Fauna Technical Note No. 1:

Eagle nest searching, activity checking and nest management

FPA
FOREST PRACTICES AUTHORITY

The Fauna Technical Note Series provides information for Forest Practices Officers on fauna management in production forests. These technical notes are advisory guidelines and should be read in conjunction with the requirements of the Forest Practices Code*. The planner will use expert judgement and available information to determine the extent and nature of field survey work required to meet decision-making requirements.*

The technical notes can be accessed on the Forest Practices Authority's website: www.fpa.tas.gov.au.

1. Introduction

Tasmanian eagles are sensitive to disturbance, particularly during the breeding season. Eagle nest management in Tasmania focuses on limiting the proximity and timing of disturbance around known nest sites, and research has shown that buffering nests from logging operations improves breeding success (Mooney & Holdsworth 1991).

This technical note provides information on

1) the characteristics of wedge-tailed eagle and white-bellied sea-eagle nest sites and their breeding behaviour and,
2) protocols for searching for nests, assessing nest activity and managing nest sites.

See Fauna Technical Note 6 for information on the latest version of the wedge-tailed eagle nesting habitat model for use in nest searches.

Management recommendations agreed with DPIPWE for forestry activities are delivered through the Threatened Fauna Adviser on the FPA website. Strategic approaches to managing nesting habitat in a particular forest block/property are encouraged, contact FPA for further details.

2. Status of the eagle species in Tasmania

2.1 Wedge-tailed eagle

The Tasmanian subspecies of the wedge-tailed eagle (*Aquila audax fleayi*) is listed as **endangered** on the Tasmanian *Threatened Species Protection Act 1995* and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. The species is also *a priority species* under the Tasmanian Regional Forest Agreement.

The Tasmanian wedge-tailed eagle is endemic to the state and is known to occur in all habitats throughout Tasmania (possible vagrant on King Island). The species requires mature forest or forest with some mature characteristics on sheltered sites for nesting and this, combined with territorial behaviour, acts to limit its breeding range and population.

2.1 White-bellied sea-eagle

The Tasmanian white-bellied sea-eagle population is listed as vulnerable under the Tasmanian *Threatened Species Protection Act 1995*. The species usually nests in forest within 5 km of the coast, lakes or large rivers or areas with a complex mosaic of farm dams. While this species will choose mature trees when available, this is not a critical requirement for nesting and the species will also nest on sea cliffs and rock stacks. Nest trees can be on exposed slopes and close to forest boundaries, particularly near water. However, nests likely to be affected by forestry operations will generally have site characteristic similar to those for wedge-tailed eagles.

3. Eagle nests and breeding

3.1 Breeding season, sensitivity to disturbance and management constraint period

The results of nest monitoring indicate that the breeding season can start as early as the beginning of June and can extend into March (Koch et al, 2013; Mooney and Holdsworth, 1991). The start, finish and duration of the breeding season can vary between years.

The sensitivity of breeding pairs to disturbance varies during the breeding season. Sensitivity reaches its peak at the beginning of each phase of the breeding season (i.e. courting/nest lining, egg laying/ incubation, hatching and fledging).

The effects of disturbance are cumulative and:

- increase with intensity, proximity and duration of disturbance
- increase when the nest is the focus of disturbance
- are greater if they occur at an elevation above the nest compared to below the nest
- are dependent on timing in relation to the breeding season
- are dependent on individual responses
- may decrease with regularity and predictability.

Birds may desert nests at any stage (i.e. eggs or chicks) if disturbance exceeds a certain threshold. Disturbance does not necessarily have to cause desertion to result in breeding failure, as birds can be kept away from the nest long enough for eggs or young chicks to become chilled and fail to survive. Stress induced by disturbance may also lower the chick's resistance to disease. Nests disturbed in one year may result in the nest not being used in the following year.

It is recommended that forest management constraints are applied from the beginning of July to January inclusive in most years to cover the period during the breeding season when birds are most sensitive to disturbance. This management constraint period takes into account the variability between years in the start of the breeding season.

There may be an extension to the period of management constraint if nest monitoring data collected in November by a trained and accredited planner or specialist indicates that the season is late. If the season is late then management constraints may apply until the end of February.

For more information about the timing of breeding and breeding behaviour see the reports from ongoing nest monitoring work in the references section of this Technical Note.

3.2 Nest site characteristics

Site level characteristics

- Nests are generally found in mature eucalypt forest greater than 27 m in height (i.e. E-3 up to E1 PI-type height class). Forest less than 27m in height (E4) need only be considered suitable nesting habitat if it contains emergent trees greater than 27 m, as is often the case along creek lines. White-bellied sea-eagles can often nest in trees less than 27 m in height (and may nest in non-eucalypt species), particularly where habitat is limited. See Fauna Technical Note 6 for information on the latest version of the wedge-tailed eagle nesting habitat model for use in nest searches.
- Areas sheltered from the strongest winds (NW and W) are almost always chosen as nesting sites by eagles. Nest site aspects are generally concentrated in the south-eastern half of the compass, though they can be found on other aspects. Local topography has an important influence on shelter and therefore nest site selection. In the absence of significant topographic relief to provide shelter (e.g. some areas in the NW of Tasmania), surrounding vegetation (tree canopies of larger eucalypts) may provide enough shelter for eagles to establish nests.

- Nests are generally sited in large trees on leeward slopes below the height of a ridge. They are generally located halfway up the slope although some may be found down in the gully or on slopes just below a plateau.
- Ground slope is usually less than 35° and site altitude is variable.
- A pair of birds will have just one nest for breeding in any particular season, however they may still line other nests in their territory with fresh material. The spacing of active nests (in one season) between territories (nearest neighbour distance, NND) tends to be fairly regular. Most territories have more than one nest (wedge-tailed eagles up to six or more and sea-eagles rarely more than two) and as a result the likelihood of finding additional nests within 2 km of a known nest is high. This likelihood decreases to very low at about ½ NND then increases again reaching a maximum at around 1 NND from an active nest.
- White-bellied sea-eagle nest spacing ranges between 3 and 8 km but due to the spacing of favourable water bodies there can be large gaps between occupied areas.

Nest tree and nest characteristics

- A nest tree is usually the largest or equal largest in the locality and has large branches that provide a stable support for the nest.
- Nests are usually positioned on the downhill side of the trunk and are usually positioned in the base of the emergent canopy.
- Eagle nests are very large and built low in the canopy of large eucalypts (dead or alive). When in use they are usually about 1.2 m across and 1 m deep (ranging from 0.8 m across and 0.5 m deep, to 3 m across and 3 m deep). Nest material comprises sticks from pencil sized up to 40 mm in diameter. Most sticks are about the thickness of an adult's index finger. The nest often appears as a 'bowl' (early in the season) lined by bark and leaves or a flat platform (late in the season), see pictures of nest examples in Appendix 2.

3.3 Nest age and nest use

Long-term viable nests and territories do not necessarily produce chicks every season. Gaps in production may be due to the high energetic costs associated with producing a chick, a dry season where prey availability is low, or where chicks from previous seasons remain dependent.

It should never be assumed that because a nest was not used in the previous season that it is abandoned. Provided the site characteristics are maintained, there is a reasonable chance that the eagles will re-use the site in future years.

Old nests are generally larger than new nests as new material is added during each breeding season. New nests contain mostly unbleached sticks and are generally smaller in size initially. However some nests remain small throughout their life due to small support structures.

Some nests possess a green stain beneath the nest that extends down the trunk of the tree. This stain results from algae growing on the nutrients leached from droppings (phosphates) or prey remains contained in the nest in moist environments. The extent of the staining does not necessarily indicate nest age, rather that the nest may have been used for breeding at some stage.

Nests that are no longer maintained or have not been used for many years may appear bleached. In moister environments old nests may have little bleaching due to low UV exposure but will have extensive decomposition of the nest base due to rot. Old nests that have not been used for a few years may also lose form and show varying degrees of slumping and disintegration.

Nests lost during a fire event may be rebuilt within a few months if the tree has not suffered structural damage, particularly if there is a history of high productivity at the site in previous breeding seasons.

4. Searches for nests

4.1 Planning surveys

See Fauna Technical Note 6 on the FPA website for information on the latest version of the wedge-tailed eagle nesting habitat model and how this model can be used to plan the area to be searched.

A Raptor Nest Search Form should be completed if a nest search is done and lodged via the FPA notification database (see Appendix 1).

4.2 Survey method

The method selected will depend on the forest type, the experience of searchers and resources available. There are two main methods for searching for potential nest sites:

1. ground searching
2. aerial surveys (rotor wing).

Ground surveys

Searching on foot is particularly suited to drier, more open forests where visibility between trees and into canopies is good. Surveys on foot become less appropriate in thick, wet forests where visibility is poor. Ground searching is recommended for small areas containing less potential habitat (e.g. single coupes) but is less efficient for large areas containing a lot of potential habitat (e.g. large hill slopes in inaccessible river valleys).

Ground searches should not be combined with other work – there are lots of examples of nests being missed when someone has been trying to search for nests while doing another job in the operation area.

Aerial surveys

While fixed-wing aircraft must be used for aerial nest activity checks (see below), helicopters are preferred for nest searches. Helicopters can fly low and slowly enough for trained observers to find nests. Once again, trained eyes are best for this sort of work. It is important to have a very good idea of the areas that need searching. Helicopter time is expensive but can be very efficient for strategically searching a number of coupes or potential operation areas. It is very important that at least one of the observers (the most experienced) acts as a navigator, especially if a nest is located. **Aerial survey work should only be carried out by people trained and accredited by DPIPWE**. **There should be no helicopters used within 1 km of a known nest during the management constraint period (July–Jan in most years, July–Feb in late season years) unless in emergency situations such as fire fighting or if the nest is known to be inactive.**

Accurate nest locality data is required for planning. If an accurate GPS location cannot be obtained a ground survey may be required to verify the location of a nest found during an aerial search. Ideally, and if necessary, this should be done as soon as practicable after the aerial search while memory of the site is fresh.

5. What to do if a nest is found?

The actions agreed with DPIPWE to ameliorate the impacts of disturbing activities in the proximity of eagles nests are delivered through the Threatened Fauna Adviser. This decision support system is available via the FPA website. You can also seek advice from the FPA Biodiversity Program staff.

The information below is to provide further clarification on what to do if a nest is found.

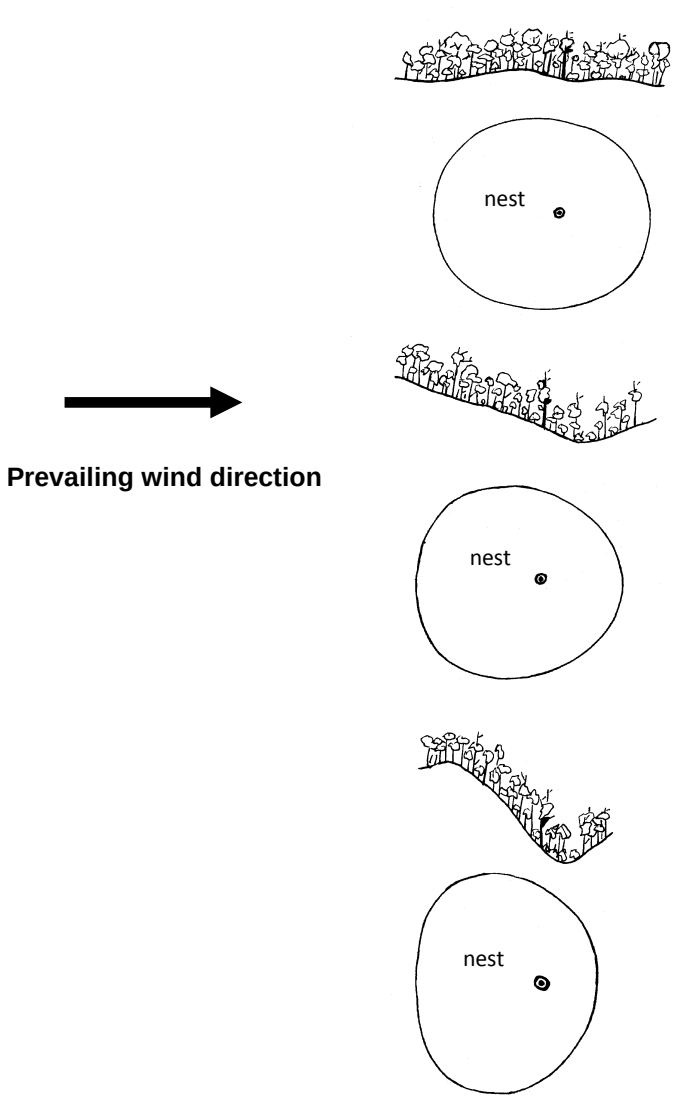
It is extremely important to ensure that nest sites remain undisturbed during the management constraint period, allowing eagles to continue using them in subsequent years. Desertions due to forestry activities or some other land-use activity usually results in subsequent attempts to nest elsewhere in the territory, often in sub standard sites. Thus, it is important to take steps to minimise the risk of nest desertion at all sites.

In general, each nest in a territory is important, whether or not it is active, because nests act as territorial flags and provide birds with alternative nesting sites within their territory.

5.1 Design of nest reserves

The basic requirement for nest protection is a reserve of **no less** than 10 ha (a circle of 360 m diameter or an oval of about 300 m x 400 m) of undisturbed habitat around the nest, concentrated uphill. On slopes, this area should be oval shaped with a long axis up and down the hill and located so the nest is $^{2}/_{3}$ to ¾ down the reserve. The steeper the hill, the greater proportion of the reserve needs to be up-slope of the nest tree. An additional buffer surrounding the nest reserve may be beneficial in some circumstances (eg., where the risk of windthrow is high). The canopy height of this additional buffer should be maintained, although it may be partially harvested

The diagrams below indicate the recommended reserve design according to the slope of a typical site.



Low slope: basically oval with more protection on windward side

Moderate slope: more protection on uphill side

Steep slope: significantly more protection on the uphill side

5.2 Nest Records

Details of a newly discovered eagle nest should be documented on a Raptor Nest Record form with the result of the nest search detailed on a Raptor Nest Search form (see Appendix 1) and submitted to the FPA. New nest records should also be entered into the Natural Values Atlas (NVA, DPIPWE). Once the new information is entered and approved in the NVA it will be reflected on other commonly used databases including the Biodiversity Values Database managed by the FPA.

6. Nest activity assessments

The ‘activity’ of a nest refers to whether a breeding attempt is underway (e.g. presence of an incubating bird or a chick). Checking the 'activity' of a nest should be avoided to minimise disturbance to breeding activity.

6.1 When is a nest active?

Due to the potential inter-annual variation in the timing of breeding events it is recommended that all known nest sites are considered ‘active’ during the breeding season unless otherwise confirmed by a specialist. The activity status of the nest will be determined by appropriate FPA Biodiversity Program staff.

As a guide, nest activity may be determined from a number of observations (see Appendix 2):

- Adults or a chick on the nest, although note that adults nearby the nest may simply indicate that the nest is in an occupied territory.
- The presence of green leaves or sticks with leaves attached indicates at the very least that the nest is being maintained (active).
- The presence of prey remains on or around the nest, although an active nest will not always have prey remains as they are regularly visited by scavengers.
- The presence of droppings on or around the nest, including on branches of the nest tree and surrounding vegetation.
- Bleached, grey sticks – particularly on the top of the nest – suggest no recent use, whereas brown, unbleached sticks are fairly recent additions. However some nests may have both bleached and brown sticks if they have been recently refurbished. Recently added brown stick may not be easily observed if only the bowl of the nest has been refurbished.

6.2 When can nest activity be checked?

Activity checks of individual nests may be conducted by trained planners in the second week of November or later.

Although checks of activity have been done routinely in September in the past, recent work suggests that the likelihood of mistakenly identifying a nest site as being ‘inactive‘ during September is high in years when the season starts late (e.g. as in 2008 - 09 & 2014-15). Checks in September should only be undertaken when exceptional circumstances apply.

Very late activity checks (January onwards) should not be undertaken because of the risk of disturbing late stage nestling (two-thirds fledging age) resulting in a premature fledging event. Such disturbance events have been known to cause serious injury or death of late stage nestlings.

6.3 Methods

As with nest searching the method selected will depend on the forest type, the experience of searchers and resources available. There are two main methods for locating and then checking the activity of a known nest:

1. Checking a nest from the ground
2. Aerial checking (using a fixed wing aircraft).

Ground based surveys should only be done for nests that have confirmed locality information, and where a good view into the nest bowl is likely. A maximum of two people are to do the checking. No more than 20 minutes is to be spent within 100 m of a nest to establish if the nest is active and record observations. Noise must be kept to an absolute minimum, there should be no need for any significant noise, especially loud talking etc. Plan to approach the nest from uphill to give the best possibility of observing nest contents. Only approach the nest as closely as you need to make the observations, but go no closer than 50 m. If a bird is observed on the nest or in the immediate area, including circling overhead, leave the nest vicinity immediately (i.e. move at least 500 m away from the nest). A confirmed result of active or

inactive should only be provided when a clear view into the nest bowl is obtained, so the entire nest surface has been assessed and there is no chance that a chick has been overlooked.

Since nest activity checks are done during the breeding season only fixed-wing aircraft should be used in aerial checking. The noise associated with rotor-wing aircraft can impact on breeding eagles. Eagles can become aggressive during the breeding season and this has resulted in mid-air collisions when helicopters are hovering near to a nest site. Fixed-wing aircraft are quieter and can travel over long distances more efficiently.

6.4 Who can undertake a nest activity check?

If a survey for activity is required in September due to exceptional circumstances then such checks should be done by a specialist from the air, unless the FPA decides that the nest can be more easily checked from the ground by a trained planner.

Nest activity checks in November should only be carried out by those who have gained competency in eagle nest searching/activity checking following attendance at a course approved by DPIPWE or other DPIPWE approved process.

6.5 Procedures to follow when ground checking the activity at a nest during the breeding season

- **Contact the FPA.** If you intend on activity checking nests please contact the FPA eagle specialist to ensure that nest checking is co-ordinated to reduce duplication of nest inspections. The FPA specialist may also have new information relating to a nest that may mean some nests will not require checking.

- **Ensure that you have up to date nest co-ordinates.** Up to date co-ordinates can be downloaded from the Natural Values Atlas https://www.naturalvaluesatlas.tas.gov.au/. Nest localities which are unconfirmed should not be assessed during the breeding season.

- **Vantage points must be found outside of the breeding season.** Nests that cannot be clearly seen into should not be ground checked and aerial methods should be considered to reduce the chance of incorrectly assessing nests.

- **Consider adding your nests to the annual aerial nest surveys undertaken by the FPA or DPIPWE.** Nests can be checked from the ground with the use of a telescope or good quality binoculars from a suitable vantage point. However, aerial surveys are, in most circumstances, more cost effective, accurate and produce fewer disturbances compared to ground checking methods.

- **Under no circumstances should a search for a nest be conducted if the nest is not visible from a pre-established vantage point.**

- **Activity checks should be conducted in a way that *avoids disturbance*, following the method given in 6.3.**

7. Minimising disturbance associated with browsing animal management operations

Management actions recommended to ameliorate the impact of forestry activities within 500 m and 1 km line of sight of eagle nests are delivered through the Threatened Fauna Adviser. While roading, harvesting, burning and carting are considered the highest risk activities, actions to avoid nest desertion may also be required for other activities associated with forestry operations (e.g., boundary marking, planting, tree health monitoring and vertebrate browsing control activities). Browsing management activities in particular can result in significant disturbance to a nest site if not carefully considered.

It is recommended that every effort is made to conduct browsing management (within the 500m or 1km line of sight of the operation area) outside of the management constraint period (see 3.1). However, it is acknowledged that pressure from browsing mammals can occur at any time which can result in significant damage to young stock, leading to reforestation failure. Such failures must be avoided as it is costly and generates additional nest site disturbance through the subsequent restoration and rehabilitation efforts.

Table 1 provides avenues for planners to implement browsing management control within 500 m and 1 km line of sight of eagle nests during the breeding season. The aim of the approach is to minimise disturbance to eagles at nests during the day. Nesting eagles are considered to be far less prone to disturbance at night (absolute darkness) while they are roosting and this has been taken into account in the development of these guidelines.

If these guidelines can be applied there is no requirement for planners to contact the FPA before undertaking browsing management activities in the vicinity of eagle nests.

Table 1. Guidelines for conducting browsing management operations during the eagle breeding season*

	Distance from nest					
Browsing Management Activity	**<200 m**		**200 to 500 m**		**> 500 m**	
	NIGHT	DAY	NIGHT	DAY	NIGHT	DAY
Light vehicle access*[2]	√	√	√	√	√	√
Browsing monitoring*[3]	X	X	√	2 visits/wk of 0.5 hr max. each	√	√
Free feeding/baiting*[4]	X	X	√	2 visits/wk of 0.5 hr max. each	√	√
Shooting*[5]	X	X	√	X	√	√
Trapping*[6]	X	X	X	X	√	√

Key

√ - acceptable activity

X - not acceptable activity

***Note that these guidelines only apply to nest sites with an intact 10ha reserve endorsed by the FPA/DPIPWE. Please contact the FPA for further advice if the nest site does not have an intact reserve.

***[2]** Light vehicle access is defined as a single 4 x 4 utility, a 4 x 4 passenger vehicle or quad bike and should provide access to and from the coupe only. All efforts should be made to avoid stopping a vehicle within 500 m of a nest if in direct line of sight.

*[3]Monitoring for browsing damage can be carried out by up to two people at a time but should be limited to the time constraints identified in Table 1 (above).

*[4]Laying of 'free feed' or baits can be carried out by up to two people at a time but should be limited to the time constraints identified in Table 1 (above).

*[5]Shooting with rifles can be carried out at a distance greater than 200 m from the nest and at night time (under the cover of complete darkness) only. The use of shot guns during the day and within the defined eagle exclusion zones is not advised due to the noise level.

*[6]It is recognised that trapping is used in many areas as a primary means of mammal control, however the intensive logistics of setting, monitoring and maintaining traps are complex and difficult to carry out in a manner that will not disturb nesting eagles. Therefore this method is not recommended within eagle nest management exclusion areas.

7.1 Minimising disturbance due to other forest management activities.

Pest control activities (including monitoring and control operations) and other activities associated with the 'growing' of trees are a 'forest practice' and therefore need to follow the eagle nest management recommendations in the Threatened Fauna Adviser, including the need to get advice from the FPA Biodiversity Program staff before undertaking any nest checks or disturbance activities.

Further reading

Brown, WE and Mooney, NJ 1997, *Modelling of the nesting habitat of the wedge-tailed eagle (*Aquila audax fleayi*) in Tasmania,* report to Tasmanian RFA Environment and Heritage Technical Committee.

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Wiersma, J, and A. J. Koch 2012, 'Using surveys of nest characteristics to assess the breeding activity of the Tasmanian wedge-tailed eagle'. *Corella* 36: 38-44.

Publication details

This technical note has been prepared by Jason Wiersma (based on an earlier version by Nick Mooney). Sarah Munks, Amy Koch, Tim Leaman and FPAC members provided comment on drafts. It should be cited as:

Forest Practices Authority 2014, 'Eagle nest searching, activity checking and nest management', Fauna Technical Note No. 1, Forest Practices Authority, Hobart

Acknowledgements

Many thanks to Chris Bond, Bernard Plumpton, Vanessa Thompson, and Leigh Walters for providing photos.

Appendix 1. Forms relating to eagle searches and nests (these forms can be accessed via the FPA web-page HERE).

Appendix 2. Nest attributes to consider during activity assessments

Nest with compressed flat top
(Flat from chick moving on top in past year)

Nest bowl
(Dished surface. Evident by chick sitting low in nest)

Nest with lining, whitewash and chick

Brown leaves and whitewash
(Obvious addition of leaves and whitewash)

Recently added green leaves
(Recent addition of leaves and some whitewash)

Nest partly or mostly bleached
(No brown sticks, green leaching present)

Document Summary Information

Document name	**Fauna Technical Note No.1: Eagle nest searching, activity checking and nest management**
Version	2.9
Trim record	2014/192033
Owner	Jason Wiersma
Author(s)	Jason Wiersma (with input from Tim Leaman, Amy Koch and Sarah Munks). Based on an earlier version by Nick Mooney
Release date	May 2015
Release Approved by	Board of the FPA
Release status	Endorsed

Version Control

Version	Date	Author(s)	Summary of changes
2	July 2009	Biodiversity Section Staff	Document previously available on FPA website revised, including creation of new nest activity assessment form and addition of nest example photographs. Previous revisions pre-date document control.
2.1	Feb 2011	Nina Roberts	Two additional photos and diagrams added to final page to illustrate difference between nest bowl and flat top nests. The addition of document control information. The wording of this document is otherwise identical to that approved by the FPA Biodiversity Manager in early 2010.
2.2	June 2012	Biodiversity Staff	2.1 edited (5.5, page 8) to clarify the action that should be taken when a nest is found during searching. Year taken off form.
2.3	May 2013	Jason Wiersma and Tim Leaman	Major restructure and removal of excess information to bring it back to basic technical instructions. Addition of browsing management operations section. Comments from V.Thompson and other FPOs taken into account.
2.4	July 2014	Sarah Munks	Major edit of 2.3 to ensure consistent with Threatened Fauna Adviser recommendations.
2.5	August 2014	Sarah Munks	Submitted to Board. Minor edit to clarify difference between management constraint period and breeding season in response to comment by I.Whyte. Minor edits following review by Jason Wiersma. Authorship made clear in document control table. Draft circulated to FPOs as 2014/156781 pending FPAC advice to the Board.
2.6	September 2014	Sarah Munks and Chris Grove	New trim ref and draft uploaded to website.
2.7	February 2015	Sarah Munks, Amy Koch, Jason Wiersma	Received comments from FPAC. Edits made to address FPAC comments (2014/216784). Some additional final draft minor edits made by JW and AK to structure and to clarify/simplify.
2.8	March 2015	Anne Chuter, Jason Wiersma,	Edits made to address FPAC sub-committee comments.

		Sarah Munks and Amy Koch	Edit to nest attributes photo page. Removal of nest record, search and activity forms from Appendix 1. These forms are now a word version available via the FPA web-page (biodiversity evaluation page). A hyperlink will be added at Appendix 1 when this Technical Note is endorsed.
2.9	May 2015	Amy Koch	Changes endorsed by the Board. Minor changes to document control as a result.

Stages required for release outside FPA

Category of advice (A1, A2, B1, B2, B3 or C):		**A2**
Stages	**Required/not required**	**Completed (date)**
Specialist	Required	8/2014
Line Manager	Required	5/2015
Peer/FPO/stakeholder review	Required	8/2014
CFPO	Required	5/15
FPAC	As required by the Board	5/15
Board	Required	5/15