Bat surveys at Mt Leura and Mt Sugarloaf Reserves, Camperdown

Mt Leura and Mt Sugarloaf
Development Committee

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Glossary

Bioregion

Bioregions are a landscape-scale approach to classifying the environment using a range of attributes such as climate, geomorphology, geology, soils and vegetation. There are 28 bioregions identified within Victoria.

Corridors and Connectivity

Wildlife corridors can be defined as “retained and/or restored systems of (linear) habitat which, at a minimum enhance connectivity of wildlife populations and may help them overcome the main consequences of habitat fragmentation” (Wilson, A. & Lindenmayer 1995). Corridors can assist ecological functioning at a variety of spatial and temporal scales from daily foraging movements of individuals, to broad-scale genetic gradients across biogeographical regions.

Ecological Vegetation Class (EVC)

EVC’s are based on a hierarchical system of classification of plant communities developed in Victoria in order to classify vegetation into units that are both ecologically meaningful and useful for natural resource managers. The classification that has been adopted in Victoria includes Ecological Vegetation Classes (EVCs) which are defined by a combination of floristics, life-form, position in the landscape, and an inferred fidelity to particular environments. Approximately 300 EVCs have been described for Victoria.

Significant Species:

Refers to species listed under the *Environment Protection and Biodiversity Conservation Act 1999, Flora and Fauna Guarantee Act 1988* and *Victorian Rare or Threatened Species.*

1. Introduction

The Mount Leura and Mount Sugarloaf Reserves are located in the western district of Victoria on the outskirts of Camperdown.

The Mount Leura Reserve was a gift from the Manifold family to the Shire of Hampden in 1899. The title was transferred to the Town of Camperdown in 1953, and then to the Corangamite Shire during amalgamations of local governments in the mid1990's. Mount Sugarloaf was purchased by the National Trust of Victoria in 1972. Both reserves are regionally significant based on thier geological features.

The Mount Leura and Mount Sugarloaf Advisory Committee was formed in 1991 with the aim of commissioning a Landscape Master Plan and Management Plan for the reserves. At the completion of the preparation of the plan in 1994, the Mount Leura and Mount Sugarloaf Development Committee was formed. The plan was further revised in 1997 to ensure the views of the volcanic landscape were not impacted.

Revegetation of the reserves was first undertaken by the local community in 1995 with approximately 35,000 native plants planted to date. An important element of the revegetation has been the involvement of local community groups and schools. The reserves are not managed alone for their geological and floristic significance. The committee also manages the reserve to provide the local community and visitors with recreational opportunities in the form of cycling, walking, jogging, geocaching, viewing the landscape, educational and photograph opportunities.

Ecological Consulting Services (ECS) was commissioned by Mount Leura and Mount Sugarloaf Development Committee to assess the success of their revegetation program in providing habitat for microbats. The assessment involved a bat trapping program within the Mount Leura and Mount Sugarloaf Reserves.

Limitations: This report is not intended to provide a detailed account of the site's geology, flora and fauna values or previous land-use. If further detailed information is required, please refer to the excellent publication published by the Mount Leura and Mount Sugarloaf Development Committee; *The Volcanic Edge* (2011).

The information presented in this report is for the sole purpose of providing the Mount Leura and Mount Sugarloaf Development Committee and other interested parties with baseline information on the microbats' present and, recommendations for further site enhancement. I have also assumed that the reader/s of the report have limited experience with microbats and the methods used to survey. The report is written with this audience in mind.

1.1 Objectives

The objectives of the study were to:

- establish a baseline of the bats present
- encourage community involvement with the trapping program
- provide an on-site information session
- provide recommendations for further bat habitat enhancement.

1.2 Microbat background

1.2.1 Microchiroptera

Bats are placental mammals and are in the order Chiroptera, the translation of this Greek word means *"hand wing"* (Reardon & Flavel 1987). There are two suborders; Microchiroptera, the microbats; they are typically small, eat insects and use echolocation to navigate. Microbats can eat up to half their body weight in insects per night.

Megachiroptera, the megabats / flying foxes are relatively large, eat fruit and pollen, have a well-developed sense of smell and large eyes suitable for seeing in the dark.

Australia's smallest bat weighs just 3.5 grams (Little forest Bat) and the largest is the Grey-headed Flying-fox weighing up to 1100 grams (Churchill 2009). Bats use a range of roosts, they include; tree branches, tree hollows and under bark, caves, mines, bridges and tunnels, bird nests and buildings. It is widely acknowledged that microbats and megabats provide important ecosystems services in the form of pollination of plants, dispersal of seeds and insect control.

Conservation

The loss of habitat is the greatest threat to microbats, in particular cavity forming (hollows) trees. Tree hollows can take up to 100-years to form and the loss of large old trees through land clearing, forestry and firewood collection places populations under serious threat. In these circumstances bats will look for alternative roosting sites in the form of buildings, this often causes human / wildlife conflicts.

Although revegetation has a positive influence by providing food resources, the vegetation is not mature enough to provide roosting opportunities for many decades. In this scenario, the use of nest boxes can be a suitable alternative (Hall 2009).

2. Approach

2.1 Desktop review

The following available literature and data were reviewed during this assessment:

- the Department of Sustainability and Environment (DSE) Biodiversity Interactive Map (22 March 2012)
- aerial photographs from Google Maps

This information was used to assess the existing environment of the study area and surrounding landscape.

2.2 Bat detector survey

An active bat detector survey was undertaken across the site over 2-nights. A bat detector processes the high frequency calls of the bat and converts the calls into human hearing range. When used in conjunction with sound analysis software, a detector may quantify levels of activity and in most cases can identify species. They are not capable of counting the number of individuals. The bat detector used was an Anabat SD2 (Titley Electronics) designed in Australia by Chris Corben. Refer to Figure 1 for image of the bat detector used.

Figure 1: Bat detector

2.3 Harp trapping

Harp traps were designed in the late 1950's in the United States by Denny Constantine. They consist of 2 or more rectangular frames 90-100mm apart with fishing line strung at spacing's of 20-25mm. A canvas bag is attached to the bottom of the frames to stop the bats from escaping.

The bat/s fly into the fishing line attached to the frames and drop into the capture bag at the base of the trap. Figure 2 below provides a visual detail of the design of a harp trap.

Figure 2: Harp trap.

Trapping surveys involves the use of harp-traps; this requires fieldworkers to have extensive experience in the capture and handling of microbats and the relevant permits to undertake the work.

The traps were placed at specific locations in the Mt Leura and Mt Sugarloaf Reserve's to increases the likelihood of captures, this is typically in what are known as flyways. Flyways take the form of vehicle and/or walking tracks, ideally vegetation will be on the verge of the track to funnel the bats into the trap whilst flying to their foraging area.

Captured individuals are identified based on characteristic features, thus overcoming the limitation of identifying bats with the use of bat detectors.

The following animal welfare considerations were followed at all times during the survey program:

- Climatic conditions were considered prior to the deployment of bat capture devices. Surveys were not undertaken in climatic conditions considered stressful for bats such as cold temperatures, strong winds or heavy rain.
- Capture devices were installed in accordance with accepted guidelines. Where possible traps were placed in sheltered or protected sites.
- Potential predation of captured bats was managed by maintaining checking traps throughout the evening.

Surveys were undertaken under AEC approval number 11.10 and Department of Sustainability and Environment Permit Number 10005473.

3. Results

3.1 Desktop review

There were no records of microbats within a 10km radius of the site on the DSE online biodiversity tool. The lack of records is more likely an artefact that few bat surveys have been undertaken in the area. There is however a cave on a property approximately 15km away known to support the nationally threatened Southern Bent-wing Bat (*Miniopterus schrebersii bassanii*).

3.2 Vegetation (Ecological Vegetation Class)

There are 10 Ecological Vegetation Classes (EVC'S) present in the Camperdown region, however only 2 EVC's are of relevance to Mount Leura and Mount Sugarloaf Reserves. The Ecological Vegetation Classes (EVC's) present in the reserves are provided in Table 3-1.

Pre-European modelling indicates (refer to Appendix C) that the reserves would have consisted of vegetation over the full extent of the reserves. Post European clearing has removed most of the vegetation with the exception of the areas were revegetation has occurred. The revegetated areas only covers a small area of the pre-European extent and consideration should be given to expanding the revegetated areas.

Table 3-1: EVC's present at Mount Leura and Mount Sugarloaf

EVC's	Appendix
Scoria Cone Woodland EVC_894	C-1
Swamp Scrub EVC_53	C-1

3.3 Climatic conditions

3.3.1 Trapping and bat detector surveys

Climatic conditions were conducive for surveying. There was warm temperatures during the day, although minimum overnight temperatures were lower than desired. Climatic conditions whilst undertaking surveys are provided in Table 3.2.

Table 3.2: Trapping surveys

Survey dates	Temp Min (°C)	Temp Max (°C)	RH (%)	Wind direction	Max Wind (km/hr)	Rainfall (mm)	Min Air Pressure hPa	Max Air Pressure hPa
01/04/2012	12	18.4	64	SE	13	0	1017.7	1019.7
02/04/2012	9.7	26.1	34	N	13	0	1010.0	1015.2

3.4 Surveys

3.4.1 Bat Detector

The bat detector indicated that bat activity was minimal, this is in contrast to the trapping rates. No conclusions are drawn as to why this was the case. Three species of bat were identified using the bat detector with sound analysis software; Large Forest Bat, Eastern Falsistrellus and White-striped Freetail Bat.

3.4.2 Harp trapping

The trapping program was extremely productive capturing a total of 32 individuals of 7-species. Figure 1 below shows the location of the trapping sites, Table 3.3 provides the GPS co-ordinates for each of the trap locations to ensure any future trapping programs can replicate the locations to within +/- 5-metres. Trapping results are presented in Table 3.4.

Figure 1: Location of Harp Traps

Table 3.3: Trap locations

Site	latitude	longitude	Elevation (M)
H1	-38.2444	143.1544	245
H2	-38.2414	143.1515	201
H3	-38.2415	143.1553	240

Table 3.4: Bat trapping results

SPECIES	H1	H2	H3	TOTAL
Gould's Wattled Bat *Chalinolobus gouldii*	1			1
Chocolate Wattled Bat *Chalinolobus morio*	3		1	4
Eastern Falsistrellus *Falsistrellus tasmaniensis*			1	1
Lesser Long-eared Bat *Nyctophilus geoffroyi*	3	2		5
Large Forest Bat *Vespadelus darlingtoni*		9	3	12
Southern Forest Bat *Vespadelus regulus*		5		5
Little Forest Bat *Vespadelus vulturnus*		3	1	4
Total	**7**	**19**	**6**	**32**

3.5 Summary of survey results

The trapping results were beyond expectations, the capture of 32 individuals of 7 species late in the bat season (late September – early April) indicates there is a healthy bat population in Camperdown, in particular, the Mount Leura and Mount Sugarloaf Reserves.

All species with the exception of one are common throughout Victoria. Eastern Falsistrellus are only caught occasionally. None of the species caught are significant at a state level however, it could be argued that Eastern Falsistrellus is a regionally significant species.

The presence of the bats is considered to being an artefact of the revegetation program that has been undertaken over the last 20-years. Although the vegetation at the site is too young to provide roosts, it would appear that it is a focal point for foraging activity. Further revegetation and replacement of dying vegetation will be important to ensure population levels remain stable.

The lack of mature hollow bearing trees with the reserves would appear it indicate that the bats are roosting off-site. On this basis, there is scope to further enhance habitat for bats through the installation of bat nest boxes. Microbats readily use nest boxes in the absence of roosts. The implementation of a nest box program also lends itself to community involvement of the back of the revegetation program. There are a number of excellent examples of successful bat box community programs to draw experience from.

3.5.1 Habitat linkages

Vegetation corridors are of particular significance as they can assist ecological function in the form of foraging, recolonisation and migration.

Habitat fragmentation is the division of a single area of habitat into two or more smaller areas, with the occurrence of a new habitat type in the area between the fragments. This new dividing habitat type is often artificial and inhospitable to the species remaining within the fragments (Bennett 1990; MacNally 1999). Although newly created habitat is generally used by some species, those species are usually generalists and are often considered aggressive (e.g. Noisy Miners), further decreasing population levels of the species remaining in the fragments. In addition to the loss of habitat area, the process of fragmentation can impact on the species within the newly created fragments in a number of ways, including barrier effects, genetic isolation and edge effects. The degree to which these potential impacts affect the flora and fauna within the newly created fragments depends on a number of variables, including distance between the fragments, local environmental conditions, the species present and mitigation measures.

A bat's ability to fly allows it to overcome many of the issues terrestrial fauna face in relation to habitat fragmentation, however specific habitat requirements may not be present. The revegetation of Mount Leura and Mount Sugarloaf has played a significant contribution in providing habitat for a number of fauna groups. The next step would be to look at opportunities to form vegetation linkages to other areas of remnant vegetation in the area.

4. Recommendations

- installation of bat nest boxes #
- implement annual bat nest box monitoring program #
- undertake bat survey every 5-years
- continue revegetation program based on pre-European modelled vegetation (refer to appendix C) #.

Initiate as community program/s involving friends groups and / or educational institutions.

5. References

1. Bennett, A.F. 1990. Habitat Corridors. Their Role in Wildlife Management and Conservation, Department of Conservation and Environment: Sydney.
2. Bennett, A. 1999. Linkages in the Landscape. IUCN: United Kingdom.
3. Churchill, S. 2009. Australian Bats. Reed New Holland: Sydney.
4. Hall, L.S. 2009. A Wild Australia Guide: Bats, Identification, Habitat, Behaviour, Diet, Conservation. Steve Parish Publishing: Queensland.
5. Hall, L.S. & Richards, G. C. 1979. Bats of Eastern Australia. Queensland, Museum: Queensland.
6. Hall, L.S. & Richards, G. 2003. Flying Around Underground: Cave Bats. In: Beneath The Surface: A Natural History of Australian Caves. Finlayson, B. & Hamilton-Smith, E. (eds). UNSW Press: Sydney. pp: 111- 126.
7. MacNally, R 1999, 'Habitat fragmentation and habitat loss: Secondary, cascading effects and predictability', *Australian Biologist*, vol. 12, pp. 138-51.
8. Reardon, T. & Flavel, S. 1987.A Guide to the Bats of South Australia. South Australian Museum: Adelaide.

Appendix A

Species description

Chalinolobus gouldii (Gould's Wattled Bat)

Distribution
Found across southern Australia with the exception of Cape York Peninsula.
Diet & foraging
They feed on bugs and moths within the lower levels of the canopy flying up to speeds of 35km or more.
Roosts
Typically roost in trees hollows but has also been known to roost in buildings, leaves and a tractor exhaust.
(Churchill 2008)

Chalinolobus morio (Chocolate Wattled Bat)

Distribution
Found across southern Australia and along the east coast to Townsville with some inland populations and Tasmania.
Diet & foraging
In Victoria they consume predominately moths, beetles and lacewings flying in the open zone between the understorey and canopy. They may forage up to 5km from their roost.
Roosts
Most roosts are in trees hollows and under the bark of trees, they are also known to have used culverts, bridges and buildings.
(Churchill 2008)

Falsistrellus tasmaniensis (Eastern Falsistrellus)

Distribution
Confined to South-eastern Queensland eastern NSW, Victoria and Tasmania
Diet
The diet consists predominately of moths, beetles, chafer and weevils, they fly within or below the canopy foraging up to 12km from the roost.
Roosts
Roosting occurs in tree hollows and occasionally buildings.
(Churchill 2008)

Nyctophilus geoffroyi (Lesser Long-eared Bat)

Distribution
Found throughout Australia and Tasmania with the exception of the east coast of Queensland.
Diet & Foraging
Moths are the most common source of prey, supplemented by and cricket nymphs, spiders and beetles.
Roosts
They are very adaptable in their roost requirements having been found roosting in tree hollows, under bark, buildings, bricks, clothing and the exhaust pipe of disused vehicles.
(Churchill 2008)

Vespadelus darlingtoni (Large Forest Bat)

Distribution
South from southern Queensland along the Great Dividing Range to the Adelaide hills and Tasmania
Diet & Foraging
In Victoria the diet consists of ants, flies, bugs, beetles and moths, foraging within the spaces of trees between the canopy and understorey.
Roosts
Typically tree hollows and occasionally buildings.
(Churchill 2008)

Vespadelus regulus (Southern Forest Bat)

Distribution
East coast of Australia from southern Queensland to Victoria south to Western Australia
Diet & Foraging
Diet consists of flies, moths, beetles and bugs, they fly close to vegetation and in gaps in understorey vegetation.
Roosts
Typically roost in tree hollows and occasionally buildings.
(Churchill 2008)

Vespadelus vulturnus (Little Forest Bat)

Distribution
Found in Eastern Australia south of 26° S: southern Queensland, NSW, throughout Victoria into South Australia and Tasmania
Diet & foraging
Their diet consists of a mixture of bugs, beetles flies moths grasshoppers and cockroaches, foraging within the upper levels of the canopy or in gaps in the vegetation.
Roosts
Roosts are predominately in tree hollows and occasionally in the roof of buildings
(Churchill 2008)

Tadarida australis (White Striped Freetail Bat)

Distribution
Recorded south of the Tropic of Capricorn in southern Australia
Diet & foraging
The diet consists of moths and beetles foraging high above the canopy and or open areas.
Roosts
Tree hollows
(Churchill 2008)

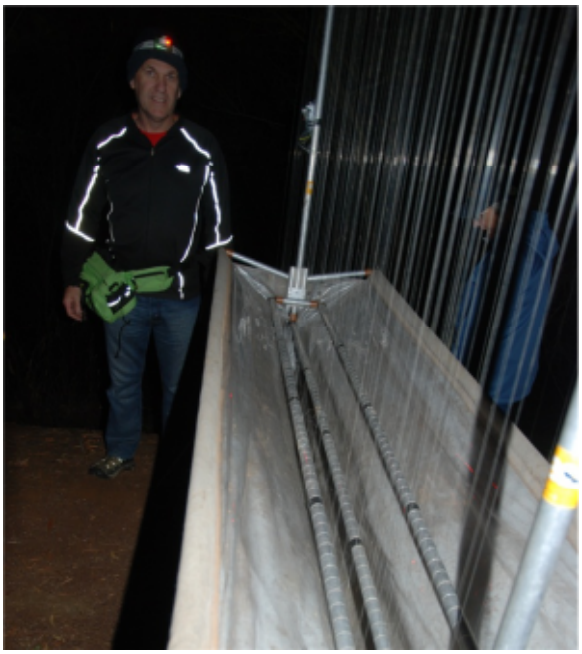
Appendix B

Photographs

Photograph B-1: Harp Trap 1

Photograph B-2: Harp Trap 2

Photograph B-3: Harp Trap 3



Photograph B-4: Checking trap

Photograph B-5: Gould's Wattled Bat

Photograph B-6: Lesser Long-eared Bat

Photograph B-7: Survey participants

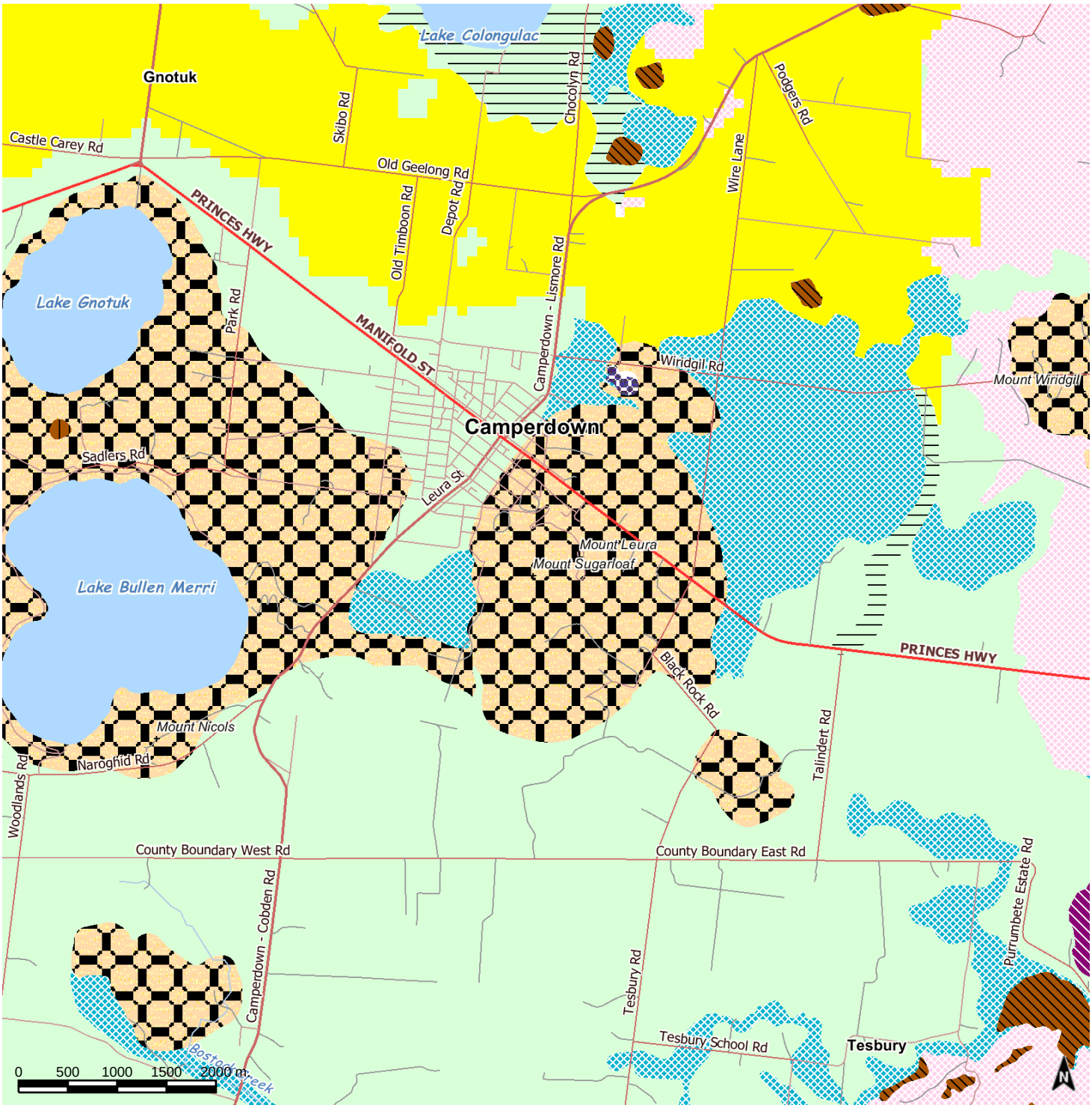
Photograph B-8: Releasing after processing

Appendix C

Ecological Vegetation Class Modelling (pre-European)

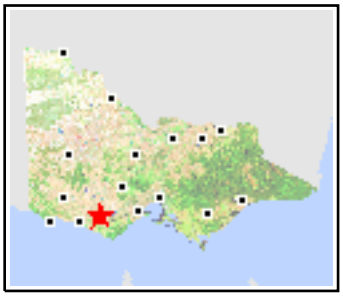
Map created Sun May 06 14:37:02 EST 2012

Department of Sustainability and Environment



Legend

Map Scale 1:57,256



Locality Map

ROADS
- Freeway
- Highway
- Main Road
- Secondary Road
- Local Road
- 2WD (Unsealed)

WATERCOURSES
- Major Watercourse
- Minor Watercourse

1750 EVCs
- 203 Stony Rises Woodland
- 992 Water Body - Fresh
- 53 Swamp Scrub
- 125 Plains Grassy Wetland
- 132 Plains Grassland
- 55 Plains Grassy Woodland
- 175 Grassy Woodland
- 894 Scoria Cone Woodland
- 691 Aquatic Herbland/Plains Sedgy Wetland Mosaic
- 647 Plains Sedgy Wetland
- 991 Water body - salt

WATERBODIES
- Watercourse Area
- Permanent Waterbody
- Wetland Area

BUILT UP AREAS

GDA Vicgrid94

State Government Victoria