower than that experienced by any other known population in SENSW. This is indicated by the following:

- Although clearing for agriculture on the lowland slopes and riparian areas occurred in the early years of European settlement there appears to have been no intensive logging in the area in recent decades, primarily because there are no substantial areas of easily merchantable timber;
- Because the eucalypt communities in this area are growing mainly on skeletal soils and often on scree on relatively steep slopes the understorey and groundcover plants are often widely scattered. Fuel loads therefore are generally low and the severity and frequency of fire appears to be less than the escarpment and coastal forests. Indeed, Simon Lang reports that to his knowledge much of the southern portions of the area have not been burnt in his lifetime;
- Wild dog activity on adjoining properties to this area has also been reported to have been very low at least on the western side of the forest. However, this has been increasing recently (Simon Lang pers. comm.). On the eastern side of the Numerella area landholders consider wild dogs to be a serious problem but believe the animals come from further east rather than from the Numerella area.

### ***Importance of the Numerella Koala population***

The Numerella forest is part of the Tableland forest and woodlands vegetation that extends contiguously northwards throughout the Southern region. Because of clearing for agriculture the forest is not contiguous with Tableland and woodland vegetation that is directly to the south in the Eden region. To the west is the Monaro Plain where there is no eucalypt vegetation. There is almost a contiguous woodland and forest link to the east, through the Kybean range to the Wadbilliga Wilderness. The SFNSW/NPWS/Diashowa taped Koala calls program obtained two positive responses on the western side of this wilderness area (J. Shields pers. comm.). A further 20 km to the east is the Dignam's Creek and Wandella areas where consistent Koala records suggest a further breeding association. The lower reaches of the Dignam's Ck area is in the Wallaga Lake National Park where the same survey team that undertook the Numerella surveys recently located evidence of a breeding female Koala. This location is approximately 10 km from the breeding population in the Murrumbidgee/Bermagui Forests.

Young Koalas are known to disperse at least 50 km from their maternal home range (Phillips pers. comm.). The movements of dispersing young may link breeding associations in the above areas which, together with the interlinking forests and woodlands, may be therefore be sustaining the core of the surviving metapopulation in SENSW.

The above suggests that the Numerella population, particularly if Koala numbers are higher than other in other areas, could be a key long term resource for the conservation of the species in SENSW.

### **Recommendations and management considerations**

The following recommendations are the outcome of a limited survey and some local consultation. Further detailed consideration of and consultation about these are necessary before they can be incorporated into any management documents or recovery plan.

#### ***Tenure of Numerella Koala habitat***

All of the eight areas surveyed and much of the remaining forest and woodland in the Numerella area is Vacant Crown Land. This area is being considered as part of the Southern NSW Comprehensive Regional Assessment for possible inclusion in the conservation reserve system.

Should this occur the area could be gazetted as a nature reserve rather than a national park. This may be appropriate, given the importance of this area for Koalas, the need for further long-term

monitoring and research, and the concerns of local people that visitor rates might increase dramatically should the area become a national park.

### **Recommendation 1**

**It is recommended that the area should be considered for status as a nature reserve.**

### ***Fire management***

The 1997 fire degraded large areas of this open forest, particularly by killing many older trees. It is recommended that a key strategy for the conservation of this koala population must be to minimise the severity and frequency of fire at least in key Koala areas. Given the extent of fuel reduction from the May 1997 fire, and the generally low levels of fuel (Simon Lang pers. comm.), it is difficult to justify any further broadscale hazard reduction burns in this area.

A study of changes in fuel loads in the area over time should be initiated and undertaken in close co-operation with the Regional Fire Service and the local community. This has been undertaken in the Mundoonen Nature Reserve (S. Jackson, NPWS, pers. comm.). The results appear to have reduced community pressure to undertake broadscale hazard reduction burns in the Reserve.

Management of fuel loads around the perimeter of this open forest area remains an important fire management issue, particularly on the western side and along parts of the Numerella/Countegany Road. This is already primarily achieved through stock grazing but some limited and carefully controlled fuel reduction burns in some ungrazed areas may be appropriate.

Whatever management strategies are in place, wildfire is inevitable in the area. A key strategy therefore is to be able to quickly extinguish fires in Koala areas if possible. Discussions should be initiated with the Regional Fire Service (RFS) to inform its members of the likely distribution and importance of the Numerella Koala population, the vulnerability of the species to fire and the need to minimise the frequency and severity of fire in Koala areas. The establishment of a Rapid Response Unit, perhaps comprising of NPWS personnel and local fire brigade members, may be an appropriate goal for the RFS.

In the event of fire, searches for injured Koalas in the burnt areas should be mounted as quickly as possible. Local people concerned with the welfare of Koalas may be able to take on this work. Appropriate veterinary services and facilities for the care of injured animals should also be available.

### **Recommendation 2**

**It is recommended that discussion with the Regional Fire Service are initiated to discuss ways in which the severity and frequency of fire in Koala areas can be minimised and whether a Rapid Response Unit can be established. No further broadscale hazard reduction burns should be undertaken except, perhaps, in some areas around the perimeter of the forested area. A study of changes in fuel loads should be initiated. Searches for injured Koalas should be mounted in the event of fire.**

### ***Community involvement***

The Numerella community is relatively remote, has a small population and a strong sense of community. The local Landcare Group has undertaken many neighbourhood-based land restoration projects. Several community members stated that local people were aware of Koalas in the Numerella area and that they had decided to keep this knowledge secret, both in the interests of the Koalas and of local residents. Although there was a sense of pride in having Koalas in the area, community members generally seemed unaware of their importance.

There is concern in the Numerella community that the development and implementation of appropriate Koala conservation measures may cause conflict in the local community. Any

management actions should be discussed with community leaders and advice sought as to how best these can be implemented so that conflict is avoided or minimised.

### **Recommendation 3**

**It is recommended that the Koala management strategies should be developed in consultation with local people. This should be carefully undertaken so as to minimise conflict. They should aim to foster a greater awareness of the importance of the population, encourage a sense of responsible community ownership and highlight ways in which local people can help conserve Koalas and their habitat.**

### ***Conserving regeneration and restoring habitat on private land***

As is the case with most woodland and forest areas that adjoin agricultural land in NSW there are many hundreds of hectares of young regeneration around the fringes of relatively undisturbed, mature open forest in the Numerella area. This primarily occurs on private land. Although this regeneration may not be sustaining breeding associations of Koalas, it may be important for dispersing young and may act as a buffer between agricultural land and koala areas. In the medium to long term it may become important Koala habitat particularly in the more fertile and undulating areas. Owners of land where such regeneration is occurring should be made aware of the long term importance of this habitat for Koalas and be given information and support to enable them to care effectively for it.

The major long-term human threat to regenerating and mature forests on private land is probably the intensive harvesting of firewood. The level of harvesting, ecological impacts and potential alternative sources should be assessed in close consultation with the community.

The restoration of significantly large areas of Koala habitat on agricultural land is an achievable long-term goal because: 1) destocking brought about by the difficult climatic and economic circumstances faced by the farming community; 2) a growing understanding of the importance of the conservation ethic in land management; 3) government funding that is available through the Native Vegetation Act (1998), National Heritage Trust and Landcare program; and, 4) changing ownership patterns in the area.

### **Recommendation 4**

**It is recommended that the Koala Recovery Plan should describe strategies to establish strategically-placed and ecologically-appropriate farm shelterbelts that enable farm productivity to be enhanced and additional habitat for Koala to be provided. These should be developed in close consultation with the Numerella Landcare Association and be supported by the government departments.**

### ***Further research and surveys***

As little is known about the Numerella Koala population it is recommended that the following research and surveys are undertaken:

1. Further surveys to increase knowledge of the distribution of the koala population. A fundamental question remains as to whether there is an area of habitat that sustains higher densities and larger numbers of Koalas than those encountered in this survey. One area that would be well worth examining carefully is the Kybean River further south from Search Area 6 and the drainage system further south from this (known locally as Rough Creek). This is a relatively large and remote area that has apparently experienced little disturbance. It is possibly one of the areas that sustained Koalas after the extensive clearing of woodlands that occurred in this area in the early years of European occupation. Koala surveys should also be conducted in the northern Numerella and Cowra Creek area to establish whether the Numerella population does extend to the Bredbo River Catchment. Surveys should also be undertaken in adjoining areas of the Badger State Forest.
2. Sampling of feed tree preferences at active sites. This is needed to gather further data to enable robust statistical analysis of the Numerella Koala's preferred browse species. In particular areas where *E. mannifera*, *E. pauciflora*, *E. rubida* and *E. macroryncha* are well represented need to be further sampled.

3. Genetic studies. These are needed to assess: 1) the relationship between this population and others in SENSW and Victoria; and 2) the level of inbreeding within this population and hence its long-term viability. Information about this need should be provided to the local community, particularly to local veterinarians. A communications network should be established to ensure that whenever a sick or injured koala is located that genetic samples are taken. The interesting possibility exists that genetic studies could be undertaken using fresh koala faecal pellets (Bronwyn Houlden pers. comm.). Any further surveys that are undertaken should ensure that samples of any fresh Koala faecal pellets found should be frozen and sent to her. She can be contacted at [houlden@unsw.edu.au](mailto:houlden@unsw.edu.au).

#### **Recommendation 5**

**It is recommended that more surveys be undertaken to increase knowledge of the distribution of the Numerella Koalas and to gather further data to enable robust statistical analysis of preferred browse species. Genetic studies should be undertaken to 1) assess the relationship between this population and others in SENSW and Victoria; and 2) ascertain the level of inbreeding with this population.**

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## **Project manager's note**

The conclusions and recommendations in this report at those of the Project Contractor developed in consultation with other survey team members and the Numerella community. They do not necessarily reflect the views of the South East Forests Conservation Council.