

## Survey Standards: Greater Glider, *Petauroides volans*

### 1 Purpose

This document is one of a series that outlines the standards required for surveying fauna species listed under the *Flora and Fauna Guarantee Act 1988* (FFG Act), along with selected other species that are the subject of forest prescriptions in particular Forest Management Plans. These standards detail acceptable survey methods and the minimum survey effort to determine the likelihood of the species' occurrence at a site. They also detail appropriate record keeping and reporting standards.

There are two main purposes of these standards.

1. To document the information required to determine if a record is valid. The standards provide the information that is required to enable an assessment to be made as to whether a record can be accepted as a valid record. All records, irrespective of how they are obtained, need to adhere to these standards.
2. To describe the acceptable level of survey effort required to infer presence/absence, or relative abundance where applicable. These minimum standards are required to be met by any organisation/group undertaking a presence/absence or relative abundance survey.

Executing and reporting a survey to these standards will support the Department of Sustainability and Environment (DSE) to make an assessment of the validity of a claim to species occurrence at a site. Subject to DSE approval, alternative survey methods may be applied where the proponent provides an evidence-based rationale for the approach and a detailed description of the survey technique(s) and where the standards are considered to exceed those set out below.

In the context of timber harvesting operations these standards should be read in conjunction with the Code of Practice for Timber Harvesting and Forest Management Plans. As further information about the species and survey techniques becomes available, these standards will be reviewed and updated.

### 2 Introduction

The Greater Glider is the largest of the gliding possums and lives in a variety of eucalypt-dominated forests, excluding rainforest (Van Dyck and Strahan 2008). In Victoria, it is found in high-rainfall forested areas of the east, north-east and the midlands southeast of Ballarat (Menkhorst 1995). It is more abundant in high-altitude forests than coastal forests and prefers forests on highly fertile soils (Braithwaite *et al.* 1988, Menkhorst 1995). Densities have been recorded in the range of 0.6-4 individuals per ha (Menkhorst 1995).

The Greater Glider is a relatively sedentary, hollow-dependent species. Emerging after dark, it moves to a feeding area by a series of glides, usually along established routes (Van Dyck and Strahan 2008). They are generally associated with mature forest (Menkhorst 1995, Loyn 2004), with large, old living trees primarily used as den trees. Male and female Greater Gliders occupy relatively small and overlapping home ranges, in the order of 1-11.5 ha (Menkhorst 1995, Smith *et al.* 2007).

Greater Gliders often occur in the same forests as Yellow-bellied Gliders *Petaurus australis* but differ greatly from them in behaviour. Greater Gliders are normally silent in the wild

but easily located by their bright eye-shine, as they often sit and stare at a spotlight (Lindenmayer *et al.* 2001, Wintle *et al.* 2005), whereas Yellow-bellied Gliders are highly vocal and tend to move away from light (Wintle *et al.* 2005).

Greater Gliders are considered sensitive to intensive logging (Tyndale-Biscoe and Calaby 1975), and prescriptions have been developed to conserve the species in forest subject to timber harvesting in East Gippsland (Department of Natural Resources and Environment 1995). The prescriptions are intended to conserve areas with high populations of the species (Department of Natural Resources and Environment 1995).

### **3 Requirements to demonstrate occurrence**

Current prescriptions in East Gippsland refer to relative abundance not to presence-absence (Department of Natural Resources and Environment 1995). Areas with high relative abundance of Greater Gliders are defined as those where more than ten Greater Gliders are detected per kilometre of spotlight transect, or densities of  $> 2$  / ha, or  $> 15$  per hour of spotlighting (Department of Natural Resources and Environment 1995). The first two criteria are equivalent if a 1 km transect is assumed to be 50 m wide (i.e. 25 m each side of the transect line) and no allowance is made for animals that may be present and not seen. Spotlighting transects over a minimum distance of 1 km constitute the only practical method to assess the first criterion. More resource-intensive studies, such as those involving radio tracking individuals, could be used to address criterion two (through provision of a density measure) but are not considered further here since such surveys require considerable resources and hence are unlikely to be employed.

#### **3.1 Acceptable records**

Sightings of individuals – Greater Gliders are readily identifiable by experienced observers, by direct observation using the spotlighting survey methods described below. As this species does not normally vocalise, all detections are based on sightings rather than calls.

#### **3.2 Non-acceptable records**

The following are not considered acceptable records in the context of timber harvesting prescriptions:

- Sightings of individuals by inexperienced individuals, without supporting evidence.
- Greater Glider remains can be identified from predator (dog or fox) scats (e.g. Lunney *et al.* 1990, Goldingay and Daly 1997, Claridge *et al.* 2010), however these are not considered acceptable records as the location where the Greater Glider was consumed may be some distance from the site where the remains were found.
- Whilst hair tubing (Lobert *et al.* 2001) can provide positive, site-specific records of the species, these records can not be used to meet prescription thresholds in Forest Management Plans, which require the observation of the relative abundance of individuals per unit (area, distance time).

#### **3.3 Survey effort and resulting level of certainty**

Greater Gliders can remain relatively stationary for long periods and have a propensity to stare at intruders. These characteristics, along with their bright eye-shine make them relatively easy to detect (Menkhorst 1995, Wintle *et al.* 2005). However, despite this, Greater Gliders can at times be inconspicuous and overlooked, especially by inexperienced

observers. In addition, spotlighting probably underestimates population sizes of Greater Gliders (Lindenmayer *et al.* 2001) since not all individuals that occur at a site will be detected during surveys. To determine the likelihood of detecting Greater Gliders at occupied sites, Wintle *et al.* (2005) calculated detection probability using spotlight surveys in wet and dry sclerophyll forests near Eden, south-eastern New South Wales. Single visit detection probabilities over a 40 min / 2 ha area for Greater Glider ranged from 10 – 70% depending on the environmental conditions, particularly temperature and habitat quality. Under average environmental conditions five visits were needed to yield a detection probability of about 90% (Wintle *et al.* 2005).

A standardised approach is recommended whereby observers conduct spotlight transects on foot covering a total distance of 1 km. Transects should be positioned in a way that maximizes coverage of the study site. Depending on the dimensions of the study site it may be more suitable to change the configuration of the transect to enable more complete coverage the target area, for example several (independently located) 200 m transects rather than a single 1 km transect (Table 1). Transects can be either along a track, or off track. When undertaking off-track transects, access needs to be checked during the day and reflective tape installed at 25 m intervals to aid navigation. It is recommended that these 25 m intervals are marked with a GPS so that the transect location can be accurately recorded.

**Table 1: Example of transect configurations.**

Area (ha)	Width (m)	Length (m)	Duration
0.5	50	100	10 mins
1	50	200	20 mins
2*	50	400	40 mins
3	50	600	60 mins
4	50	800	80 mins
5	50	1000	100 mins

\* The probability of detection of Greater Gliders for a 40 min / 2 ha search area over two visits under ideal conditions (or five visits under average conditions) is estimated as to be 90% (Wintle *et al.* 2005).

For each transect, the location of Greater Gliders should be estimated by recording the observers position on a GPS unit and estimating the perpendicular distance to the glider within bands 25 m wide. Although the standard spotlighting transect is 50 m wide (25 m either side of the transect), in practice, due to their bright eyeshine, Greater Gliders can be often be detected at distances greater than this (e.g. 40 m; Kavanagh 1984). Effective detection distances vary with vegetation density (Wintle *et al.* 2005), topography and other factors. Providing an estimation of distance can potentially be used to provide a more robust density estimate using the principles of distance sampling (Buckland *et al.* 1993) in addition to the measure of relative abundance (i.e. number of individuals per unit effort).

Where transects are located along roads the observer walks slowly, covering approximately 100 m in 5 mins and pausing at 25 m intervals to listen for movement. Transects located off roads or tracks require approximately 10 mins per 100 m length of transect to accommodate

navigation through rough terrain. Observers should use spotlights with minimum 30 W power to locate gliders, thoroughly searching each tree.

Spotlight transects should be conducted well after dark, as Greater Gliders may not emerge from their hollows as early as some other species. Generally the transects should be conducted in the first half of the night as little is known about when they return to their hollows before dawn.

Where Greater Glider surveys are conducted under optimal conditions (high habitat quality, warm temperatures with no rain, fog or bright moonlight) a minimum of 2 repeat visits is recommended for a 40 min / 2 ha transect (sensu Wintle *et al.* 2005). In areas containing lower quality habitat and/or under colder temperatures, five or more repeat visits of the 40 min / 2 ha transect are needed to provide an equivalent probability of detection of Greater Gliders (Wintle *et al.* 2005).

### **3.4 Reporting standards for relative abundance surveys**

To assess the adequacy of surveys conducted for Greater Gliders, proper documentation of survey effort is essential. This is particularly the case for survey methods where reliable quantitative assessments of survey results (e.g. number of Greater Glider records per spotlight hr or per spotlight km), and where data concerning survey effort (number of spotlights and survey duration) are required to assess survey adequacy.

The following data are required to support a record of a Greater Glider:

- name and contact details of the observer (including a willingness to make themselves available to escort an independent validator to the site, if required);
- permit details of the surveyors where required (i.e. a research permit under the Wildlife Act, as well as a research permit under the National Parks Act if working within a Park and consent from DSE Land and Fire Division if working in State Forest);
- date and time of record;
- precise geographic location of record (written location and GPS coordinates);
- details of the species present and number of individuals detected;
- method of obtaining the record, including the sampling effort (i.e. length of spotlight transect, area sampled, amount of time spent spotlighting and number of spotlights);
- supporting evidence, if required: Greater Gliders may need to be distinguished from similar species, such as Yellow-bellied Glider. A detailed description of the animal, and if possible, clear photographs are to be submitted to allow independent confirmation of the identification;
- it is recommended that data on environmental variables (Table 2) are also recorded to help verify survey effort and interpret probability of detection.

This is the core information required for records to be entered onto the Victorian Biodiversity Atlas. Records of all other species observed at the site should also be submitted to the Atlas.

**Table 2: Additional covariates to be recorded for each survey (adapted from Eyre and Buck 2005).**

<b>Description of covariates</b>	<b>Categories or indices of covariate</b>
Moon phase – % moon out	0–100%
Nightlight	0 – No moonlight, or heavy cloud cover obscuring light
	1 – Low
	2 – Medium
	3 – High
Cloud cover-percent of sky covered	0–100%
Air temperature	0–30 °C
Estimate of wind velocity in canopy (Beaufort wind scale)	0: calm (< 1 km/h); smoke rises vertically
	1: light air (1-5 km/h); wind direction shown by smoke-drift, but not by wind vanes
	2: light breeze (6-11 km/h); wind felt on face; leaves rustle; ordinary vanes moved by wind
	3: gentle breeze (12-19 km/h); leaves, twigs in constant motion; wind extends light flag
	4: moderate breeze (20-28 km/h); raises dust and loose paper; small branches are moved
	5: fresh breeze (29-38 km/h); small trees in leaf begin to sway; crested wavelets form on inland waters
	Conditions > '5' are unsuitable to conduct spotlighting surveys.
Precipitation	0 – No rain
	1 – Fog or periodic drizzle
	2 – Light rain
	3 – Medium rain
	4 – Heavy rain
Time after dusk	0–6 h
Total flower index of the overstorey (m <sup>2</sup> ha <sup>-1</sup> )	0 – No trees in flower

**The Department of Sustainability and Environment**  
**Approved Survey Standards: Greater Glider *Petauroides volans***  
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Description of covariates	Categories or indices of covariate
	1 – Light flowering
	2 – Medium flowering
	3 – Heavy flowering
Access	1 – Easy: along roads, tracks or bare ground and /or low grassy understorey, no / gentle slope
	2 – Moderate: mixture of grassy and shrubby understorey / gentle or moderate slope / rocky material / isolated patches or wire grass
	3 – Difficult: larger patches of dense shrubs / logging slash / wire grass with little open ground or grassy areas, and/or steeply sloped
Visibility	1 – Excellent; middle storey is open, no / few / low shrubs steep slope allows canopy views, line of sight mostly > 30 m
	2 – Moderate; some shrubby patches and line of sight variable from 10 - 30 m
	3 – Poor: thick understorey e.g. 5 – 10 year old regrowth, very high canopy and line of sight mostly < 10 m

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