

# Action Statement

Flora and Fauna Guarantee Act 1988

No. 124

## Masked Owl

*Tyto novaehollandiae  
novaehollandiae*

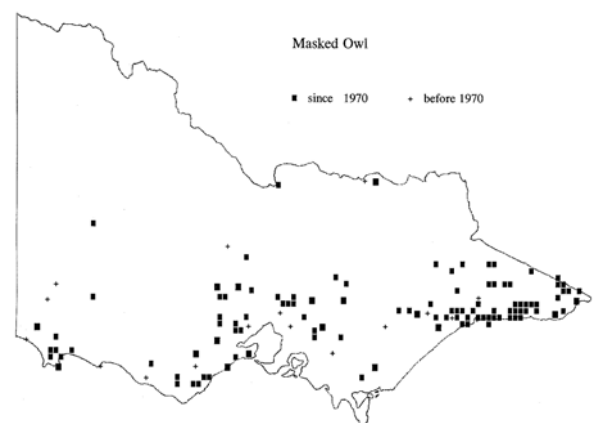
### Description and distribution

The Masked Owl occurs in New Guinea and Australia. In Australia, there are four recognised races of Masked Owl: *Tyto novaehollandiae melvillensis* (Melville Island race), *T. n. kimberli* (the northern race), *T. n. novaehollandiae* (southern race) and *T. n. castanops* (Tasmanian race) (Schodde & Mason 1980). This report concentrates on the southern race, but includes some information from Tasmania.

Higgins (1999) describes three main colour morphs across Australia; ranging from a light or white morph in the north, to the dark or tawny morph of Tasmania, with a variable intermediate morph in south-eastern Australia. The intermediate morph has an off-white facial disc, upper parts blackish-brown but washed yellow and densely speckled white, and coarsely dark-spotted, off-white underparts. There can be substantial variations in colour between individuals in any area. The feet are powerful and the legs heavy and fully feathered. The female is larger than the male (Length: F 39-50 cm, M 33-41 cm) and tends to be darker than the male in southern Australia. Female voice is a strong harsh territorial shriek, and the male performs aerial displays with chattering calls (Higgins 1999). The Masked Owl is larger and more powerful than its wide-ranging open-country relative, the Barn Owl (*Tyto alba*). Pale individuals of Masked Owl can appear similar to Barn Owls.



Masked Owl *Tyto novaehollandiae*  
(Photo: David Hollands)



### Distribution in Victoria

[source: *Atlas of Victorian Wildlife*, NRE 2000a]

The lifespan of the Masked Owl has been estimated at 10 years (Bell *et al.* 1996), although this is likely to be an underestimate, given the longevity (decades) of other owl species.

The Masked Owl occurs from southern New Guinea to Australia where the southern subspecies tends to be restricted to the coastal strip east of the Great Dividing Range and around the southern coast to the Pilbara in Western Australia. The northern subspecies extends the distribution from north-eastern Queensland across to the Kimberley region in Western Australia. Tasmania has the majority of Australian records (65%) and is considered to be the stronghold of the species (Blakers *et al.* 1984). The Tasmanian population is estimated to be about 615 breeding pairs, based on a mean density of one bird per 546ha, and assuming that non-forested habitats are unsuitable (Bell *et al.* 1996).

Currently, the *Atlas of Victorian Wildlife* contains 261 records of Masked Owl (NRE 2000). In Victoria, the strongholds of the Masked Owl appear to be in East Gippsland and the Otway Ranges; and to a lesser extent in the Central Highlands, Midlands and Portland areas. There is a great deal of variation in the density of records between regions. Road kills are a common source of records, and incidental records tend to be concentrated close to highways. Nevertheless, East Gippsland seems to be the most densely populated region in Victoria; a relatively large number of records originate from this region and adjacent areas in south-eastern New South Wales (Peake *et al.* 1993).

The perception that the Masked Owl occurs in low densities throughout its range may be misleading, given the cryptic nature of the species, the fact that it can be easily confused with the Barn Owl (Garnett 1992), and that it is generally less responsive than other owl species to call playback for census purposes (Debus 1995). The resemblance to Barn Owl applies both to physical appearance and call. Calls of Brush-tailed Possums, Sulphur-crested Cockatoos and immature Sooty Owls may also resemble those of the Masked Owl to varying degrees, and this can lead both to erroneous records and to a reluctance of careful observers to report Masked Owls. Peake *et al.* (1993) state that, since the number of Masked Owl territories in Victoria is not known, all estimates of the size of the state's owl population will be tentative. Similarly, it is difficult to ascertain the former distribution of the species, and assess whether its current patchy distribution is a result of clearing and fragmentation of native vegetation.

The Masked Owl inhabits a wide variety of lowland forests and woodlands that provide mature trees with hollows suitable for nesting and roosting, and

nearby open areas for foraging (Schodde & Mason 1980, Conole 1986, Emison *et al.* 1987, Peake *et al.* 1993). Masked Owls have been observed in a broad range of habitats including: tall open-forests and woodlands dominated by Blue Gum *Eucalyptus globulus* (Otways), Mountain Grey Gum *E. cypellocarpa* (Otways and Central Highlands), River Red Gum *E. camaldulensis*, Manna Gum *E. viminalis* (You Yangs State Park), Narrow-leaved Peppermint *E. radiata*, and Candlebark *E. rubida* (Wombat State Forest). They also occur in stands of lower stature such as those dominated by Mealy Stringybark *E. cephalocarpa*. In particular, Victorian Masked Owls occur along partially forested river flats near the coast, and may require open areas, such as clearings or forest edges, for foraging, as well as hollows, dense vegetation or caves for roosting (Emison *et al.* 1987). The species may be able to persist entirely within suitable forest habitat. However, Roberts (1983) found Masked Owl at a site more than 10km from the nearest cleared land, and many recent records from East Gippsland, the Otway Ranges and elsewhere have also been far from cleared land (NRE 2000). Peake *et al.* (1993) summarised habitat data from 69 sites in Victoria (described from databases and literature), categorising 64 of the sites into four main habitat types:

- (n=22 sites): lowland sclerophyll forest (mainly Silvertop Ash *E. sieberi*, Yertchuk *E. consideniiana*, Red Bloodwood *E. gummifera*) east of Orbost, and mostly on the coastal side of the Princes Highway.
- (n=10 sites, between Bairnsdale and Nowa Nowa): lowland forest (Silvertop Ash, Victorian Eurabbie *E. pseudoglobulus*, Bangalay *E. botryoides*, Messmate Stringybark *E. obliqua*) and/or limestone box forest (Blue Box *E. bauerana*).
- (n=10 sites): predominantly Red Gum *E. camadulensis*/Grey Box *E. microcarpa* sites.
- (n=22 sites, all in the southern ranges, the Great Dividing Range between Ballarat and Genoa, the Otway Ranges or the Strzelecki Ranges): valley-floor forest (usually incorporating floodplains, creek-flats, or gullies).

The remaining single site records were of the following: sub-alpine woodland (Snow Gum *E. pauciflora*) near Wulgulmerang; Manna Gum woodland on the Dundas Tablelands near Nareen, Manna Gum woodland-farmland at Stoney Rises near Cobden; montane dry woodland (Manna Gum, Snow Gum, Narrow-leaved Peppermint)-farmland near Bendoc, and farmland with introduced conifers and remnant *Allocasuarina* and eucalypts near Portland. All farmland sites where information was available were pastoral rather than cropland.

Almost all of the sites summarised above incorporate more than one type of habitat, such as the lowland forest–heathland ecotone preferred on the East Gippsland Plains. An examination of the habitat near sites of road-kills suggested that Masked Owls probably utilise the ecotone between forest and cleared land and inhabit fragmented forest–pastoral landscapes (Debus & Rose 1994, Kavanagh & Murray 1996, based on information from Peake *et al.* 1993). This concurs with other suggestions that the Masked Owl appears to favour ecotones (Conole 1986, Emison *et al.* 1987), although any owl species with a large home range is likely to include a variety of habitats within that range. In NSW, the Masked Owl is most commonly found in open forest with a sparse understorey or ground cover or at the ecotones between closed forests and open-forest or woodland (Debus & Rose 1994, Kavanagh & Murray 1996).

The four main habitat types defined above provide two important habitat elements for the Masked Owl - tree hollows and prey accessibility. Attempts to determine a significant relationship with habitat variables and home ranges of Masked Owls have been hindered by small sample sizes (see Kavanagh & Peake 1993, Loyn *et al.* in press). However, examination of available information about the habitat of Masked Owls consistently reveals features common to most observations:

- Masked Owls are generally observed at low altitude sites;
- Masked Owls apparently have a preference for some of their territory to contain forest with an open structure;
- the sites support an abundant terrestrial or arboreal mammal fauna;
- old trees with large hollows are essential for the provision of roost sites and nest sites.

The Masked Owl is thought to nest only in large hollows in old eucalypt trees (Kavanagh & Murray 1996), although the species is commonly known to use caves for roosting (McAllan 1997).

Most breeding data have been collected in Tasmania. Both current and historical nests (n=26) occurred in either living or dead *Eucalyptus* species, at a mean height of 10m in trees of a mean height of 24m (Bell *et al.* 1996).

In New South Wales, there are fewer than 20 localities with breeding records, and only five of these localities have been recorded since 1980 (Debus & Rose 1994). Kavanagh & Murray (1996) reported that the Masked Owl has been observed to breed at any time of year. Autumn and winter may be favoured seasons in New South Wales, and spring breeding has been recorded in Victoria. It is likely that, in the wild, the species produces 1–3 young per year (Kavanagh & Murray 1996).

In Victoria, there are six documented breeding records: Casterton, 1902 (D’Ombra 1903); near Timboon, 1926 (Peake *et al.* 1993); near Nareen (Peake *et al.* 1993); Eltham (Peake *et al.* 1993); near Orbost 1994 (NRE 2000), and near Casterton 1999 (R. Hill *pers. comm.*).

Courting pairs have also been recorded in lowland sclerophyll forest in East Gippsland, and in a small patch of plains grassy woodland near a river lined with large River Red Gums (Peake *et al.* 1993).

The Masked Owl generally hunts in areas of open understorey (Schodde & Mason 1980, Emison *et al.* 1987) or clearings (Debus 1993). Poor manoeuvrability is believed to make the species better adapted to surprise attacks than pursuit (Debus 1993, Mooney 1993).

Victorian prey records originate from stomachs of road-killed owls, nest debris and direct observations of birds with prey, and demonstrate predation of both arboreal and terrestrial mammals. Prey items include Sugar Glider *Petaurus breviceps*, Bush Rat *Rattus fuscipes*, Swamp Rat *Rattus lutreolus*, House Mouse *Mus musculus*, Common Ringtail Possum *Pseudocheirus peregrinus*, European Rabbit *Oryctolagus cuniculus*, unknown parrot species, and Goat Moth *Xyleutes* sp. (Debus 1993, Peake *et al.* 1993). Analysis of prey items from 106 pellets collected near Casterton showed that about half of 215 prey items were European Rabbit *Oryctolagus cuniculus*, a quarter were House Mice *Mus musculus*, and most others were a variety of native mammals with just a few birds and bats (E. McNabb, *pers. comm.*). Analysis of prey items from pellets collected in New South Wales revealed several additional species: Sulphur-crested Cockatoo *Cacatua galerita*, Brown Antechinus *Antechinus stuartii*, Dusky Antechinus *Antechinus swainsonii* (Kavanagh 1996), Long-nosed Bandicoot *Perameles nasuta* and Hastings River Mouse *Pseudomys oralis* (Debus and Rose 1994). All of these species inhabit forest, and all of the native mammal prey species are virtually confined to forests.

The data from Casterton suggest that introduced mammals can be an important part of the diet of Masked Owls in mixed forest and farmland, and it has been suggested that introduced species may, to some degree, compensate for a decline in the abundance of native species (Debus 1993).

Debus (1993) estimated the annual food demands of a family of wild Masked Owls to be about 140kg, or 430 average-sized prey animals (mean prey size of 327g), assuming 1.2 young per territory.

The Masked Owl is considered to be sedentary and territorial (Schodde & Mason 1980, Emison *et al.* 1987). It may occupy exclusive home ranges, and may mate for life (Kavanagh & Murray 1996).

Home ranges and resource use probably vary with geographic location, prey availability, seasonal conditions, habitat and breeding status (Kavanagh & Murray 1996). Whilst the Masked Owl may be territorial, Kavanagh & Murray (1996) did not observe any interactions with nearby Southern Boobook (*Ninox novaeseelandiae*) and Tawny Frogmouth (*Podargus strigoides*) during a study of a non-breeding female Masked Owl. At sites in Victoria and New South Wales, the home range of Masked Owls has been reported to overlap with those of Powerful and Sooty Owls (Kavanagh 1996, E. McNabb *pers comm.*). The Masked Owl probably reaches its greatest densities in those eucalypt forests and woodlands where there are no Sooty Owls (Debus 1993).

In eastern Australia, Schodde & Mason (1980) calculated the permanent range of a pair of Masked Owls to be about 500-1 000ha. They also suggest that territories are widely spaced. In southern Victoria, Beardsell (cited in Debus 1993) suggested the home range of a pair with optimal habitat and prey was 400-500ha. Limited radio-tracking data from south-western Victoria suggest a home range in the order of 1000 ha, for a female supporting recently fledged young (E. McNabb *pers. comm.*).

In NSW, Kavanagh & Murray (1996) estimated a larger home range than that proposed by Schodde & Mason (1980). During a radio-tracking study of a non-breeding female, they estimated a home range of 1 017-1 178ha. Within this area, the radio-tagged owl spent, on average, 77% of its time in bushland edge, and 23% of its time more than 100m from any bushland, foraging equally in the low-lying open areas and upper slope forested areas.

A critical population level for the Masked Owl has not been determined for Australia.

### Current conservation status

Garnett (1992) Rare (Aust., Southern subspecies)

NRE (2000) Endangered (Vic.)

The Masked Owl has been listed as a threatened species under the **Flora and Fauna Guarantee Act 1988**. It is not known whether there has been a decline in numbers of Masked Owl in Victoria; however the low numbers of breeding records for the species are reason for serious concern.

The following threatening processes are of concern for the Masked Owl in Victoria:

- Land clearance and fragmentation — whilst the use of cleared areas adjacent to retained forests or woodlands suggests that Masked Owl can tolerate some degree of habitat disturbance, the use of road edges in forest and other areas has

resulted in a high incidence of road-kills (e.g. 81% of 54 records in Tasmania (Debus 1993); 27 of the 261 records in the Atlas of Victorian Wildlife (i.e. 10%).

- Loss of trees with large hollows — large hollows suitable for owl nest and roost sites are likely to form only in very old, mature trees. Hence, Masked Owls are vulnerable to land management practices that reduce the availability of large hollows.
- Loss of prey species — prey density is an important determinant of territory size, breeding success and, ultimately, survival of individuals. Hence, land management practices that reduce the availability of suitable prey, which themselves may be dependent upon hollows and ground cover, will have a detrimental impact on Masked Owl populations.

In its final recommendation the Scientific Advisory Committee (SAC 1991) has determined that the Masked Owl is:

- significantly prone to future threats which are likely to result in extinction, and
- very rare in terms of abundance or distribution.

### Major Conservation Objectives

The short-term conservation objective is to restrict further decline of the Masked Owl by protecting known pairs and their habitat on public and private land. An additional long-term objective is to increase population numbers in potentially suitable areas, where owls are now scarce, by maintaining and restoring habitat across land tenures. The combined objective is to return the species to a secure conservation status in the wild. This strategy follows the approach developed for Powerful Owls (*Ninox strenua*) by Webster *et al.* (1999). These objectives will be achieved by:

#### Short-term (<5 years):

- identifying and protecting Masked Owl habitat on public land (and private land where possible) to ensure protection of 150 resident pairs of Masked Owls across the range of the species in Victoria;
- improving knowledge of habitat use and ecology of Masked Owls and their population size and distribution (particularly the size of the breeding population) through targeted research and survey. This will include further surveys (using call playback) and studies of habitat use (dietary analysis, observation and radio tracking). Investigations of habitat dynamics, hollow ontogeny and ecology of prey species will be conducted as an aid to developing new habitat as opportunities arise. Modelling habitats and testing models will be

conducted mainly as an aid and precursor to efficient survey work;

- implementing management prescriptions for designated habitat areas within state forest and conservation reserves, and encouraging similar actions by private landholders;
- monitoring population size to determine if management prescriptions are effective. Liaising with New South Wales National Parks and Wildlife Service to determine wider population viability of populations occurring across the border from East Gippsland.

#### **Long-term (>5 years):**

- generating community awareness and promoting restoration of owl habitat on private land, and emphasising the need to protect sites occupied by the Masked Owl wherever possible;
- assessing the effects of management or habitat fragmentation on owl populations;
- determining habitat quality indices and Masked Owl densities in different habitats.

### **Management Issues**

Because Masked Owls tend to be sparse throughout most of their range, and difficult to census, little is known about the specific habitat requirements of the species, and the precise impact of potentially threatening processes. However, a number of processes may have adverse impacts on the species.

#### **Ecological issues specific to the taxon**

Intensive timber harvesting activities leading to a reduction in the abundance of hollows suitable for nest sites or prey species may pose a threat to the Masked Owl over much of its range (SAC 1991).

The existing parks and reserve system may not provide sufficient suitable habitat to meet the management objectives of this Action Statement. Complementary management actions are required to conserve owl populations within state forest and on private land..

The frequency and timing of burning to manage understorey vegetation may impact on the abundance of prey species, and may be particularly detrimental if burning is conducted during Masked Owl breeding activity. Firewood collection is also likely to reduce the abundance of prey, as these materials provide habitat for some prey species.

Because they make use of forest/farmland edges and farmland with scattered old trees (among other habitats), Masked Owls are potentially vulnerable to a range of management practices in the rural landscape. Poisoning of introduced mammals such as European Rabbits in farmland on forest edges may lead to secondary poisoning of

owls or reduced abundance of prey species. Various sprays may have toxic effects. Changes in land use have occurred in several regions, with unknown effects on Masked Owls. For example, extensive tree plantations have been established in some areas, with associated loss of scattered old trees and open space. Long-term effects on wildlife are likely to have positive and negative components, and need to be investigated.

#### **Wider conservation issues**

Actions implemented to conserve and protect the Masked Owl throughout its range will benefit other threatened species that are dependent on similar habitat elements. These may include species listed on the **Flora and Fauna Guarantee Act 1988**, such as Sooty Owl *Tyto tenebricosa*, Barking Owl *Ninox connivens*, Powerful Owl, Squirrel Glider *Petaurus norfolcensis*, Brush-tailed Phascogale *Phascogale tapoatafa*, and New Holland Mouse *Pseudomys novaehollandiae*. However, three of these species (Barking Owl, Squirrel Glider and Brush-tailed Phascogale) have their strongholds north of the Great Divide whereas Masked Owls are found mainly in southern Victoria.

The loss of hollow-bearing trees has been listed as a potentially threatening process under the Flora and Fauna Guarantee Act (SAC 1991), and an Action Statement is being prepared. The development of management actions across public and private land necessary to address the ongoing loss of hollow-bearing trees will benefit Masked Owl conservation. Furthermore, actions undertaken to protect vegetation communities (eg. old growth forest) will be beneficial to Masked Owl conservation.

### **Previous Management Action**

#### **Survey**

Between 1990 and 1999 surveys for large forest owls have been undertaken by NRE in East Gippsland (28 records from 440 surveyed sites), North-east Victoria (0 records from 472 sites surveyed), the Gippsland Regional Forest Agreement region (6 records from 480 surveyed sites), Central Highlands (5 records from 343 surveyed sites), and the West Victoria Regional Forest Agreement region (2 records from 129 sites surveyed) (McIntyre and Bramwell in prep., Loyn *et al.* 2001 and unpublished data).

#### **Habitat Protection**

Masked Owl records have been included in Sites of Biological Significance arising from pre-logging surveys commenced in 1983 (e.g. Earl *et al.* 1983). These sites have now been reviewed and adopted

by the Forest Management Area (FMA) planning process.

Specific prescriptions and targets to protect the Masked Owl in state forests have been developed by McIntyre and Henry (in prep.) and incorporated in the East Gippsland Forest Management Plan (FMP) (CNR 1995), Midlands FMP (NRE 1996b), Central Highlands FMP (NRE 1998) and the proposed North East FMP (NRE 1999).

These plans include conservation guidelines for old-growth forest and large forest owls within a network of conservation areas, encompassing designated parks and reserves and Special Protection Zones<sup>1</sup> (SPZ) and Special Management Zones<sup>2</sup> (SMZ) within state forest. The measures taken to protect Masked Owl populations vary between plans according to regional circumstances:

- In the East Gippsland FMA (regional target population 100 pairs), up to 500ha of SPZ or SMZ is established in state forest for each pair of owls, apportioned to Geographic Representation Units (GRU);
- In the Midlands FMA (regional target population 20 pairs), each owl nesting or roosting site discovered will have areas of 250m radius (ie. 20ha) SMZ designated as an interim measure until an appropriate management regime can be implemented;
- In the Central Highlands FMA (regional target population 20 pairs), at least 500ha of suitable habitat is protected in SPZ for each pair of owls;
- In the Otway FMA (regional target population 20 pairs), the plan gives high priority to encouraging further research into the requirements and distribution of large owls. Further Special protection Zones have been added as part of the Regional Forest Agreement process.
- In the North East FMA (regional target population 10 pairs) the plan stipulates that 500ha of mature forest, within 3.5km of a confirmed record, will be reserved from harvesting either in existing conservation reserves or state forest SPZs. Where possible, habitat patches will be greater than 100 ha in area and contiguous.
- A targeted assessment of the Masked Owl for use in the North East FMP (Lampman 1997) was prepared using published studies, discussions

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<sup>1</sup> SPZ-areas managed for conservation with timber harvesting being excluded.

<sup>2</sup> SMZ-areas managed to maintain conservation values whilst catering for timber production under certain conditions.

with NRE biologists then conducting owl surveys, and discussions with other biologists.

## Research

Most information on Masked Owls in Victoria has been gained opportunistically in the course of other activities. Recent surveys of forest owls and associated work (e.g. dietary analysis and radio-tracking near Portland) have added substantially to our knowledge base. Otherwise, no research into the ecology of the Masked Owl has been conducted in Victoria.

## Intended Management Action

The following actions are intended to meet the short-term objective of restricting further decline of the Masked Owl by protecting known pairs and their habitat on public and private land. They will also begin to address the overall objective of returning the species to a secure conservation status in the wild.

### Identification and protection of Masked Owl sites

1. Conduct targeted surveys across all land tenures in Victoria to locate as many resident pairs of Masked Owls as possible across land tenures throughout the main range of the species, focusing mainly on lowland forests south of the Great Divide.

*Responsibility: NRE (Parks, Flora and Fauna Division; Forests Service), Parks Victoria*

2. Select areas of suitable habitat to be managed for the protection of Masked Owl, up to the target of 150 resident pairs on public or private land in the next five years. Such protected areas will be termed Masked Owl Management Areas (MOMAs) and may overlap with management areas established for other species. Selection of MOMAs should be based both on the strength of evidence for existence of a resident pair, and on the need for MOMAs to be distributed throughout the main range of the species with a reasonable spread across habitats and land tenures. However, some preference should be given to the protection of suitable habitat within conservation reserves, especially in large parks where home range is protected within the conservation reserve.

*Responsibility: NRE (Parks, Flora and Fauna Division; Forests Service), Parks Victoria*

### Modelling

3. As more information becomes available from further survey and research, it should prove possible to model the distribution of Masked Owls (as already done for Powerful and Sooty Owls) and use these models to predict where Masked Owls are most likely to occur. Because

of the apparent rarity of the species, such models will need to be used mainly as a survey tool to help locate suitable habitat where survey effort may be most usefully applied. Protection would be afforded to such sites where practical if they were found to support Masked Owls in the course of model testing and further survey work. Models would also be useful in evaluating the suitability of remaining habitat in the vicinity of historical records of the species. Models may be useful in identifying habitat elements of special importance for Masked Owls. If confirmed, such elements could become the focus of more sophisticated management actions in future years.

*Responsibility: NRE (Parks, Flora and Fauna Division; Forests Service)*

#### **Habitat restoration**

4. Research information will also be used to help restore habitat for Masked Owls over time in areas where this proves practical. An adaptive approach will be needed as new information becomes available.

*Responsibility: NRE (Parks, Flora and Fauna Division)*

#### **Monitoring**

5. Monitor selected MOMAs, and all known breeding sites, at suitable intervals, to determine persistence of owls and breeding success. Monitoring protocols should recognise that Masked Owls are difficult to detect, and that great care should be taken to minimise disturbance of known sites. The most efficient means of monitoring will be evaluated so as to provide statistically valid analyses of management actions and program evaluation.

*Responsibility: NRE (Parks, Flora and Fauna Division; Forests Service), Parks Victoria*

#### **Habitat Protection**

In State forests, the requirements of this Action Statement will be implemented through the development of FMPs to ensure effective integration of owl conservation measures with other forest values and uses. Conservation strategies for Masked Owl in existing plans are generally consistent with this Action Statement and will be maintained until the plans are reviewed. Protection in state forest will follow two protocols. Where clear-fell harvesting (NRE 1996a) or seed-tree systems are used, a Special Protection Zone will be established to exclude timber harvesting from specified areas. Where selective harvesting is used (NRE 1996a), a Special Management Zone will be established with specific

prescriptions to protect habitat elements such as old hollow-bearing trees that may be used by Masked Owls and their prey.

6. Masked Owl Management Areas (MOMAs): Where clear-fell or seed-tree systems are used, delineate and protect a core area of at least 500ha of suitable habitat (dependent on habitat type) as SPZ. For MOMAs based on specific records (rather than habitat modelling), the SPZ will fall within a 3.5km radius (approximately 3 800 ha) of the record (e.g. nest or roost tree).

*Responsibility: NRE (Forests Service; Regions)*

7. Masked Owl Management Areas (MOMAs): Where selective harvesting (NRE 1996a) is used, manage areas of 1 000ha to maintain habitat capable of supporting adequate populations of terrestrial and arboreal prey mammals to support breeding owls. MOMAs based on specific records will comprise 3ha SPZs around the records plus SMZs of about 1 000ha which will allow for modified timber harvesting practices that retain sufficient levels of habitat trees. MOMAs based on habitat modelling will comprise solely the approximately 1 000ha SMZs. Special Management Zone Plans will be prepared specifying the prescriptions to be applied within SMZs for Masked Owl and will become part of the relevant Regional prescriptions.

*Responsibility: NRE (Forests Service; Regions)*

8. All confirmed nesting and roosting sites utilised recently and frequently (based on reliable observation or physical evidence such as pellets or wash) **located outside MOMAs** will be protected by a 3ha SPZ around the site and a 250-300m radius (or equivalent linear area) SMZ buffers around identified localities, unless they are already protected. In these cases, habitat for foraging is provided in areas excluded from timber harvesting by general prescription including wildlife corridors, steep areas and unmerchantable areas and areas protected for other management purposes.

*Responsibility: NRE (Forests Service; Regions)*

9. Locate, monitor and protect all known Masked Owl habitat sites within the parks and reserves system as a contribution to target numbers of regional MOMAs. In larger parks and reserves delineate MOMAs of at least 500 ha of continuous suitable habitat which can be managed so as to be free of significant disturbance factors. In smaller conservation reserves, protect as much suitable habitat as possible and endeavour to obtain co-operative management from adjoining landowners.

*Responsibility: Parks Victoria*

10. Avoid the development of intensive recreational facilities near known nesting and roosting trees, and discourage public access to breeding areas of Masked Owls.

*Responsibility: NRE (Forests Service), Parks Victoria*

11. Assess planning permit applications (Native Vegetation Retention planning amendment referrals, mining applications etc.) in accordance with major conservation objectives to protect a target number of sites across the species' range. This may include areas of Crown Land other than state forest, parks and reserves.

*Responsibility: NRE (Regions)*

12. Encourage and assist Municipal Councils to develop conservation mapping and Geographic Information Systems overlays within planning schemes to improve information on owl habitat and breeding sites across private land. Ensure, using provisions of local planning schemes, the **Flora and Fauna Guarantee Act 1988** and the **Planning and Environment Act 1987**, that Municipal Councils meet objectives and obligations to protect owl habitat on private land. Roadsides and creek-lines may be especially valuable as habitat for Masked Owls and other fauna in the rural landscape.

*Responsibility: NRE (Regions), local government authorities*

13. Encourage private landowners to enter into voluntary agreements (eg. *Trust for Nature* covenants, *Land for Wildlife Scheme*) to protect owl sites on private land across the species' known range. Covenanted or other effectively protected sites on private land may be used to attain the targets for MOMAs specified above. Such MOMAs need not be a minimum size, as long as they effectively protect the habitat elements likely to be used by Masked Owls. Planning permit applications (subdivision, native vegetation clearing, and mining) will be assessed in line with the major conservation objectives to protect breeding sites on private land.

*Responsibility: NRE (Parks, Flora and Fauna Division; Regions), Trust for Nature, Catchment Management Authorities, local government authorities*

#### **Research**

14. Investigate home ranges and use of habitat in a variety of habitat types, from dry open forest to tall wetter forests and mixed forest and farmland.

*Responsibility: NRE (Parks, Flora and Fauna Division; Forests Service), Parks Victoria*

15. Conduct dietary studies to refine the understanding of prey selection in all major habitat types of the Masked Owl. In the absence of suitable techniques, such as telemetry studies of individual birds to calculate territory use, densities and population dynamics of main prey species in each habitat would be used to refine owl territory size estimates based on dietary requirements as calculated by Seebeck (1976) and Kavanagh (1988).

*Responsibility: NRE (Parks, Flora and Fauna Division; Forests Service), Parks Victoria*

16. Undertake telemetry studies to determine dispersal and recruitment of young birds into the established population.

*Responsibility: NRE (Parks, Flora and Fauna Division; Forests Service), Parks Victoria*

17. Record habitat attributes of known Masked Owl sites in order to contribute to the development of a habitat model for the species, similar to those which have been developed for Powerful and Sooty Owls (Loyn *et al.* 2001). Investigate the actual use of such habitat elements by Masked Owls to determine their importance and assess the need to focus conservation efforts on those elements.

*Responsibility: NRE (Parks, Flora and Fauna Division; Forests Service), Parks Victoria*

#### **Review**

18. When new research information becomes available, it may be possible to refine the management approach to focus specifically on habitat elements actually used by Masked Owls. In that case, it may be possible to meet management objectives more effectively by conserving those elements widely in the landscape, rather than through the current approach of site-based MOMAs. Targeted and innovative research is the key to obtaining information needed to make such a change of strategy, and the research effort should be planned with this as a possible goal. This point is especially relevant for poorly known species such as Masked Owl, as our knowledge of the species' needs is currently imperfect and likely to change rapidly with further work.

*Responsibility: NRE (Parks, Flora and Fauna Division; Forests Service), Parks Victoria*

19. Contribute to the development of a national strategy for the conservation of large forest owls (ie. Masked Owl, Sooty Owl and Powerful Owl).

*Responsibility: NRE (Parks, Flora and Fauna Division)*



20. Prepare and distribute an information pamphlet and record card to potential observers through established networks such as Birds Australia, Bird Observers Club of Australia, Field Naturalists Club of Victoria, *Land for Wildlife* scheme, Victorian National Parks Association and the *Trust for Nature*, to encourage the community to report nest sites, roosting sites and general sightings of the Masked Owl.

*Responsibility:* NRE (Parks, Flora and Fauna Division)

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Further information can be obtained from Department of Sustainability and Environment Customer Service Centre on 136 186.

Flora and Fauna Guarantee Action Statements are available from the Department of Sustainability and Environment website: <http://www.dse.vic.gov.au>

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