

# **Draft Koala Report**

# **NSW Far South Coast**

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# 1. INTRODUCTION

## 1.1 AIMS OF PROGRAM

In 2005 the Department of Environment and Conservation (DEC) initiated a koala survey and monitoring program in the Far South Coast Region of south-eastern NSW, primarily focussing on national park estate. This report provides information on the methods used, the results obtained, and some discussion about these results.

The aims of the program were:

1. To ascertain whether koalas are persisting in areas where records from the previous two decades suggested a breeding aggregation of koalas might be present and thereby contribute to assessments of koala's conservation status in the region;
2. To gather base-line data to test an approach to monitoring low-density koala populations that has been developed by DEC and undertaken in other parts of south-eastern NSW, and;
3. To collect fresh koala scats for DNA analyses to establish genetic relationships of the species across the region.

## 1.2 BACKGROUND

The methods used to survey for evidence of low-density koala populations has a complex history. The South East Forests Conservation Council<sup>1</sup> primarily used the sweep search method (Section 3.1). Forests NSW use a transect method involving scanning the ground for koala scats and intensive quadrat searches of ground litter<sup>2</sup>. The NPWS has used the sweep search method in the Shoalhaven Gorge<sup>3</sup> and NE Monaro Regions<sup>4</sup>. Briggs<sup>5</sup> assessed both methods and concluded that the sweep scat surveys are more accurate, but less repeatable than transect surveys.

Both the sweep search and transect methods were used in this survey program, though there are significant differences between the FNSW transect method and that used in this program (Section 3.2).

The program was timely for the following reasons:

1. Few koala records have been reported in the Far South Coast Region in recent years, compared with those gathered in the 1990's<sup>6</sup>, possibly because of the limited extent of surveys. Surveying some of the areas, particularly where there are clusters of records, aimed to help to inform to what extent koalas are persisting in the region;
2. Preliminary analyses of data collected using a transect-based survey method (Section 3:2) developed by DEC and undertaken in other parts of south-eastern NSW, suggested such an approach could make a useful contribution to the monitoring of low-density koala populations in some parts of NSW<sup>7</sup>. Undertaking such surveys in the Far South Coast Region, where this technique had not been previously undertaken, provided comparative opportunities to assess whether this approach should be implemented in the Far South Coast Region;

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<sup>1</sup> South East Forests Conservation Council (1998). *Final Report of the South East Forests Koala Research Project*. South East Forests Conservation Council, PO Box 797, Bega, 2550.

<sup>2</sup> NPWS (1999). *Conditions for the Conservation of Threatened Fauna in State forests of the Eden Forestry Region*. Integrated Forestry Operations Approvals. Department of Environment and Conservation PO Box 656 Merimbula NSW 2548.

<sup>3</sup> Allen C. D. (2002). *Distribution Surveys, Habitat Assessment and Management Recommendations for the Koala (*Phascolarctos cinereus*) in the Shoalhaven Gorge Region*. Unpublished report for the Threatened Species Unit, NSW National Parks & Wildlife Service. Department of Environment and Conservation PO Box 656 Merimbula NSW 2548.

<sup>4</sup> Allen C. D. (2004). *Overview of Koala Surveys, Research and Monitoring for the Koala (*Phascolarctos cinereus*) 2001-4 in SENSW*. Department of Environment and Conservation PO Box 656 Merimbula NSW 2548.

<sup>5</sup> Briggs, S. (1999). Report on Meeting 17-18 February 1999 to Address Koala Issues for South East Forests Koala Recovery Team. Department of Environment and Conservation PO Box 656 Merimbula NSW 2548.

<sup>6</sup> South East Forests Conservation Council (1998). *Modelling Koala Habitat and Use in Murrah and Bermagui Forests*. An unpublished report commissioned by RACAC for the Comprehensive Regional Assessment in the Eden Region. Prepared by the South East Forests Koala Research Project. South East Forests Conservation Council, PO Box 797, Bega, 2550.

<sup>7</sup> DEC (Unpublished Information)

3. Koala recovery actions such as habitat conservation and rehabilitation and community education are being implemented by DEC and the Southern Rivers CMA and these need to be based on the most up-to-date information on the distribution and status of the regional koala population, and;
4. The survey and monitoring program was planned before but then undertaken against a backdrop of proposed logging operations in Murrah State Forest, adjacent to one of the key survey areas. For this reason, much of the program focused on the Cuttagee and Nutley's Creek catchments of the Biamanga NP, Bermagui NR and Murrah State Forests. Primarily this was driven by the need to gain information about koala distribution near to the proposed logging areas to assist decision-making about whether and to what extent these should proceed.

### 1.3 KOALA MANAGEMENT FRAMEWORK

The logging was postponed until the completion of a Koala Management Framework for the region. Both the DEC and Forests NSW (FNSW) agreed that methods used in pre-logging surveys was ineffective and that the Framework needed to develop two forms of survey regimes for investigative/research purposes and to include descriptions of monitoring regimes<sup>8</sup>.

DEC intends to incorporate a high level of consultation to provide adequate opportunities for the local community and agencies to contribute to the development of the Koala Management Framework.

This report has been prepared being mindful of this intention and in the belief that the value of the process will be enhanced through the provision of good information about this survey program; its background, aims, methods and outcomes.

## 2 STUDY AREAS

Koala surveys and associated monitoring were undertaken in four major study areas<sup>9</sup> within the Far South Coast Region (Figure 1):

1. Study Area 1: The forests to the south west of Bermagui, including Biamanga NP, Bermagui NR and Murrah SF;
2. Study Area 2: Kooraban NP;
3. Study Area 3: South East Forests National Park, Yurammie Section, and;
4. Study Area 4: South East Forests National Park, Tantawangalo Section.

A summary of previous koala survey work in these study areas and in the wider region is provided in Allen (2005)<sup>10</sup> a copy of which is appended to this report (Appendix 3).

## 3 METHODS

The koala survey and monitoring program used two sampling methods for detecting the species: sweep searches and transect-based searches. Each of the techniques is described immediately below.

### 3.1 SWEEP SEARCH METHOD

Sweep searches were undertaken by survey teams comprising variable numbers of participants. Where possible the team formed a line with one member being close to a landmark such as a track, ridge-line or gully. The line then moved through a designated survey patch<sup>7</sup>, scanning the ground for koala fecal pellets. Distances between team members varied greatly, depending on habitat quality. Areas under larger trees (>300mm Diameter at

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<sup>8</sup> DEC (2005) Development of a Koala Management Framework for the Eden Forestry Region Community Involvement.

<sup>9</sup> In this report I have use the word "patches" to describe the areas searched for evidence of koalas and "areas" to describe the wider study areas.

<sup>10</sup> Allen C.D. 2005. *Information on Koalas in the Far South Coast of NSW*. Communication with NSW Scientific Committee. Department of Environment and Conservation PO Box 656 Merimbula NSW 2550.

Breast Height -DBH), particularly known feed tree species, were preferentially targeted. Where scratchmarks on the trunks of trees suggested koala activity a more thorough search was sometimes undertaken. The approximate boundaries of the patch searched, the approximate search time and brief information about the habitat were recorded. When pellets were observed the location was recorded on a GPS. The tree species under which the pellets were found and its DBH were also recorded. These data were later transposed as information layers onto Arcview GIS.

### **3.2 TRANSECT METHOD**

In the transect method a standard team of four individuals searched for koala scats within a pre-defined rectangular area measuring 40m X 500m. This area was broken into four parallel sampling units, each measuring 10m X 500m. A single person was then allocated to a given sampling unit. At 50m intervals along each sampling unit the total number of trees searched was recorded, together with information about the location, species and DBH of any trees under which koala scats were found. This information was recorded by a fifth person, who also took note of the length of time taken to do the searching in that interval. Gathering information in this way reduced sampling error and also allowed further analysis of the impact of differing transect lengths as well as effort on recording evidence of koalas.

### **3.3 DECIDING WHICH METHOD TO USE**

The survey program aimed to encourage a high level of volunteer involvement from the local community (including the Aboriginal community) as well as staff from DEC, SFNSW and Aboriginal Land Councils. This was to both enable and broaden the educative component to the work and to maximise the extent of the work undertaken.

Coordinating such participation is a complex process involving varying numbers of participants, with differing levels of skill and experience. This was one reason why the two methods, described in Section 3.2, were used in this program.

A range of factors influenced decisions as to which method, or methods, to use on the day:

1. Numbers: The transect method requires a team of five people. When a smaller or larger number of participants were available, the sweep search method (sometimes in addition to the transect method) was used.
2. Team coordination. On some occasions more than five people participated and it was necessary from a safety perspective to keep the group together. In this case, the sweep search method, with its options for variable numbers of participants, was judged to be a more appropriate method to use.
3. To assist decision-making re-logging proposals: The sweep search method appeared to offer greater opportunities to gain information about koala distribution near to areas where logging was imminent. This method was employed more extensively and more frequently near to proposed logging areas.
4. Educational opportunities: In the case of three transect surveys, international students, some of whom had survey experience, participated. In these cases a more experienced person shared the same 10m sampling unit and worked together with a less experienced person.

## **4 RESULTS**

### **4.1 SURVEY METHODS: COMPARATIVE OUTCOMES**

A total of 18 patches totalling approximately 162 ha were surveyed using the sweep search method taking 147.5 person hours of survey time. Nineteen koala scat sites<sup>11</sup> were located, these being mainly in two clusters to the north and west of Cuttagee Lake.

Eighteen patches totalling approximately 36 ha were surveyed using the transect method taking 107.5 person hours of survey time, with four koala scat sites being located.

The results for each study area are tabulated below.

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<sup>11</sup> One or more trees with koala scats located underneath

**Table 2: Number of patches and hectares surveyed, survey time and number of scat sites located in each study area using the sweep search and transect methods.**

Study Area	Method	No of patches	Area (ha)	Total Hours	No of Scat Sites	Search Hrs per scat site	Search time per ha
1	Sweep Search	12	146	120.5	14	8.6	0.8
	Transect	8	16	62.5	3	21	4
2	Sweep Search	3	6.74	16	5	3.2	2.4
	Transect	2	4	10	1	10	2.5
3	Sweep Search	3	9.7	11	0	0	1.1
	Transect	5	10	20	0	0	2
4	Sweep Search	0	0	0	0	0	0
	Transect	3	6	15	0	0	2.5
Total	Sweep Search	18	162	147.5	19	7.8	0.9
	Transect	18	36	107.5	4	27	3

## 4.2 KOALA SCAT SITE DISTRIBUTION

Of the twenty three koala scat sites that were located, 17 were in Study Area 1 and 6 in Study Area 2. No koala scats were located in Study Areas 3 and 4. Eleven of the positive sites yielded scat samples with sufficient patina (a shiny film of mucus that occurs on fresh scats) to warrant them being preserved with alcohol for later DNA extraction (Section 5.6).

The seventeen koala scat sites located in Study Area 1 were distributed in the following way:

1. Thirteen were located in two clusters approximately 2 km apart from each other to the north and west of Cuttagee Lake (the north and west Cuttagee patches);
2. One was near the north-eastern boundary of Bermagui NR (the Bermagui NR patch) approximately 3 km to the north of the northern Cuttagee clusters;
3. Two were located near Yowrie Rd (Yowrie Rd patches), approximately 5 km north-west-north of the Cuttagee clusters;
4. One was located in the Murrah SF, approximately 6 km from the western Cuttagee patches.

Some quite small koala scats were found in the northern Cuttagee patch that were probably from a juvenile koala (B. Triggs pers. comm.<sup>12</sup>)

Two other scat sites were located in Murrah SF that team participants concluded were likely to be koala scat but further analyses were unable to provide definite confirmation of this (B. Triggs pers. comm.). One of these scats, collected at 766574/5955437 could only have been from very young animal if it was from a koala. The other sample, collected at 763092/5960299, was only half of a single pellet, possibly produced by a mature koala.

The six scat sites located in Study Area 2 were in the vicinity of the northern end of Sams Ridge and KB Roads.

Information concerning the scat site locations, tenure, survey method, age of scats, tree species under which the scats were located and the locations of those samples judged to have high potential to provide DNA samples is provided in Table 1.

<sup>12</sup> Barbara Triggs, Dead Finish, Genoa, Victoria 3981.

**Table 1: Details regarding sites where evidence of koala scats were recorded. Attributes include land tenure, survey method used, location of the site in AGD66, age of scats, tree species under which the scats were located and the locations of those samples judged to have high potential to provide DNA samples**

Date	Tenure	Method	East	North	Scat Age*	Forest Age**	Species	DNA
6/4/05	Biamanga NP	Sweep Search	234041	5960013	F	M	E longifolia	Y
6/4/05	Biamanga NP	Sweep Search	233941	5959955	F	M	E longifolia	Y
6/4/05	Biamanga NP	Sweep Search	233791	5959952	F	M	E. muelleriana	Y
6/4/05	Biamanga NP	Sweep Search	233757	5960132	F	M	E. mue & E.lon	Y
6/4/05	Biamanga NP	Sweep Search	233513	5959824	O	M	NR	N
6/4/05	Biamanga NP	Sweep Search	233579	5959800	F&O	M	E. muelleriana	Y
19/4/05	Biamanga NP	Sweep Search	767233	5961121	M	M	E longifolia	N
19/4/05	Biamanga NP	Sweep Search	766983	5961150	O	M	E. muelleriana	N
20/4/05	Biamanga NP	Transect	231760	5958506	O	R	E longifolia	N
20/4/05	Biamanga NP	Sweep Search	231834	5958576	O	R	E. muelleriana	N
20/4/05	Biamanga NP	Sweep Search	231840	5958576	O	R	E longifolia	N
20/4/05	Biamanga NP	Sweep Search	231861	5958687	O	R	E longifolia	N
20/4/05	Biamanga NP	Sweep Search	232055	5958815	O	R	E. muelleriana	N
20/4/05	Biamanga NP	Sweep Search	232155	5958715	O	M	E longifolia	N
22/4/05	Murrah SF	Transect	766597	5955575	M	R	E. aglommerata	N
25/5/05	Kooraban NP	Transect	765535	5973472	F	R	E. muelleriana	Y
25/5/05	Kooraban NP	Sweep Search	765410	5973427	F	R	E longifolia	Y
26/5/05	Bermagui NR	Transect	234114	5963061	M	M	E.globoidea	Y
7/6/05	Kooraban NP	Sweep Search	765700	5972824	F	R	E. muelleriana	Y
26/8/05	Kooraban NP	Sweep search	764300	5973271	F	M	E longifolia	N
26/8/05	Kooraban NP	Sweep search	764310	5973270	F&O	M	E longifolia	Y
26/8/05	Kooraban NP	Sweep search	764363	5973241	F	M	E. muelleriana	Y

\*Scat Age: F = Fresh; M = Medium Aged; O = Old.

\*\*Forest Age: M = Mature; R = Regrowth.

Figures 2 & 3 show the locations of the scat sites, earlier koala records, search patches and beginning and end points of the transects in Study Areas 1 & 2.

More detailed information tables about each of the patches searched, the number of participants, time spent searching and the outcomes is appended (Appendix 1).

**Figure 2: Locations of the scat sites, earlier koala records, search patches and beginning & end points of the transects in Study Area 1 (Forests to the South West of Bermagui).**

**Figure 3: Locations of the scat sites, earlier koala records, search patches and beginning & end points of the transects in Study Area 2 (Kooraban NP).**

## 5 DISCUSSION

### 5.1 KOALA DISTRIBUTION

#### 5.1.1 Resident and Dispersing Koalas

Evidence of koalas may come from animals that belong to breeding aggregations. These koalas usually have long-term fidelity to their individual home range areas<sup>13</sup>. Alternatively the

<sup>13</sup> Recovery Plan for the Koala (*Phascolarctos cinereus*) in NSW (2003). NPWS National Parks & Wildlife Service, PO Box 1967, Hurstville, NSW, 2220.

evidence may be from a dispersing koala that may be on the fringes of an aggregation or may have traveled many kilometers from its maternal home range and/or other resident koalas.

For the land manager, identifying patches of forest used by resident koalas is important, as these sustain breeding potential and the good management of these patches needs to be a key component of koala recovery efforts. This view is supported by Briggs<sup>14</sup> who recommended that attention should focus on determining where breeding associations are, rather than on numbers of koalas in the region.

From some of the study areas searched in this survey program there are data from radio-tracked koalas occupying harmonic mean areas (the core patches areas used by the animals) of between 38 and 202 ha<sup>15</sup>, all of which probably belonged to breeding aggregations.

The comparatively large home range sizes used by these koalas increase the difficulties of ascertaining whether evidence is from resident or dispersing koalas.

### 5.1.2 Study Area 1

Within the northern Cuttagee survey patch koala scats of consistently different sizes were located close together in 1998<sup>16</sup> and 2001<sup>17</sup> and 2002<sup>18</sup>, indicating ongoing breeding activity. A female koala with juvenile young was also sighted in the adjoining catchment to the east in 1996 (Alan Douche pers. comm.)<sup>19</sup>.

A limited koala survey in 2003<sup>20</sup> in this Cuttagee patch failed to locate evidence in the immediate vicinity of the scat sites located in the previous surveys. However, scats were located approximately 500m from the vicinity of these sites.

In the current survey there were quite different sized scats at different locations, including some that appeared to be a young animal.

It seems reasonable to conclude from the accumulated evidence presented above that this patch is part of forested habitat that continues to sustain a breeding aggregation of koalas.

The north and west Cuttagee patches are two kilometers apart and linked by mature, relatively undisturbed forest with a predominance of koala feed tree species. This interlinking area was not searched in this survey. Whether or not this western patch is also occupied by a resident koala or koalas or just visited by dispersing animals is inconclusive, but previous nearby records and the cluster of sites located in this survey in this patch suggests that the former might be the case.

Scats located in Bermagui NR were quite fresh and, based on their small size, appeared to be from a young animal. This might suggest that this evidence was from a dispersing young. However, this patch has previous records, including two koalas sighted on Nutleys Creek Rd. One was in 1995 (Annette Turner, pers. comm.)<sup>21</sup> and one was in 2002 (Rob Summers pers. comm.)<sup>22</sup>. The latter sighting was of a juvenile koala, so small that it was unlikely to have

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<sup>14</sup> Briggs, S. (1999). Report on Meeting 17-18 February 1999 to Address Koala Issues for South East Forests Koala Recovery Team. Department of Environment and Conservation PO Box 656 Merimbula NSW 2550

<sup>15</sup> Jurskis, V. and B. Potter, (1997). *Koala Surveys, Ecology and Conservation at Eden*. Research Division, SFNSW, PO Box 2119, Beecroft, NSW, 2119

<sup>16</sup> South East Forests Conservation Council (1998). Final Report of the South East Forests Koala Research Project. South East Forests Conservation Council, PO Box 797, Bega, 2550.

<sup>17</sup> Allen C.D. (2001) SCMA Koala Recovery Program: Coordinator's Report on Survey Program: May 20<sup>th</sup> – July 6<sup>th</sup> 2001. Internal report to NPWSTSU. National Parks and Wildlife Service NPWS Southern Zone NPWS Southern Zone PO Box 2115 Queanbeyan NSW 2620.

<sup>18</sup> DEC (Unpublished data)

<sup>19</sup> Alan Douche Forests NSW Batemans Bay, NSW 2536.

<sup>20</sup> DEC (Unpublished data)

<sup>21</sup> Annette Turner. The Crossing, Pigs Crossing Rd, Nutleys Creek, Bermagui, NSW, 2546.

<sup>22</sup> Rob Summers. Nutleys Creek Rd, Nutleys Creek, Bermagui, NSW, 2546.

travelled far from its mother. Scats from a juvenile koala were later located at the tree where the animal was sighted<sup>23</sup>. Additionally, several other koala scat sites, both in Bermagui NR and in Bermagui State Forest were located in the same year<sup>24</sup>.

The above information suggests that a breeding aggregation may still survive in this locality and may even be a part of the Cuttagee aggregation. Only two transects and no sweep search patches were surveyed in the Bermagui NR locality, and no surveys were undertaken in the adjoining Bermagui State Forest. A more extensive survey of this part of the study area that attempts to gather more definitive evidence of ongoing koala residency appears warranted.

It is even more difficult to draw conclusions of residency or dispersal from evidence gathered from the other koala scat site locations in Study Area 1. The failure to locate koala scats in many of the patches searched suggest that koalas may no longer be resident in this, the central and western parts of the study area, although it is probably still used by dispersing koalas.

### 5.1.3 Study Area 2

The locality where the sweep search and transects patches were surveyed in Study Area 2 are towards the northern end of Sams Ridge Rd and to the west of KB Road, within Kooraban NP. To our knowledge no koala surveys had been previously undertaken in this particular part of the study area.

The locality was selected for survey because of the following anecdotal information provided to the survey coordinator:

1. A concerted effort was undertaken to keep a wildfire out of the area by FNSW and local brigades in the seventies because of known koala presence (Les Williamson pers. comm.)<sup>25</sup>; and,
2. KB Road was named as such by FNSW because of known koala presence and because of this, logging operations in the 1980's were less extensive and intensive (Arthur Cotterill, pers. comm.)<sup>26</sup>.

Koala surveys were much less extensive in this study area than in Area 1. The five koala scat sites that were located in this area using the sweep search method took an average search time of less than half that required to find scats in Study Area 1.

Taken together, the anecdotal information, the relative ease in finding koala evidence and the presence of fresh and old scats at one of the sites located in this survey suggest that this part of Kooraban NP is also sustaining a resident breeding aggregation of koalas.

Pre-logging surveys undertaken before the area was incorporated in the national park system yielded some koala evidence in catchments to the north-west in the late 1990's (Brian Moore, pers. comm.<sup>27</sup>), and one site was located in a NPWS follow-up survey in 2001<sup>28</sup>. Whether the breeding aggregate extends into this part of the Study Area, or whether this was evidence from dispersing animals is unknown. The fact that local residents, several of whom are keenly interested in koala conservation, who have not reported hearing koalas bellowing near their properties, suggests that the latter may be the case.

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<sup>23</sup> DEC (Unpublished data)

<sup>24</sup> DEC (Unpublished data)

<sup>25</sup> Les Williamson. Princes Highway, Cobargo, NSW, 2550.

<sup>26</sup> Arthur Cotterill. PO Cobargo NSW 2550.

<sup>27</sup> Brian Moore. Forestry NSW, Batemans Bay, NSW 2539.

<sup>28</sup> Allen C.D. (2001) SCMA Koala Recovery Program: Coordinator's Report on Survey Program: May 20<sup>th</sup> – July 6<sup>th</sup> 2001. Internal report to NPWTSU. National Parks and Wildlife Service NPWS Southern Zone NPWS Southern Zone PO Box 2115 Queanbeyan NSW 2620.

The question whether breeding koalas also occur to the west of this part of Kooraban NP is unknown. Koala surveys undertaken in the Murrabrine area in 1999<sup>29</sup> located no evidence of koalas. However, a male koala was captured in Yowrie in December 2004 and there are some recent reports of koalas sighted towards the north western edge of Kooraban NP.

#### 5.1.4 Study Areas 3 & 4

Relatively extensive surveys and research have been undertaken in the Yurammie and Tantawangalo Sections of the South East Forests NP, particularly in the 1990's.

In Yurammie there are anecdotal reports koalas sighted during logging operations in late '70's<sup>30</sup>, and this was the only area where koalas were recorded in Braithwaite's survey of logging operators<sup>31</sup> that covered the entire region to the south of the Bega River. Two koalas (both male, one in settled home range, the other probably a dispersing young animal) were radio-tracked by SFNSW (1992-4)<sup>32</sup>.

A community survey recorded highest number of koala sightings in the region in Tantawangalo in the 1990/91<sup>33</sup>. Bellows of three male koalas were recorded in 1991 in a community field survey in the vicinity of Carey's Fire Trail<sup>34</sup>. An intensive survey for koala scats in the same year by SFNSW staff led to their conclusion that, based on the variability in appearance of scats a minimum of three koalas were present<sup>35</sup>. Between 1992 & 4, FNSW staff radio-tracked a breeding female (known to have produced two young) whose home range was within this survey patch and a young dispersing male that ranged over catchments to the south of this patch<sup>36</sup>.

In the SEFCC community-based survey undertaken in 1996-8, 25 sites were located in Yurammie and four in Tantawangalo<sup>37</sup>. These sites were generally widely scattered and difficult to locate.

The areas selected for surveys in the program that is the subject of this report were, in the judgement of the survey coordinator, the most likely to have been sustaining breeding aggregates and therefore more likely to yield evidence of koalas. The failure to locate any koala scat sites is therefore of concern, though no firm conclusions should be drawn about this outcome, given the limited nature of the surveys undertaken.

## 5.2 CONSERVATION STATUS

There is concern<sup>38, 39, 40, 41, 42, 43</sup> (see also Appendix 3) that koala numbers in the region have declined and they may be close to regional extinction. Although there has been controversy

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<sup>29</sup> Allen, C. 1999a. *Distribution Surveys and Management Recommendations for the Koala (Phascolarctos cinereus) in the Murrabrine Area*. Unpublished report for the Threatened Species Unit, NSW National Parks & Wildlife Service, PO Box 2115 Queanbeyan NSW 2620.

<sup>30</sup> Allen C.D. (1998) Towards the Extinction of the Yurammie/Tantawangalo Koalas. Chris Allen 7 Little Church St Bega NSW 2550.

<sup>31</sup> Braithwaite et al (1983). Studies on the arboreal marsupial fauna of eucalypt forests being harvested for woodpulp at Eden NSW. 1. Species and distribution of animals. Australian Wildlife Research 1983 10 219-229.

<sup>32</sup> Jurskis, V. and B. Potter, (1997). *Koala Surveys, Ecology and Conservation at Eden*. Research Division, SFNSW, PO Box 2119, Beecroft, NSW, 2119.

<sup>33</sup> Lunney, D., Esson, C., Moon, C. and Ellis, M. (1997). A community-based survey of the Koala *Phascolarctos cinereus* in the Eden region of SENSW. *Aust. Wildl. Res.* 1997 **24**. 111-128.

<sup>34</sup> Allen, C. D. (1992). *Koala Habitat Survey of the Devils Creek Catchment* Unpublished submission to the Australian Heritage Commission. Chris Allen 7 Little Church St Bega NSW 2550..

<sup>35</sup> Jurskis, V., Rowell, D. and Ridley, D. (1994). *Survey Techniques and Aspects of the Ecology of the Koala near Eden*. Research Division, SFNSW, PO Box 2119, Beecroft, NSW 2119.

<sup>36</sup> Jurskis, V. and B. Potter, (1997). *Koala Surveys, Ecology and Conservation at Eden*. Research Division, SFNSW, PO Box 2119, Beecroft, NSW, 2119.

<sup>37</sup> South East Forests Conservation Council (1997) Final Report of the South East Forests Koala Research Project. Unpublished report for Dept Urban Affairs and Planning. SEFCC, PO Box 797, Bega, 2550.

over population estimates, Briggs<sup>44</sup> suggests that the actual number of koalas in the region is unimportant (given that all estimates show numbers are low), compared with the number and location of breeding aggregations.

Figures 4 & 5 have been prepared in order to give a graphic impression of how few koalas are probably present in the breeding aggregation located in Study Area 1, based on reported home range sizes (38 and 200 ha) of radio-tracked koalas in the region<sup>45</sup>. Figure 4 focuses on the immediate vicinity of the Cuttagee patches, whilst Figure 5 extends this graphic impression further south and north.

To the east of the area delineating indicative home ranges in Figure 5 the forest has a much smaller proportion of koala feed tree species. There is also a greater level of human settlement, from where there are no recent reports of koalas. To the west there is an extensive spread of bell minors and a high proportion of dense young regrowth forest. The lack of success in finding koala evidence in this central and western parts of the study area in this survey, together with the sparsity of records over time and space suggests that Figure 5 presents what is probably the maximum number of koalas that could be present in this breeding aggregation.

Given that less than 50% of this breeding aggregation will consist of breeding females, and some of the habitat will be unoccupied this suggests that less than 10 breeding females are present, in this, one of only two breeding aggregations known to be surviving on the Far South Coast. And this is probably a maximum figure; there may be far fewer breeding females.

The issue of why (and indeed whether) koalas are so rare in the region has had a long and controversial history. For example, Briggs<sup>46</sup> reported on an attempt to mediate between conflicting interpretations of data by SFNSW and the South East Forest Conservation Council. She concluded that koala numbers in the entire region were probably in the low hundreds and that magnitude of habitat decline in State Forests was difficult to ascertain because of uncertainty about short and long term effects of various types of logging on koala habitats.

Since then the evidence of forest decline has become more apparent<sup>47</sup>. This strengthens the case that there is a relationship between habitat degradation, associated dieback and declining koala numbers<sup>48</sup> although not everyone accepts this<sup>49</sup>.

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<sup>38</sup> Norton, T. W. 1994. Koala management in south-east Australia and the potential roles for reintroduction biology. Pages 254-259 in M. Serena, editor. Reintroduction biology of Australian and New Zealand fauna. Surrey Beatty & Sons, Chipping Norton, Sydney.

<sup>39</sup> Allen & Bertram (1997) South East Forests Koalas: Nomination as an Endangered Population. South East Forests Conservation Council PO box 797 Bega 2550d

<sup>40</sup> Allen C.D. (1998) Towards the Extinction of the Yurammie/Tantawangalo Koalas. Chris Allen 7 Little Church St Bega NSW 2550.

<sup>41</sup> Yurangalo Inc (2001). Nomination

<sup>42</sup> Murrah/Bunga Koala Recovery: Natural Heritage Trust Project 2001, Nomination to NSW Scientific Committee to List Five Forest Koalas as Endangered. PO Box 161 Bermagui NSW 2546.

<sup>43</sup> Allen C.D. 2005. *Information on Koalas in the Far South Coast of NSW*. Communication with NSW Scientific Committee. Department of Environment and Conservation PO Box 656 Merimbula NSW 2550.

<sup>44</sup> Briggs, S. (1999). Report on Meeting 17-18 February 1999 to Address Koala Issues for South East Forests Koala Recovery Team. Department of Environment and Conservation PO Box 656 Merimbula NSW 2550

<sup>45</sup> Jurskis, V. and B. Potter, (1997). *Koala Surveys, Ecology and Conservation at Eden*. Research Division, SFNSW, PO Box 2119, Beecroft, NSW, 2119.

<sup>46</sup> Briggs, S. (1999). Report on Meeting 17-18 February 1999 to Address Koala Issues for South East Forests Koala Recovery Team. Department of Environment and Conservation PO Box 656 Merimbula NSW 2550

<sup>47</sup> Jagers, J. (2004) *Estimating the extent of declining forest in south east New South Wales*. Unpublished, presented at the proceedings of a colloquium at Batemans Bay 18-19 November 2003. (eds. T.C.R. White and V. Jurskis) State Forests of NSW, Sydney.

<sup>48</sup> Toward Adaptive Management in the Bateman Bioregion

The apparent robustness of the NE Monaro koala population (Table 4), which is sustained by habitat growing on poorer soils in drier climatic conditions with what is probably comparable or even higher levels of eucalypt defoliation than that which is occurring on the Far South Coast region, might suggest a cautious approach to issues concerning declining koala numbers and forest decline. It may be the case that forests in the region are still capable of sustaining substantially higher numbers of koalas and that explanations for the absence of the species in much of this habitat need to be found elsewhere.

One factor that may have contributed to declining koala numbers in the region is the apparent vulnerability of breeding aggregations to social dislocation and a consequent reduction in breeding ability. Phillips<sup>50</sup> provides evidence that koala numbers declined over a 25-year period at Tukki NR after 20% of the animals were removed, despite the habitat being well managed.

In the Far South Coast most forested areas sustaining breeding aggregations of koalas have had a relatively rapid succession of severe, human-induced impacts since European occupation that would have included the repeated removal of home range boundary markers and feeding resources in many areas sustaining breeding aggregations (see Appendix 2 for a summary of some of these impacts). These will have caused ongoing social dislocation of breeding aggregations.

However, because of the rugged and infertile nature of much of the north east Monaro habitat, such impacts have been less frequent and less severe, particularly in recent decades. Perhaps this may help to explain the apparent differences in the conservation status of the koala populations in each region.

If it is the case that there are socio-ecological reasons that help to explain why koalas are so rare in the far South Coast region then the fact that koalas have survived in at least two of the study areas, despite their history of human impacts, apparently low numbers, forest decline and the severity of the most recent drought, gives some cause for hope. The potential for koala recovery is better now in terms of increases in the area of the reserve system, more extensive canid control programs, increased community awareness, voluntary conservation agreements and habitat restoration initiatives on the forest fringes and the potential for a more integrated and effective approach to fire management.

Provided impacts on habitat can be minimized, forest restoration initiatives encouraged and koala numbers are not now too low we may be at the beginning of a recovery phase for koalas in at least the study areas where breeding aggregations appear to be surviving.

Being able to gather fragments of evidence efficiently in ways that can maximise our understanding of what is happening with koalas in these areas will enable more informed support for the recovery of koalas in these areas. Assessing the effectiveness of koala survey methods is important part of this work, and is discussed further below.

### **5.3 SURVEY METHODS AND MONITORING POTENTIAL**

#### **5.3.1 Transect surveys to date**

In Jan 2004 DEC staff reviewed approaches to monitoring low-density koala populations and recommended testing the transect method described in Section 3.2 in localities in south-eastern NSW where there was recent evidence of koalas, or where koalas were considered to be likely to be present. It was suggested that each transect could be re-surveyed once every five years, thus enabling a relatively large number of transects to be sampled over each five year period.

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<sup>49</sup> Jurskis, V. (2004) *The role of changed fire regimes in the apparent decline of eucalypts in temperate Australia*. Presentation to 11<sup>th</sup> Annual AFAC Conference and Inaugural Bushfire CRC Conference, 7-9 October 2004, Perth, Western Australia.

<sup>50</sup> Phillips, S. (2000) *Population Trends and the Koala Conservation Debate* Conservation Biology, 2000 Blackwell Science Ltd. Volume 14(3) June 2000 pp 650-65. Special Section: Conservation of Koalas in Australia. School of Environmental and Applied Science, Griffith University, Gold Coast Campus, PMB 50 Gold Coast MC, Queensland 4127.

During 2004 transects were surveyed in the Shoalhaven Gorge and north-east Monaro regions, and in the Mundoonen NR near Yass.

The table below provides raw data comparing the number of 100m transect intervals of transect searched to date, including those in this survey, the number of intervals with koala scats and the percent success rate in each region.

**Table 4: Number of 100m transect intervals searched, the number of intervals with koala scats and the percent success rate in each region.**

Region	Number of 100m intervals searched	Number of intervals with koala scats	Percent success rate
Shoalhaven	115	45	39.1
NE Monaro	70	23	32.9
Mundoonen NR	40	2	5.0
FS Coast	95	4	4.2

### 5.3.2 Comparing Transect and Sweep Survey Methods

The survey results presented in Table 2 of this report shows that both the transect and sweep search methods were comparable in locating koala evidence on an area-searched basis. However, more hectares per hour were searched using the sweep search method than the transect method.

The results regarding the relative efficiencies of each method are inconclusive, particularly as they were not tested together at the same time within survey patches where scat sites were located. Most of the scat sites located in the sweep search surveys were in two patches and the results may just reflect the locations of the patches where each method was used.

The results do however suggest that the sweep search method is more likely to provide firmer evidence of koala residence than transect surveys. It was not possible to assess whether the koala scat sites found on four transects were from dispersing or resident animals. However, in two cases, in the west Cuttagee patch and Kooraban NP sweep search surveys, undertaken near to the transect surveys, provided firmer evidence of koala residency than that provided by the transect surveys.

Given the above, if the main objective of a koala survey is to undertake a preliminary assessment of koala presence and/or residency the sweep search method is probably the more efficient of the two methods.

However, an advantage of the transect method is that it is repeatable, to the extent that the patch searched is more clearly defined and the method of searching is more rigorous. It provides greater opportunities to contribute to a monitoring program if this is feasible and the resources are committed on a long-term basis to enable this to be implemented effectively.

Another advantage of the transect method is that at the end of every 50 or 100 meter interval the team stops and reports observations to the recorder. This enables greater team cohesion, discipline and focus than what usually occurs during sweep search surveys.

### 5.3.3 Prioritising Further Surveys

The efficiency of the transect survey method in providing data for monitoring purposes is related to the rate of success in locating koala scats; the lower the proportion of intervals with koala scats, the more transects will have to be searched to provide sufficient data for meaningful examination of long-term trends in the occurrence of the species.

Deciding how extensive and in which region a transect-based survey program should be implemented for koala monitoring purposes therefore becomes a resource allocation issue. Although we cannot at this stage quantify the resources that would be required, the preliminary indications are that if this program was implemented across the Far South Coast region a substantial budgetary commitment would be required.

Nevertheless there is probably a good case that further transects are established in and adjacent to the two parts of the study areas identified as being probably occupied by breeding aggregations of koalas. This is for the following reasons:

1. The areas are relatively small; probably a day or two's fieldwork each year (four or eight transects) for each area over a five year period would provide sufficient preliminary information to assess the effectiveness of this approach for monitoring purposes;
2. The results could assist the management in each area, particularly in terms of fire and fuel load management, canid control programs and forest conservation and restoration initiatives;
3. Failure to locate scats using this approach might trigger wider and more extensive surveys.

Additionally, a more robust and experimentally sound assessment of the comparative efficiencies of the sweep search and transect methods could be undertaken if both were methods were used within the same patches where breeding aggregations are likely.

An indicative budget for this transect-based monitoring suggestion, for additional comparative sweep search surveys, and for other possible koala survey undertakings in other study areas is appended (Appendix 2). Information on the expenditure required for the work described in this report is also appended.

#### 5.4 DNA COLLECTION AND ANALYSES

Research into koala genetics can ascertain levels of inbreeding with populations and assist population estimates. It can also ascertain the level of genetic differences between populations and whether these are connected by the movements of dispersing animals. In this sense it potentially offers an important monitoring tool for koala recovery work. Indeed, the national koala conservation strategy recommends that genetic management should be an integral part of koala conservation<sup>51</sup>, a conclusion supported by Sherwin *et al.* 2000<sup>52</sup>.

Before the current research program commenced there were few data on koala genetics and limited information about the level of genetic diversity within and between populations in south-eastern NSW. Prior to 2000, DNA had only been extracted from blood and tissue samples collected from koalas within the Campbelltown population (R.Close pers. comm.)<sup>53</sup> and from four South Coast koalas<sup>54</sup>. In the latter case, the Far South Coast koalas sampled showed similar levels of genetic diversity to wild populations in Victoria and Queensland and higher levels than those found in artificial populations in Victoria<sup>55</sup>. However, neither the samples nor any other information about these samples were retained (Emmins pers comm).

Early in 2002 DNA was successfully extracted from relatively fresh koala fecal pellets (where the patina was present) as part of a graduate research project at the University of Western Sydney<sup>56</sup>. Since then DNA has been extracted from 22 pellet samples collected from the Shoalhaven Gorge study area, 23 from the north-eastern edge of the Monaro, 10 from the Varney's Ridge near Jindabyne and 2 from the South Coast. Micro-satellite analyses are being undertaken on all these samples. The 11 samples collected as a result of this survey program will provide useful additional data on the genetics of koalas in south-eastern NSW.

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<sup>51</sup> Australia and New Zealand Environment and Conservation Council. 1998. *National Koala Conservation Strategy*. Environment Australia, Canberra, Australian Capital Territory.

<sup>52</sup> Sherwin, W. B., Timms, P., Wicken, J., Houlden, B. (2000) Analysis and Conservation Implications of Koala Genetics. *Conservation Biology* Volume 14(3) June 2000 pp 639-649

<sup>53</sup> Professor R. Close. Campbelltown College of Science, Technology and Environment, University of Western Sydney, Locked Bag 1797, Penrith South NSW 2750.

<sup>54</sup> Jurskis, V. and B. Potter, (1997). *Koala Surveys, Ecology and Conservation at Eden*. Research Division, SFNSW, PO Box 2119, Beecroft, NSW, 2119.

<sup>55</sup> Jurskis, V. and B. Potter, (1997). *Koala Surveys, Ecology and Conservation at Eden*. Research Division, SFNSW, PO Box 2119, Beecroft, NSW, 2119.

<sup>56</sup> Hey, G. 1999. *A Manual for Collecting and Transporting Koala faecal pellets for molecular studies*. University of Western Sydney School of Science, Food and Horticulture, Locked Bag 1797 Penrith South DC NSW 1797.

This probably provides sufficient samples to enable a post-graduate research project to be undertaken (Rob Close, Pers. Comm)<sup>57</sup>, although additional samples would enhance the research potential for such a project.

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<sup>57</sup> Professor R. Close. Cambelltown College of Science, Technology and Environment, University of Western Sydney, Locked Bag 1797, Penrith South NSW 2750.

## 6 APPENDIX 1

### 6.1 FURTHER INFORMATION ON SWEEP SEARCH PATCHES

The table below provides information about each of the patches searched using the sweep search method, the number of participants, the total hours spent searching and the outcome.

**Table 3: Patches searched, the number of participants, the total hours spent searching and the outcome.**

Date	Tenure	Survey start location	Patch searched	No	Hours	Outcome
24/03/2005	Biamanga NP	Southern side of Head of Cuttagee Rd, approximately 1k from junction of Nutleys Creek Rd.	Drainage area SSW towards Cuttagee then spur back to HofC Rd	4	12	Nil
1/04/2005	Biamanga NP	Southern side of Head of Cuttagee Rd, approximately 2k from junction of Nutleys Creek Rd.	Cuttagee Creek SW of spur	1	2	Nil
6/04/2005	Biamanga NP	Southern side of Head of Cuttagee Rd, 2.5k west of junction with Tartha/Bermagui Rd	Catchment to south of HofC Rd	4	20	6 scat sites
10/04/2005	Biamanga NP	Southern side of HofC Rd 200m from junction with Nutley's Ck Rd	Catchment to SW and spur to NW	7	21	Nil
18/04/2005	Biamanga NP	Head of Cuttagee Rd, 2K SW from Siltstone Rd	Southern side of Head of Cuttagee Rd.	4	14	Nil
18/04/2005	Murrah SF	Across Cuttagee Creek at end of spur	End of spur and across creek	4	2	Nil
19/04/2005	Biamanga NP	Yowrie Rd, 1.5k E of junction with Nutley's Ck Rd	Southern slope to south and east	5	7.5	Nil
19/04/2005	Biamanga NP	Yowrie Rd, 2.5k E of junction with Nutley's Ck Rd	Southern slope to south, east, north and return	5	7.5	2 scat sites
19/04/2005	Biamanga NP	500m SW from junction of Nutley's Ck & HofC Rds	Spur to SW	5	5	Nil
20/04/2005	Biamanga NP	Siltstone FT, 1k east of junction with Honeymoon Ridge FT.	Area to north of start of Transect 003	1	1.5	5 scat sites
20/04/2005	Biamanga NP	East of Transect SC_003	East of Transect SC_004	2	1	Nil
21/04/2005	Murrah SF	Junction of Murrah River Rd and entry road into 2033	Area to directly south of transect and then ESE to gully junction	4	6	Nil
21/04/2005	Murrah SF	100m north of junction of Murrah River Rd and entry road into 2033	Spur to north	5	5	Nil
21/04/2005	Murrah SF	1.7k (approx) down entry track into 2032. Transect start approx 120m west of track	Southern face (northern side) of gully system to south of transect	4	6	Nil
22/04/2005	Murrah SF	From gully at 766250/5955700	Spur Back to Murrah River Rd	5	5	Nil
22/04/2005	Murrah SF	East of Transect SC_007	Area east of transect to gully junction to north	4	6	1 possible; not confirmed
22/04/2005	Murrah SF			2	2	Nil
25/05/2005	Kooraban NP	Just past bridge		5	5	1 scat site
7/06/2005	Kooraban NP	Track going south beyond first creek crossing on Sams Ridge Rd, 800m beyond first creek crossing on track, following eastern side of spur towards gully junction then back on track.		3	6	1 scat site
15/06/2005	SEF NP (Yurammie)	Knoll on Yellow Pinch FT.	From knoll to next spur, just below regrowth area	5	2.5	Nil
15/06/2005	SEF NP (Yurammie)	From end of transect 15 north and NNW to FT	From end of transect back to track	5	2.5	Nil
26/08/2005	Kooraban NP	Down track to leading east from KB Rd, 1k north of the junction of KB/Sams Ridge Rd	Area to north of track, just beyond first junction	3	6	3 scat sites
<b>Total Hours</b>					<b>147.5</b>	

## 6.2 FURTHER INFORMATION ON TRANSECT PATCHES

FIELD NUMBER	TENURE	START		BEARING	Y/N	SURVEY START	AREA SEARCHED
		Eastings	Northings				
SC_001	Biamanga NP	764023	5960122	140	N	H of Cuttagee Rd, approx. 2k from Nutleys Ck Rd junction.	Spur to SE
SC_002	Biamanga NP	763988	5959758	315	N	As above	Return along lower slop SW face of spur
SC_003	Biamanga NP	231748	5958511	0	Y	Siltstone FT, 1k east of junction with Honeymoon Ridge FT.	Area to north of start point
SC_004	Biamanga NP	768512	5958392	160	N	Just east of junction of Siltstone Rd and FT	Area to south of start point
SC_005	Murrah SF	762049	5959212	80	N	Junction of Murrah River Rd and entry road into 2032	25m NE of junction
SC_006	Murrah SF	763181	5960004	60	N	1.7k (approx) down entry track into 2032.	Transect start approx 120m west of track
SC_007	Murrah SF	766477	5955306	10	Y	Murrah River Rd. approx 1k west of H'moon Ridge Rd	Off road
SC_008	SEF NP (Yuram.)	738892	5916608	0	N	Knoll area off Myrtle Forest Rd	North of knolls
SC_009	SEF NP (Yuram.)	739326	5916631	245	N	Lower slopes of Myrtle Creek	Back to knolls
SC_010	Koorab an NP	765690	5973412	290	Y	Just past bridge	Sams Ridge Rd
SC_011	Koorab an NP	764320	5974268	110	N	Just past bridge	Sams Ridge Rd
SC_012	Bermagui NR	234071	5963532	180	N	Nutleys Creek, between River and Pigs Crossing Rds	Due South of Rd
SC_013	Bermagui NR	234233	5963479	190	Y	Nutleys Creek, between River and Pigs Crossing Rds	Due South of Rd
SC_014	SEF NP (Yuram.)	749333	5916394	65	N	Spur South of Yellow Pinch FT Northern side.	Southern side, just below regrowth area
SC_015	SEF NP (Yuram.)	750006	5916558	245	N	Spur South of Yellow Pinch FT Southern side. Just below logging area.	From beyond end of SC_013
SC_016	SEFNP (Tanta)	731289	5920582	300/330	N	West of Careys FT	Northern side of creek
SC_017	SEFNP (Tanta)	730910	5920883	?	N	Beyond SC_017	Northern side of creek
SC_018	SEFNP (Tanta)	730842	5921061	42	N	Towards drainage line before scrape trail	Up spur from near creek
SC_019	Nutleys Ck Rd	768169	5961698	90	N	Near Junction of Nutleys Ck Rd and FT	Spur to east

## 7 Appendix 2

### 7.1 SURVEY PROGRAM COSTS

Table 5 presents information and is decision-making on resource allocation

**Table 5**

	Person Days	Salary plus oncosts @\$200:00 per day	Vehicle	Total
Preparation	4	1000		
Field work, coordinator	14.5	3625	1500	
Fieldwork, other DEC staff	12.5	3125	500	
Fieldwork, FNSW	4.5	1125	250	
Data Entry, Mapping, Report	12	3000		
<b>Total</b>		<b>11875</b>	<b>2250</b>	<b>14125</b>

### 7.2 INDICATIVE KOALA SURVEY BUDGET

The following table has been prepared to provide indicative information as to the approximate costs of potential koala survey and monitoring work that could be undertaken as a continuation of the work described in this report. The tasks are prioritised, with those higher up the list appearing to have greater potential to contribute to improving our understanding of the distribution and conservation status of koalas in the region. Two options are provided for some of the tasks in terms of the minimum and maximum extent of the work that could be reasonably undertaken.

The extent of koala recovery work, including its survey, monitoring and research components, is constrained by budget limitations and a range of competing initiatives to which resources could be allocated. The information is provided here to assist and inform community input and decision-making on resource allocation within that competitive environment.

Task	Method	Person Days	Salary @\$200 per day		Oncosts X 25%	Vehicle	Total
			Fieldwork	Management*			
Establish transects in and adjacent to breeding aggregation localities in Study Area 1.	T**	5	1000	1000	1250	150	3400
	T	10	2000	2000	2500	300	6800
Establish additional transects in and adjacent to breeding aggregation localities in Study Area 2.	T	5	1000	1000	1250	150	3400
	T	10	2000	2000	2500	300	6800
Testing relative efficiencies of each survey method	SS***	5	1000	1000	1250	150	3400
	SS	10	2000	2000	2500	300	6800
Distribution surveys in western Koorban NP and adjacent areas	SS	10	2000	2000	2500	300	6800
Distribution surveys in SEFNP (Yurammie) and Yurammie SF	SS	10	2000	2000	2500	300	6800
Distribution surveys in SEFNP (Tantawangalo)	SS	10	2000	2000	2500	300	6800

\* Management includes preparation (logistics and personnel), data entry and analysis, mapping and report writing

\*\* T = Transect Method

\*\*\*SS = Sweep Search Method

## 8 APPENDIX 3

### 8.1 SUBMISSION TO NSW SCIENTIFIC COMMITTEE

#### INFORMATION ON KOALAS IN THE FAR SOUTH COAST REGION OF NSW

##### **Background**

The table below was initially prepared to help select areas on the Far South Coast where a NPWS koala monitoring survey is proposed to commence in the spring of 2004. It provides information on all localities where survey data and anecdotal records suggest breeding associations of koalas may have survived into the 1990's and, in some cases, may still be present.

Although there may be other breeding associations surviving in the region I am not aware of any evidence to suggest this is the case.

Following a request from the Chief Ecologist of the Australian Koala Foundation for information about the conservation status of koala on the Far South Coast of NSW, the table was adapted to provide information about each locality where a decline in koala numbers is suggested by the available evidence.

The adapted table lists the known impacts specific to the locality (drought and wildfire are additional impacts that have occurred in all localities in recent decades) that may have impacted on koalas and/or degraded the habitat sustaining each breeding association.

Of these impacts, intensive logging refers to the forestry practice of integrated harvesting in alternate coupes where a high proportion (usually <80% of trees) in the coupe are removed for woodchip and sawlog products.

Although I am employed by the NPWS undertaking koala recovery work in Southern NSW, conclusions I draw from the information in the table do not necessarily represent the views of the Service. I personally take full responsibility for its contents.

##### **The conservation status of Koalas on the Far south Coast of NSW**

The information in the table suggests the following regarding the conservation status of the Koala in SENSW:

1. Koala numbers appear to have declined in recent decades in 13 out of 15 localities listed in the table. Some of this evidence is conclusive (eg Compartments 2004/5, Bermagui State Forest) and from other localities it is quite tentative. There is no evidence to suggest koala numbers are increasing in any locality. Although the extent of data from each locality is variable, its consistency from across the region gives it greater significance.
2. Field surveys by the NPWS and the Australian Koala Foundation have been undertaken in areas sustaining low-density populations in other parts of south east NSW during 1999-2004. These have been much more successful in locating evidence of koalas than in the South Coast Region. I have participated in most of these surveys. The comparative lack of success of koala surveys in this period in the latter region, both when compared with previous surveys and with the survey results from other areas, further suggests a region-wide decline in numbers.
3. There has also been a decline in anecdotal sightings over the past two decades. Fanning (1990)<sup>i</sup> lists extensive anecdotal sightings in the region during the previous two decades, particularly in the Tantawangalo and Yurammie areas. Similarly, there are many anecdotal reports of koala sightings in the same period from the Bermagui area. In the past five years anecdotal reports have averaged approximately one or two a year. This is despite the NPWS undertaking a koala recovery program that has had a relatively high public profile with media releases and radio interviews appealing for information about koala sightings and koala habitat restoration works on approximately 20 private properties.
4. The last reported collision between a car and a koala in the whole region occurred in the Wallaga Lake NP in 1993.

Taken in isolation each of the above points do not provide conclusive evidence that koala numbers in the Far South Coast region are declining or are facing regional extinction. The evidence provided is limited and fragmentary and a cautious interpretation may be warranted. This is particularly the case with the information derived from koala surveys; these were significantly more intensive and extensive in the Far South Coast region during the period 1990-7 than the period 1998-2004. Recent surveys in some localities have been limited in their extent and intensity and this may skew the limited data to give the impression of a greater decline in koala numbers than that which may have occurred.

However, when the existing survey evidence is combined with the other evidence provided in the table, a more powerful case of declining numbers with increasing likelihood of regional extinction is apparent.

Chris Allen  
19<sup>th</sup> June 2004

## INFORMATION ON KOALAS IN THE FAR SOUTH COAST REGION OF NSW

Locality	Survey/Research	Summary of evidence since 1990	Impacts other than w/ drought since 1980
Dignams Creek	Field surveys by local residents in 1998, SFNSW in 1998, NPWS in 2001 <sup>i</sup> , Callback survey by NPWS in 2002 <sup>ii</sup>	Koala fecal pellets located in all field surveys.	Neighbouring areas int logged late 1980' and 1 Rotweiller escaped intc 90's, observed by resid several occasions in th three years.
Gulaga NP Wallaga Lake Area	Field surveys by NPWS contractors in 1999 <sup>iv</sup> , and by NPWS in 2002 and 2003 <sup>v</sup> . Callback survey by NPWS in 2002 <sup>vi</sup>	Koala fecal pellets indicating breeding female located in 1999. Anecdotal report of koala sighting in 2001. One male koala call may have been heard during 2002 field survey.	None known
Narira Creek	Callback survey by SFNSW in 1997 <sup>vii</sup> . Field survey on one property by NPWS in 2003 <sup>viii</sup> .	Anecdotal reports of koalas from local residents of seeing koalas in the 1970's and early 1980's. Anecdotal reports from three residents hearing koalas exchanging bellows in early 90's. Female with young sighted by one resident in 1991. Dead koala found in 1993. Male bellow recorded in SFNSW callback survey in 1997. Male koala bellow reported by local resident in 2002.	Subdivision and clearir housing and fencing.
Bermagui/ Cobargo Rd	Community survey by Lunney et al in 1991 <sup>ix</sup> .	Anecdotal reports from many local residents of seeing koalas on the road in the 1970's and early 1980's. Relatively high number of sightings recorded in survey by Lunney et al.	Subdivision and clearir housing and fencing.
Compart ments Bermagui State Forest	Fanning (1990) <sup>x</sup> . Field surveys by SFNSW in 1992-6 <sup>xi</sup> and SEFKRP in 1997 <sup>xii</sup> .	SFNSW reported 20 koalas in area in 1970's. Anecdotal reports from many local residents of seeing koalas on the road in the 1970's and early 1980's. Relatively high number of sightings recorded in community survey (1991). Resident mature male koala radio-tracked 1992-6 when contact was lost.	None known
Nutleys Creek Rd	Field surveys by SEFKRP in 1997 <sup>xiii</sup> and NPWS in 2002 <sup>xiv</sup> .	Koala fecal pellets found in both surveys. Very young koala observed by local residents and pellets of joey located by NPWS (2002).	None known
Biamanga NP Cuttagee Creek	SFNSW pre-logging surveys in 1994, Field surveys by SEFKRP in 1996/8 <sup>xv</sup>	Koala observed during logging operations in logged area. Koala fecal pellets of mother and young located in SEFKRP surveys. No surveys have been undertaken in this area since 1998	Area extensively and ir logged
Biamanga NP north of Cuttagee Lake	Field surveys by SFNSW in 1996, SEFKRP in 1996-8 <sup>xvi</sup> and NPWS in 2001-4 <sup>xvii</sup> , <sup>xviii</sup> . Callback survey by SFNSW in 1997 <sup>xix</sup> .	Female with young observed by SFNSW staff. Koala fecal pellets of mother and young located in SEFKRP surveys in two areas approximately 1 kilometre apart. Male bellow recorded in SFNSW callback survey (1997). Koala fecal pellets of mother and young located by NPWS (2002), Pellets located approximately 500m from this area in 1993.	None known
Wadbillag a NP, Murrabrin e Area	Callback survey by SFNSW in 1997 <sup>xx</sup> . Field survey by NPWS in 2000 <sup>xxi</sup>	Two callback responses in 1997.	Intensive logging in ma area
Mumbulla SF Lizard Rd Area	SFNSW callback survey in 1997 <sup>xxii</sup> , NPWS callback survey in 2002 <sup>xxiii</sup>	Two male bellows recorded in SFNSW survey in 1997.	Timber Stand Improver (involving the ringbarkii trees to try to promote regrowth and intensive 1980.
Glen Allen SF	Field surveys by SFNSW and NPWS in 1999 <sup>xxiv</sup> .	Koala repeatedly sighted over a period of several weeks. Carcass located in same area in Nov 1999.	Extensive logging in ne state forests both befor
South East Forests NP - Tantawan galo Area	Community survey by Lunney et al in 1991 <sup>xxv</sup> . Field surveys by TCPA from 1990-4 <sup>xxvi</sup> , <sup>xxvii</sup> , SFNSW from 1991-6 <sup>xxviii</sup> . SEFKRP from 1996-8 <sup>xxix</sup> . NPWS in 2003 <sup>xxx</sup> . Two koalas radio-tracked by SFNSW from 1992-4 <sup>xxxi</sup> .	The community survey (Lunney 1991) recorded highest number of koala sightings in region in the locality in the 1990/91. Bellows of three male koalas recorded in community field survey (1990). Breeding female (known to have produced two young) and young male radio-tracked. Koala pellets in female's home range area and surrounds relatively easy to locate in 1991. Some pellets located in 1996, but more difficult to find.	Intensive logging in soi Tantawangalo in (1992 used by dispersing mal

South East Forests NP Cathcart Area	Assessment by Roger Martin (1993) <sup>xxxii</sup> . Field surveys by SEFCC in 1993, SFNSW in 1993 and SEFKRP in 1997 <sup>xxxiii</sup> .	Young koala observed beside logged coupe and area where relatively high density of koala fecal pellets located (1993). Hair from joey koala identified in nearby logged coupe.	Intensive logging through Cathcart Forest
South East Forests NP Yurammie Area	Survey by Braithwaite (1981) <sup>xxxiv</sup> . Two koalas radio-tracked by SFNSW (1992-4) <sup>xxxv</sup> . Field surveys by SEFKRP (1996-8) <sup>xxxvi</sup> .	Anecdotal reports from loggers of koalas sighted during logging operations in late '70's. Yurammie was the only area where koalas were recorded in Braithwaite's survey of logging operators (1981). Two koalas (both male, one in settled home range, the other probably a dispersing young animal) radio-tracked by SFNSW (1992-4). Fecal pellet sites located by SEFKRP (1996-8)	Locality intensive logging in 1970's.
Nullica SF	Two koalas radio-tracked by SFNSW (1992-4) <sup>xxxvii</sup> SEFKRP (1996-8) <sup>xxxviii</sup> .	The koalas (mature male, breeding female and back young) radio-tracked. Koala fecal pellets located during SEFKRP survey (1997)	Intensive logging through in 1980's.

<sup>i</sup> Fanning, D. (1990). *Koalas in the South East Forests*. Unpublished report to Forestry Commission. Gunninah Consultants, Sydney, NSW. Research Division, SFNSW, PO Box 2119, Beecroft, NSW 2119.

<sup>ii</sup> Allen C.D. (2001) SCMA Koala Recovery Program: Coordinator's Report on Survey Program: May 20<sup>th</sup> – July 6<sup>th</sup> 2001. Internal report to NPWSTSU. National Parks and Wildlife Service NPWS Southern Zone NPWS Southern Zone PO Box 2115 Queanbeyan NSW 2620.

<sup>iii</sup> NPWS (Unpublished data)

<sup>iv</sup> Allen, C. D. (1999a). Unpublished report of koala surveys in the Wallaga Lake National Park and Goura Nature Reserve. National Parks and Wildlife Service NPWS Southern Zone NPWS Southern Zone PO Box 2115 Queanbeyan NSW 2620.

<sup>v</sup> Watts G. (2003). Burn Plan for Wallaga Lake NP. NPWS Narooma

<sup>vi</sup> NPWS (Unpublished data).

<sup>vii</sup> Jurskis, V., Shields, J. and Douche, G. (in prep.). A Playback Survey of Koalas in the Eden Region. Research Division, SFNSW, PO Box 2119, Beecroft, NSW, 2119.

<sup>viii</sup> Allen C.D. (2003b) Lewin property report. Koala Habitat Restoration Project.

<sup>ix</sup> Lunney, D., Esson, C., Moon, C. and Ellis, M. (1997). A community-based survey of the Koala *Phascolarctos cinerius* in the Eden region of SENSW. *Aust. Wildl. Res.* 1997 **24**. 111-128.

<sup>x</sup> Fanning, D. (1990). *Koalas in the South East Forests*. Unpublished report to Forestry Commission. Gunninah Consultants, Sydney, NSW. Research Division, SFNSW, PO Box 2119, Beecroft, NSW 2119.

<sup>xi</sup> Jurskis, V., and B. Potter, (1997). *Koala Surveys, Ecology and Conservation at Eden*. Research Division, SFNSW, PO Box 2119, Beecroft, NSW 2119.

<sup>xii</sup> South East Forests Conservation Council (1997). *Modelling Koala Habitat and Use in Murrumbidgee and Bermagui Forests*. An unpublished report commissioned by RACAC for the Comprehensive Regional Assessment in the Eden Region. Prepared by the South East Forests Koala Research Project. SEFCC, PO Box 797, Bega, 2550.

<sup>xiii</sup> Jurskis, V. and B. Potter, (1997). *Koala Surveys, Ecology and Conservation at Eden*. Research Division, SFNSW, PO Box 2119, Beecroft, NSW, 2119.

<sup>xiv</sup> NPWS (Unpublished data).

<sup>xv</sup> South East Forests Conservation Council (1997) Final Report of the South East Forests Koala Research Project. Unpublished report for Dept Urban Affairs and Planning. SEFCC, PO Box 797, Bega, 2550.

<sup>xvi</sup> South East Forests Conservation Council (1997) Final Report of the South East Forests Koala Research Project. Unpublished report for Dept Urban Affairs and Planning. SEFCC, PO Box 797, Bega, 2550.

<sup>xvii</sup> Allen C.D. (2001) SCMA Koala Recovery Program: Coordinator's Report on Survey Program: May 20<sup>th</sup> – July 6<sup>th</sup> 2001. Internal report to NPWSTSU. National Parks and Wildlife Service NPWS Southern Zone NPWS Southern Zone PO Box 2115 Queanbeyan NSW 2620.

<sup>xviii</sup> NPWS (Unpublished data)

<sup>xix</sup> Jurskis, V., Shields, J. and Douche, G. (in prep.). *A Playback Survey of Koalas in the Eden Region*. Research Division, SFNSW, PO Box 2119, Beecroft, NSW, 2119.

<sup>xx</sup> Jurskis, V., Shields, J. and Douche, G. (in prep.). *A Playback Survey of Koalas in the Eden Region*. Research Division, SFNSW, PO Box 2119, Beecroft, NSW, 2119.

<sup>xxi</sup> Allen, C. D. (2000). *Unpublished report of koala surveys in Murrumbidgee Area*. National Parks and Wildlife Service NPWS Southern Zone NPWS Southern Zone PO Box 2115 Queanbeyan NSW 2620.

<sup>xxii</sup> Jurskis, V., Shields, J. and Douche, G. (in prep.). *A Playback Survey of Koalas in the Eden Region*. Research Division, SFNSW, PO Box 2119, Beecroft, NSW, 2119.

<sup>xxiii</sup> NPWS (Unpublished data)

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- <sup>xxiv</sup> Allen (2000). Unpublished report of koala surveys in the Nunnock Swamp Areas. National Parks and Wildlife Service NPWS Southern Zone NPWS Southern Zone PO Box 2115 Queanbeyan NSW 2620.
- <sup>xxv</sup> Lunney, D., Esson, C., Moon, C. and Ellis, M. (1997). A community-based survey of the Koala *Phascolarctos cinerius* in the Eden region of SENSW. *Aust. Wildl. Res.* 1997 **24**. 111-128.
- <sup>xxvi</sup> Allen, C. D. (1992). *Koala Habitat Survey of the Devils Creek Catchment* Unpublished submission to the Australian Heritage Commission TCPA, PO Box 797, Bega, NSW, 2550.
- <sup>xxvii</sup> Cork, S., Feary, S. & Mackowski, C. (1995). *Koala Conservation in the South East Forests: Proceedings of an expert workshop*. NPWSNSW, PO Box 1967, Hurstville, NSW, 2220.
- <sup>xxviii</sup> Jurskis, V., Rowell, D. and Ridley, D. (1994). *Survey Techniques and Aspects of the Ecology of the Koala near Eden*. Research Division, SFNSW, PO Box 2119, Beecroft, NSW 2119.
- <sup>xxix</sup> South East Forests Conservation Council (1997) Final Report of the South East Forests Koala Research Project. Unpublished report for Dept Urban Affairs and Planning. SEFCC, PO Box 797, Bega, 2550.
- <sup>xxx</sup> Allen C.D. (2003) Koala Survey in the Boben Rd Area, Tantawangalo Forest (Aug. 2003). NPWS PO Box 565 Merimbula 2548.
- <sup>xxxi</sup> Jurskis, V. and B. Potter, (1997). *Koala Surveys, Ecology and Conservation at Eden*. Research Division, SFNSW, PO Box 2119, Beecroft, NSW, 2119.
- <sup>xxxii</sup> Martin, R. W. (1993). *The Remnant Koala Population in the Cathcart State Forest: South East Forests Conservation Council v. Director of National Parks and Wildlife Service and Forestry Commission NSW*. Unpublished statement prepared for Land and Environment Court regarding the proposed logging of Compartment 1381 Cathcart Special Prescription Area
- <sup>xxxiii</sup> South East Forests Conservation Council (1997) Final Report of the South East Forests Koala Research Project. Unpublished report for Dept Urban Affairs and Planning. SEFCC, PO Box 797, Bega, 2550.
- <sup>xxxiv</sup> Braithwaite et al (1983). *Studies on the arboreal marsupial fauna of eucalypt forests being harvested for woodpulp at Eden NSW. I. Species and distribution of animals*. Australian Wildlife Research 1983 10 219-229.
- <sup>xxxv</sup> Jurskis, V. and B. Potter, (1997). *Koala Surveys, Ecology and Conservation at Eden*. Research Division, SFNSW, PO Box 2119, Beecroft, NSW, 2119.
- <sup>xxxvi</sup> South East Forests Conservation Council (1997) Final Report of the South East Forests Koala Research Project. Unpublished report for Dept Urban Affairs and Planning. SEFCC, PO Box 797, Bega, 2550.
- <sup>xxxvii</sup> Jurskis, V. and B. Potter, (1997). *Koala Surveys, Ecology and Conservation at Eden*. Research Division, SFNSW, PO Box 2119, Beecroft, NSW, 2119.
- <sup>xxxviii</sup> South East Forests Conservation Council (1997) Final Report of the South East Forests Koala Research Project. Unpublished report for Dept Urban Affairs and Planning. SEFCC, PO Box 797, Bega, 2550.