



Fauna Technical Note No. 1: Eagle nest searching, activity checking and nest management

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, endorsed planning tools 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.

Contents

1. Introduction	2
1.1 Purpose and scope of this Technical Note.....	2
1.2 Other resources for eagle management under the forest practices system	2
2. Ecology and conservation status of eagle species in Tasmania.....	3
2.1 Wedge-tailed eagle.....	3
2.2 White-bellied sea-eagle	3
3. Eagle nests and breeding.....	3
3.1 Nest site characteristics.....	3
3.2 Nest age and nest use.....	4
4. Sensitivity to disturbance	5
4.1 Factors that influence how disturbing activities are to eagles	6
4.2 Eagle management constraint period timing	7
4.3 Managing eagles sensitivity to disturbance	8
5. Searching for nests.....	8
5.1 Why nest searches are important.....	8
5.2 Who can undertake nest searches?.....	8
5.3 When can nest searches be undertaken?.....	8
5.4 Planning searches	8
5.5 Nest search methods.....	9
5.6 Frequency of nest searches	10
6. What to do if a nest is found	10
6.1 Nest records	10
6.2 Design of nest reserves	11
6.3 Management of nest reserves	12
6.4 Line-of- sight modelling	12
7. What to do if a known nest is not found	13
8. What to do if you think you have a 'derelict' nest	13

8.1. What is a derelict eagle nest?	13
8.2. Process for a change in nest classification to ‘derelict’	14
8.3. Managing derelict nests	15
9. Nest activity checks	15
9.1 Who can undertake a nest activity check?	15
9.2 When can nest activity be checked?	15
9.3 Methods for assessing nest activity.....	15
9.4 When is a nest considered active?.....	17
10. Conducting nest condition assessments	17
10.1 Guidelines for conducting Unmanned Aerial Vehicle (UAV) nest condition assessments.....	17
11. Guidelines for minimising disturbance associated with browsing animal management operations....	18
12. Guidelines for minimising disturbance associated with planting operations	19
12.1 Precautions during planting	20
13. Management of planned burns.....	20
14. Further reading	20
15. Appendix. Examples of derelict nests	22

1. Introduction

1.1 Purpose and scope of this Technical Note

This Technical Note has been prepared solely for use by the Tasmanian forestry industry, in the conduct of forest practices authorised under the *Forest Practices Act 1985*. While this Technical Note may provide useful information for activities not covered by this Act, caution should be taken when applying forestry specific eagle management to other activities.

Management of eagle species under the Tasmanian forest practices system focuses on managing the risk of disturbance to breeding birds and associated nest sites. Management recommendations for eagle species, agreed with NRE Tas for forestry activities, are delivered via the [Threatened Species Adviser](#) available on the FPA website. Fauna Technical Note 1 provides **supplementary** information to support the management advice delivered through the Threatened Species Adviser, and links to other resources to aid in eagle nest site management.

Specifically, this Technical Note provides information on:

- 1) wedge-tailed eagle and white-bellied sea-eagle breeding behaviour and the characteristics of nest sites
- 2) protocols for searching for new nests and undertaking nest activity checks
- 3) minimising disturbance on nest sites during common forestry activities (i.e. browsing management, planting, planned burns etc.).

1.2 Other resources for eagle management under the forest practices system

- [Fauna Technical Note 6](#) contains information on the latest version of the wedge-tailed eagle nesting habitat model, which can be used when planning nest searches. The wedge-tailed eagle nesting habitat model can be found on the FPA [Biodiversity Values Database](#) web map on the FPA website.

- [Fauna Technical Note 14](#) provides information on how to identify eagle nests in comparison to other commonly seen avian nests.
- Forms relating to the documentation of nest searches, new nest locations and nest checks can be accessed via the [Biodiversity planning page](#) on the FPA website.
- The Raptor Notifications Database can be used to submit raptor forms, proposals for nest reserve designs and any requests for eagle advice specific to eagle nests. The Raptor Notifications Database is accessed via the [Notifications Database](#) on the FPA website.

2. Ecology and conservation status of eagle species in Tasmania

2.1 Wedge-tailed eagle

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

The Tasmanian wedge-tailed eagle is endemic to the state and occurs throughout Tasmania (possible vagrant on King Island).

The species is territorial, and most breeding pairs maintain several nests within their territory. Wedge-tailed eagles are very selective in where they build their nests, which are typically located in large trees on sheltered sites (more details below). Home range size and nest site selection factors limit the breeding population of the species. Breeding pairs will attempt to breed in most, but not all years. They usually lay two eggs but generally raise only one fledgling. The young from the previous breeding season will sometimes remain with the parents or near to the nest sites in the following breeding season.

2.2 White-bellied sea-eagle

The white-bellied sea-eagle (*Haliaeetus leucogaster*) is listed as **vulnerable** under the Tasmanian *Threatened Species Protection Act 1995*.

The potential range of the white-bellied sea-eagle is the whole of Tasmania including all islands.

The species usually nests in forest within 5 km of the coast, lakes, large rivers or areas with a complex mosaic of farm dams. While this species will choose to nest in mature trees when available, this is not a critical requirement 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 characteristics similar to those for wedge-tailed eagles.

Whilst there is considerable overlap in the nest site characteristics of the two Tasmanian eagle species, white-bellied sea eagles often nest in trees other than eucalypts and on exposed sites, as compared to wedge-tailed eagle. White-bellied sea eagle nest sites cover a greater range of aspects (compared to wedge-tailed eagles they are less likely to require sheltered aspects) and they have a much greater tolerance for disturbed sites (particularly near the coast or lakes where there is regular boating activity). As the structure and positioning of nests is very similar between the two eagle species, and nests built by one species can later be used by the other, it is often not possible to determine which species is using a particular nest unless the breeding birds are in residence. This had led to the same management being applied to both species. Management of disturbance is focused entirely on the area around nests.

3. Eagle nests and breeding

3.1 Nest site characteristics

Site level characteristics

- Eagle nests are most often found in mature eucalypt forest greater than 27 m in height (i.e. E-3 up to E1 PI-type height class), although both species will nest in trees less than 27 m in height (and may nest in non-eucalypt species), particularly where habitat is limited. Eagles may also nest in forest less than 27 m in height (E4) where it contains emergent trees greater than 27 m, as is often the case along creek lines.
- Areas sheltered from the strongest winds are almost always chosen as nesting sites by eagles. This means nest sites are generally concentrated on slopes in the south-eastern half of the compass, although they can be found on other aspects as local topography has an important influence on shelter from prevailing winds. In the absence of significant topographic relief to provide shelter surrounding vegetation (tree canopies of larger eucalypts) may provide enough shelter for eagles to establish nests.
- Nests are most often located in large trees on leeward slopes below the height of a ridge. They are often located halfway up the slope although some may be found downslope in the gullies or on slopes just below a plateau. Nests can also be found in trees on flat landscapes when there is adequate shelter.
- The wedge-tailed eagle habitat model, available on the FPA website, can be used to help identify areas where you may locate white-bellied sea eagle and wedge-tailed eagle nests. See [Fauna Technical Note 6](#) for information on the latest version of the wedge-tailed eagle nesting habitat model which can be used when planning nest searches. The wedge-tailed eagle nesting habitat model can be found on the FPA [Biodiversity Values Database](#) web map.

Nest tree and nest characteristics

- Nest trees are typically large (live or dead), with large branches that provide a stable support for the nest.
- Eagle nests are very large, ranging from 0.8 m across and 0.5 m deep, to 3 m across and 3 m deep. Nests are made of sticks, ranging from pencil sized up to 40 mm in diameter. Most sticks are about the thickness of an adult's index finger. The nest surface often appears as a 'bowl' (early in the season) lined by bark and leaves, or a flat platform (late in the season and particularly if in use).
- Eagles maintain more nests than they use for breeding.

For more information on nest attributes and how to identify eagle nests, refer to [Fauna Technical Note 14](#) on the [Biodiversity planning page](#) of the FPA website.

3.2 Nest age and nest use

Long-term viable nests and territories do not necessarily produce chicks every season. Gaps in reproduction can be due to different reasons, such as high energetic costs associated with producing a chick annually, a dry season where prey availability is low, or where juveniles from previous seasons remain dependent on adult parents.

It should never be assumed that because a nest was not used in the previous breeding season that it is abandoned. As long as the nest site is maintained (including no loss of supporting branches, limbs across the nest, etc.), there is a reasonable chance that the eagles will re-use the nest site in future years. Even if a nest tree becomes unviable (e.g. due to structural failure), eagles have a strong fidelity to good quality sites and so will often rebuild in a nearby tree.

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. However, some nests remain small throughout their life due to the limitations associated with small nest support structures.

Some (but not all) nests possess a green stain beneath the nest that can extend 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 in multiple seasons.

Nests that are no longer maintained or have not been used for many years may appear bleached (noting that bleached nests can still be used, so bleaching alone does not indicate that a nest is abandoned). In moister environments, old nests may have little bleaching due to low UV exposure but may have extensive decomposition of the nest structure. Old nests that have not been used for several years may also lose form and show varying degrees of slumping and disintegration.

4. Sensitivity to disturbance

Tasmanian eagles are sensitive to disturbance at certain times of the year, with wedge-tailed eagles being generally more sensitive than white-bellied sea eagles. The period over which eagles are most sensitive to disturbance is referred to as the *eagle management constraint period* (see section 4.2 for more information).

The possible outcomes of exposing breeding eagles to disturbance include:

- Failure to attempt to breed (during nest selection or threat assessment periods).
- Eagles permanently abandoning a nest.
- Eagles building a new nest in a different place (increasing the area that needs to be managed for the species).
- An eagle may flush from the nest (i.e. leave when it otherwise would not) leaving nest contents (e.g. chick/egg) open to predation and exposure. The longer the bird is away from the nest, the greater the risk to survival of the chick/egg.
- A startled eagle suddenly flushing from a nest may inadvertently break/damage an egg/chick in the process.
- Adults may not provision food as regularly as necessary, causing the young to develop hunger traces on feathers (weakening the feathers) and resulting in longer fledging periods. This can result in chicks fledging underweight and increasing the risk of premature mortality.
- Disturbance to a nest later in the chick's developmental stage can cause it to jump from the nest before it can fly (before flight feathers have fully formed) leading to broken bones and death (pre-fledging).

Eagles may abandon a breeding attempt at any stage if they are disturbed. Importantly, disturbance does not necessarily have to cause long-term desertion to still result in breeding failure, as birds can be kept away from the nest for short periods of time which are long enough for eggs/young chicks to be predated on or suffer heat/cold stress and die. A key role of adult eagles is to prevent such temperature stress and to guard against predation (e.g. by forest ravens or other raptors). Stress resulting from nest 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(s).

The sensitivity of breeding pairs to disturbance varies during the year. Sensitivity reaches its peak at the beginning of each phase of breeding (i.e. courting/nest refurbishment and lining, egg laying/ incubation, hatching of the chick and fledging dependence). However, the fledging period is also particularly important to manage as premature fledging can have adverse outcomes for the chick.

Figure 1 below highlights the variation in eagles' sensitivity to disturbance throughout breeding.

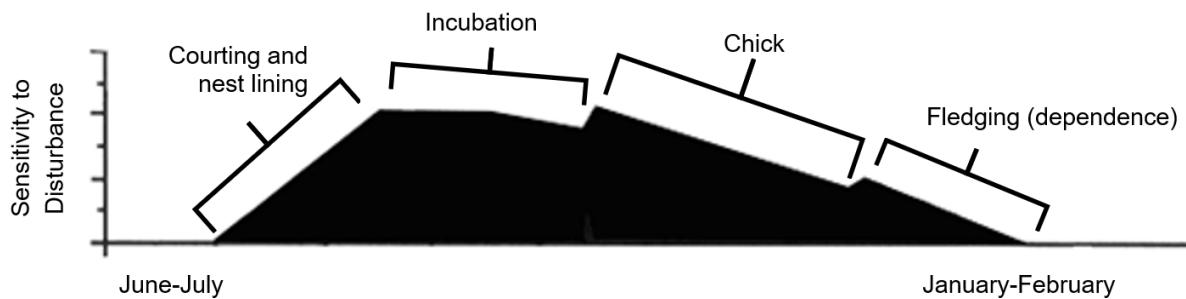


Figure 1. Indicative diagrammatic representation of Tasmanian eagle sensitivity to disturbance while breeding

4.1 Factors that influence how disturbing activities are to eagles

Forestry operations include a range of activities with differing levels of disturbance to eagles. The degree to which birds are impacted by a disturbance event varies between individual birds or pairs, but generally varies with the factors outlined in Table 1 below.

Table 1. Factors that have the potential to influence eagle's sensitivity to disturbance^{1,2}

Disturbance factor	Description
Distance	The closer the activity ³ is to the nest, the more disturbing it is likely to be. Even discrete pedestrian activity can be extremely disturbing to birds if it occurs near the nest.
Visibility	Activities closer to the nest are often likely to be noticed by birds due to the associated noise. Activities further away from a nest site may be noticed initially due to their visibility. Therefore beyond 500 m from the nest, activities are more likely to be disturbing if they are very visible to the birds (i.e. in line-of-sight). However, even when in close proximity the visibility of an activity can impact how disturbing it is, for example wearing discrete clothing may make pedestrians less noticeable to breeding birds.
Spatial extent	Activities with smaller spatial footprints are likely to be less disturbing than those with a large spatial footprint (e.g. longer roads are likely to be more disturbing than shorter roads).
Direction	Activities that are or may appear (to the eagles) to be focused on them (<i>directed disturbance</i>) are more disturbing than a comparable activity that is not apparently focused on the nest (<i>incidental disturbance</i>). For example, roads or pedestrian activity going directly towards a nest (a) are more disturbing than activities that are not directed towards a nest (b). <div style="text-align: center; margin-top: 10px;"> </div>
Elevation	Activities that are located at an elevation above a nest site are more disturbing than those located below a nest site.
Noise	Activities causing high noise volume (e.g. loud machinery, pedestrians shouting etc.) are more disturbing than those at lower volumes.

Duration	For a novel disturbance (see predictability below), the longer the duration of an activity the more disturbing it can be to breeding birds. Even brief disturbances can have an escalating impact on the birds if repeated. However, some birds can habituate to a prolonged disturbance (most likely over multiple years).
Time of day	Activities occurring during daylight hours have the potential to be more disturbing than those that occur overnight.
Predictability	New/unexpected activities are more disturbing than ongoing activities. A new activity may be of the same nature as a previous activity, but if it occurs in a new location, it can still create disturbance. For example, a bird may be accustomed to a road that has been active for years, but building/using a new road near the nest could lead to nest desertion.
Variability	Variable/irregular activities are more disturbing than those of a constant nature. Constant activity that happens on a regular basis over prolonged periods could habituate a bird to it, whilst variable/irregular activities can surprise an eagle.
Timing of disturbance in relation to breeding season stage	Eagles are more likely to flush or desert a nest at the beginning of each phase of the breeding season (i.e. courting/nest lining, egg laying/incubation, hatching and fledging).
Experience	Eagles' experience will impact how sensitive they are to disturbance. Eagles that have been persecuted (e.g. shot at) are likely to be more fearful of people regardless of where they are. Conversely, eagles exposed to long-term benign disturbance (e.g. some agricultural practices) may exhibit some habituation and decrease in sensitivity over time.
Individual	Individual birds will vary in their tolerance to disturbance. Even within a breeding pair the tolerance levels may be vastly different. Therefore, exceeding the tolerance limits of the most sensitive bird of the pair may lead to breeding failure.
Weather	Activities undertaken on very cold, hot or wet days are more likely to present an increased risk to chicks and eggs (if adults have flushed) than on days with warm and/or dry weather.
¹ Information in table derived from expert knowledge.	
² All factors described in this table can have cumulative disturbance effects on nest sites when undertaken concurrently. All eagles have a threshold to disturbance, which will vary between individuals due to a range of factors (see above). All birds, even very tolerant birds, will respond negatively if their threshold is exceeded.	
³ 'Activity' and 'Activities' refers to any forest practice including native forest and plantation harvesting, carting, road building, quarry construction, removal of native vegetation, regenerating native forests, establishing plantations, vertebrate browsing control activities and any pedestrian activity ⁴ during the aforementioned operations.	
⁴ Pedestrian activity during coupe planning has the potential to be very disturbing to eagles.	

4.2 Eagle management constraint period timing

Eagles can be active around the nest year-round but there are stages during which eagles spend more time closer to the nest. The results of nest monitoring indicate that breeding activities (e.g. courtship) 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 these stages varies between years depending on seasonal factors. To provide a practical guideline that encompasses this variation, it is recommended that forest management constraints are applied from the beginning of July to January inclusive in most

years. This is referred to as the eagle management constraint period, which is intended to capture the most sensitive stages of the breeding period for the majority of birds, from nest site selection, egg laying and incubation, to the stage when the majority of chicks have fledged. The timing of the management constraint period also takes into consideration the variability between years at the start of the breeding season. Data on the progress of a particular season (typically aerial survey data collected in November) may be used by the FPA to announce a late season, in which case the management constraint period may extend into February. The FPA will declare the timing of the management constraint period around the end of November each year.

It is extremely important to ensure that nest sites remain undisturbed during the management constraint period, thereby increasing their probability of being used in subsequent years and therefore reduce the risk of subsequent attempts to nest elsewhere in the territory, often in sub-standard sites.

In general, each nest in a territory is important, regardless of whether they are being used. Nests act as territorial flags (advertising that the area is occupied) and provide birds with alternative nesting sites within their territory.

For more information about the timing of breeding and breeding behaviour, refer to the nest monitoring reports in the 'Further reading' section of this Technical Note.

4.3 Managing eagles sensitivity to disturbance

Eagle management in Tasmania focuses on limiting the proximity and timing of disturbance around known nest sites. Known nests are assumed to be active unless proven otherwise (see section 8). Management actions recommended to mitigate the potential impact of forestry activities on nest sites during the management constraint period are delivered through the [Threatened Species Adviser](#) on the [FPA website](#).

5. Searching for nests

5.1 Why nest searches are important

It is important to undertake searches for new and existing nests prior to harvesting, to enable early identification and management of nest trees and nesting habitat and minimise risk of disturbing breeding birds. Searching for existing nests helps to confirm whether known nests are still present (and therefore may require management) or not (if the nest tree has fallen, etc).

5.2 Who can undertake nest searches?

Nest searching is a task that requires considerable practice and a good understanding of where eagle nests are likely to be located. Nest searches should be carried out by at least one assessor who has attended and passed an FPA/NRE Tas approved eagle management course. It can be helpful to have at least one experienced person involved in the nest search.

Planners are encouraged to maintain the currency of their skills either through ongoing involvement in eagle management or refreshing their eagle training every five years.

5.3 When can nest searches be undertaken?

Searches for nests should only be undertaken outside the eagle management constraint period. If this is not practical contact the FPA for advice via the Raptor Notifications Database.

5.4 Planning searches

Operations that require nest searching are detailed in the Threatened Species Adviser recommendations. Searches should be carefully planned to target areas most likely to contain a nest. Spatial information such as the eagle nesting habitat models, aerial imagery, forest type, PI type etc can be useful when planning an eagle nest search. The wedge-tailed eagle nesting habitat model, and associated [Fauna Technical Note 6](#), are available on the FPA website and on the FPA's Biodiversity Values Database web map. However spatial layers are guides only and should not replace experience

based on an understanding of eagle ecology and local knowledge when planning and conducting searches.

If a nest search is conducted a *Raptor Nest Search Form* must be completed and lodged via the FPA raptor notification database. The *Raptor Nest Search Form* is available on the [FPA website](#). For search programs that cover multiple or large-scale operation areas, raptor nest search information can be provided via alternative formats as agreed by the FPA. The assessor must also keep a record of search areas including GPS track log of areas walked or flown, which the FPA may request if needed for audit purposes.

5.5 Nest search methods

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

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

Nest searches may also be undertaken using other techniques agreed with the FPA.

Ground searches

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 field work – there are examples of nests being missed when someone has been trying to search for nests while doing another field task within the operation area.

Ground surveys are best conducted by two or more people walking about 50–100 m apart (depending on visibility), providing an overlap in the trees they are assessing for potential nests sites. Potentially suitable areas for nesting are considered and planned prior to the conduct of the search. Searchers should turn and look around at regular intervals – even large nests can be hidden from view from certain angles. In cases where the searchers are unsure of which species built a nest, a good quality photograph can be referred to the FPA for potential identification.

Aerial searches

Aircraft use can be expensive, but aerial searches can be very efficient for strategically searching multiple operation areas or large search areas. Helicopters are preferred for nest searches as they can fly low and slow enough for observers to locate nests. Aerial searches are difficult and require specialised skills and therefore aerial search work should include at least one highly experienced searcher. It is important to have a very good idea of the areas that need searching before commencing.

Maps of the search areas should be pre-prepared. It is recommended that the most experienced person acts as the navigator to help ensure potential areas are adequately covered.

The usual search method is to fly parallel transects following the contours. However, topography, weather conditions and safety considerations will ultimately determine the flight path. Narrow gullies are best investigated by flying up the gully from its lowest point. Flying downhill limits the view of the forest canopy, particularly forest directly in front of the helicopter, but may be unavoidable in which case additional transects should be flown to ensure the area is adequately searched. The contour transect method is most effective in larger search areas over even slopes, but the width of transects and flight speed need to be adjusted to account for the density of the forest crowns.

An external Bluetooth GPS connected to a tablet up-loaded with search area polygons, in combination with real-time recording of the helicopter flight path, can provide valuable feedback on the adequacy of the search. Where practical, each known nest within the search areas, including newly located nests

should be photographed through an open window (without hovering over nests, due to the damage rotowash may have on the nest), to obtain the best quality photographic record of the nest site.

If a new nest is located, an accurate GPS location is needed for planning nest management. If an accurate GPS location cannot be obtained from the air, a ground survey may be required to verify the nest location. Ideally, and if necessary, this should be done as soon as practicable after following the conduct of the aerial search while memory of the site is fresh.

If an eagle or eagles are observed near the search area they should be monitored closely. If the eagle shows interest or aggressive behaviours the search of that area should be abandoned immediately for safety reasons. If eagle/s remain in the vicinity for more than a few minutes, the search should be abandoned even if no aggressive behaviours are observed.

5.6 Frequency of nest searches

Pre-operational searches

Potential nesting habitat should be surveyed for nest sites prior to the commencement of forestry operations. A nest search must be undertaken in areas that have not been searched in the past two years. Pre-operational searches should be timed as close as possible to the planned operation commencement date.

Searches during longer term operations

If the operation is intended to occur over a long time period, extending past the two-year search window, then an additional search may be warranted if there has been a period of inaction between high-risk activities of more than twelve successive months. This is applicable for high-risk activities including:

- harvesting
- carting
- roading operations
- site preparation with machinery.

Low risk activities such as planting and assessments (i.e. person(s) on-ground, undertaking work by foot) are exempt from this ongoing currency requirement.

Quarries

A pre-operational search is required prior to establishment of a new quarry. No further eagle nest searches are required for quarries once established unless a variation is made to a quarrying FPP that requires CFPO approval (i.e. if an increase in area beyond 20 ha or 10% of the original area covered by the FPP is required) in which case a nest search must be undertaken.

6. What to do if a nest is found

The process to follow if a nest is found can be summarised as:

1. document the nest record
2. establish a nest reserve on your land tenure
3. manage the nest site where relevant to forestry activities.

Further information on these steps can be found in the Threatened Species Adviser recommendations, and in the information below. Further advice can also be sought from the FPA via the Raptor Notifications Database.

6.1 Nest records

If a new eagle nest is found, details should be documented on a *Raptor Nest Location Form* (found on the [FPA website](#)) and must be either entered into the [Natural Values Atlas](#) (NVA) or alternatively sent to the FPA, via the Raptor Notifications Database, who will upload records to the NVA for validation. If you require the FPA to upload the new records details to the NVA, please specify this in the notification.

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.

6.2 Design of nest reserves

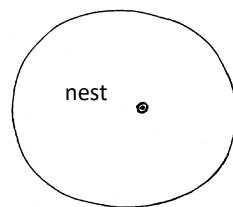
Design of an eagle nest reserve should only be carried out by those who have attended and passed an FPA/NRE Tas approved eagle management course.

The basic requirement for nest protection is the creation of a reserve of **no less** than 10 ha (a circle of minimum 360 m diameter or an oval of about 300 m x 400 m) of undisturbed native vegetation around the nest, concentrated uphill of the nest tree. On slopes, this area should be oval shaped with a long axis up and down the hill and located so the nest is $\frac{2}{3}$ to $\frac{3}{4}$ down the reserve (see diagram below). The steeper the hill, the greater proportion of the reserve needs to be up-slope of the nest tree. The nest need not be in the middle of the reserve but should be at least 100 m from any edge. An additional buffer surrounding the nest reserve may be beneficial in some circumstances (see nest reserve diagram below). The canopy height of this additional buffer should be maintained, although it may be partially harvested.

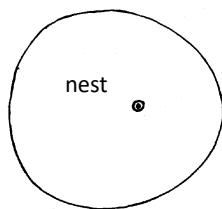
The diagrams below indicate the recommended reserve design according to the slope of a typical site.



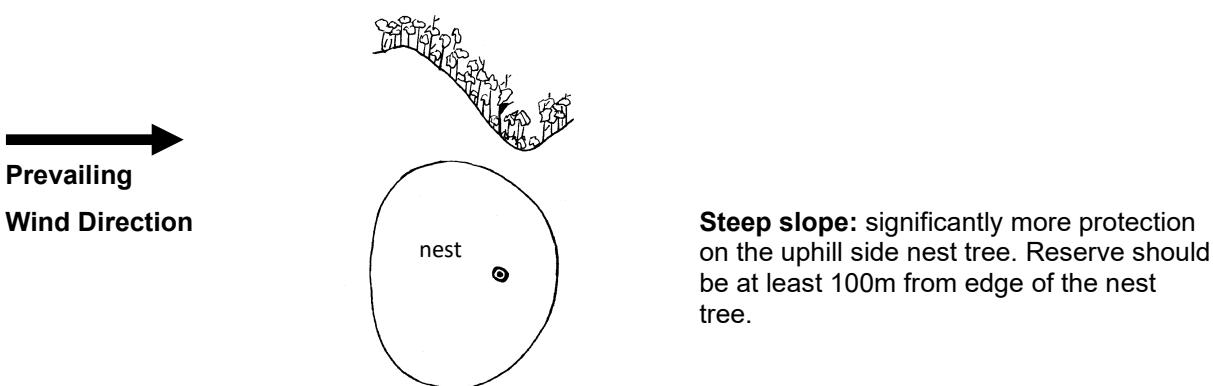
Prevailing
Wind Direction



Low slope: basically circular, but with slightly more protection on windward side. Reserve should be at least 100m from edge of the nest tree.



Moderate slope: more protection on uphill side. Reserve should be at least 100m from edge of the nest tree.



A copy of the proposed reserve design must be provided to the FPA for endorsement.

6.3 Management of nest reserves

- Nest reserves should be protected from high intensity and extensive regeneration burns. A low intensity burn for fuel reduction purposes may enter the nest reserve outside the eagle management constraint period, provided there is a low risk of the nest tree being deleteriously affected.
- Machinery should not enter the nest reserve.
- No trees should be felled into or out of the nest reserve. Where this occurs accidentally, advice should be sought from the FPO as to whether the tree should be removed or left in place. The decision on removing a tree should be based on the relative merits of doing more damage to the undergrowth if the tree is removed versus the possibility of the dead head of the tree being a site of ignition from any burning in the coupe.
- New roads and tracks should not be built through the reserve. Existing roads and tracks can continue to be maintained outside of the eagle management constraint period.
- Nest reserves should be protected from other forms of disturbance such as damage by cable lines etc. Where cables are required to cross a nest reserve, advice should be sought from FPA.

Contact the FPA for advice, via the Raptor Notifications Database, if the nest reserve management cannot be implemented.

6.4 Line-of-sight modelling

The Threatened Species Adviser recommends that during the eagle management constraint period, activities are limited within 500 m or 1 km line-of-sight of an active eagle nest. Line-of-sight means the areas where a breeding eagle could see when at the nest.

Producing a line-of-sight model typically requires access to Geographical Information System software (GIS). The standard way of conducting the analysis is to do a 'viewshed' analysis based on the location, topography and height of the nest in the tree. The actual nest height should be used if known, but when the height of the nest is not known, a default height of 30 m should be used. Initial analysis should usually first consider a 'bare ground' model that does not consider screening provided by vegetation.

There are occasions when variations to this approach may be appropriate. These may involve the use of different nest heights, use of vegetation screening, or alternate methods such as the use of drone imagery. Under these circumstances advice should be sought from the FPA on whether the alternate approach meets the intent of the line-of-sight requirements. Contact the FPA for advice if you are not able to produce a line-of-sight model.

7. What to do if a known nest is not found

Nests can be lost through natural attrition when nest trees or stabilising branches fall, when fires destroy nests, or through degradation of abandoned nests, etc. When a searcher is confident of the locality information but a known nest is unable to be located during a nest search, there is a process for considering the nest as absent. Absent, in the context of an eagle nest, is defined as a nest that was once present in a location but has been formally declared as 'lost' and is therefore no longer required to be managed.

To report a nest as absent the following process must be followed.

A minimum of two nest checks must be undertaken (at least one aerial (non-UAV) and one ground check – see section 8 on how to undertake nest checks), outside of the management constraint period and the following information supplied to the FPA via the Raptor Notifications Database:

- a *Raptor Nest Absent Form* which includes both checks (aerial and ground)
- photos of the site including adjacent trees (if possible)
- flight paths for the aerial check and GPS track logs for the ground check
- personnel involved in both checks
- dates of checks
- a detailed description of the nest and reasons for why it is considered lost or absent (e.g. nest destroyed, nest on ground, nest tree fallen, etc.).

The FPA will use the above information to confirm whether a nest is formally considered absent and will arrange for the status of the nest to be changed on the NVA and subsequently the BVD. The nest will still appear on BVD reports but will be listed as absent.

Contact the FPA for advice, via the Raptor Notifications Database, if you cannot undertake both an aerial AND a ground check, or if you can provide sufficient evidence to declare a nest as absent from only one check.

Once a nest has been formally listed as absent, the nest reserve should remain in place but specific management for that nest is no longer required. Retaining the nest reserve, even when a nest is declared absent, is important as it provides highly suitable habitat and it is common for eagles to rebuild nests in the habitat provided in nest reserves. There is no restriction on activities during the management constraint period unless another nest is located, but the nest reserve should still be managed as per section 6.3 above. If the nest reserve cannot be managed as per section 6.3 for an absent nest, contact the FPA for advice via the Raptor Notifications Database.

8. What to do if you think you have a 'derelict' nest

8.1 What is a derelict eagle nest?

A derelict eagle nest is an eagle nest in such poor structural condition that it is not expected to be used for breeding again.

Nests are classified as derelict based on the attributes of the nest alone, not on the conditions of the tree, nearby nests, or surrounding landscape. A nest can enter a derelict state when:

- the nest has been abandoned by birds for long enough that the structural integrity of the nest has declined to such an extent that the birds are unlikely to be able to use or rebuild the nest. For example, the nest may be slumping out of the nest tree, the extremely loose, degraded or vegetated structure of the nest indicates the nest has not been maintained for a long period of time, or only part of the original nest structure remains;

- a major support structure of the nest (e.g. large tree limb) has been damaged in a way that the nest is partially falling out of the tree or the width of the remaining nest surface is of insufficient size to allow for a breeding attempt;
- Something has fallen onto and obstructed the nest (e.g. a branch) of such a size that the birds cannot remove it or a location that obstructs the nest surface, effectively reducing the capacity of the nest to support a breeding attempt.

Images showing examples of each category of derelict nests are provided in the Appendix.

8.2 Process for a change in nest classification to ‘derelict’

Eagles can rebuild or improve the structural integrity of a nest that has been unused for a period of years. Consequently, the identification of ‘derelict’ nests is a task that needs to be performed by a person very experienced in the full range of nest conditions that can be found in eagle nests. The purpose of this part of the technical note is to help practitioners identify nests that *might* be classified as derelict, but noting that the formal assessment and reclassification of a nest to this status class is undertaken by independent specialists.

8.2.1 Collecting evidence

If a practitioner suspects that a nest may meet the definition of a derelict nest, they will need to collect supporting documentation. Typically, this would be collected outside the eagle management constraint period and would be in the form of one or more quality photographs, although other media would be supported if it allows the specialist to easily assess the condition of the nest.

Images that will most easily allow specialists to assess the condition of the nest will have the following attributes. They should be captured:

- at high resolution
- in good lighting (i.e. not too much contrast which can make it difficult to properly assess the image)
- in reasonable proximity to the nest (i.e. the nest is large enough in the image to be clearly seen)
- preferably from an angle slightly above horizontal, providing a view into the nest platform as well as the sides of the nest to display any evidence of nest slumping.
- to clearly show areas where slumping or significant damage has occurred, and/or objects that have fallen into and obstructed the nest surface.
- in multiple images from different angles of the nest, to allow for a more thorough and definitive assessment to be undertaken by the specialist.

Images can be taken from the ground, by drone, or from an aircraft, provided they are of sufficient standard to capture the attributes described above. Imagery should be collected outside the eagle management constraint period.

Any background information on nest history or past images of the nest are also useful.

8.2.2 Submit evidence for assessment

Applications to change a nest classification to derelict should be submitted to the NVA via a *Raptor Nest Location Form*. On this form, answering ‘yes’ to the question ‘could the nest potentially be assessed as derelict?’ will trigger an assessment of whether the nest can be classified as derelict or not. The request should include the images, any other background information, and the justification for a change in nest classification to derelict. Applications to change a nest classification to derelict should only be submitted by people who have attended and been accredited at an FPA/NRE Tas approved eagle management course.

Requests to change a record status will be considered through NRE Tas’s data management processes. This process uses species specialists (which may include FPA specialists) to validate data and verify observations. After specialist consideration a response will be provided to the applicant indicating if the

nest is considered derelict or not, or if the evidence provided was insufficient to make a determination. If determined to be 'derelict', this status will be indicated in future BVD and NVA reports.

8.3 Managing derelict nests

Recommended management for derelict nests is outlined in the Threatened Species Adviser. Derelict nests are to be managed as if they were an 'absent' nest (see Section 7). That is, a nest reserve should be maintained around the derelict nest, but the restrictions that occur during the eagle management constraint period no longer apply. It is also important that nest search currency measures are maintained as a new nest could be built in the area. The Threatened Species Adviser should be consulted for more detail and the most up-to-date management recommendations for Absent or Derelict nests.

9. Nest activity checks

The 'activity' of a nest refers to whether a breeding attempt is underway (e.g. presence of an incubating bird, chick or egg). Activity checks are conducted during the management constraint period. All nest activity checks should be considered potentially disturbing and therefore should undergo a risk and prioritisation process and be reviewed in consultation with the FPA.

9.1 Who can undertake a nest activity check?

Nest activity checks are conducted differently to nest searches and therefore require different skills and methods to undertake.

Ground based activity checks must be carried out by at least one assessor who has attended and been accredited at an FPA/NRE Tas approved eagle management course. Individuals are encouraged to maintain the currency of their skills either via ongoing involvement in eagle management or refreshing their eagle training every five years. Upcoming training courses are listed on the [FPA's website](#).

Aerial activity checks are complex and require highly specialised technical skills and therefore can only be carried out by those who can demonstrate to FPA/NRE competence in undertaking the work and have the capacity to collect robust data for use in determining management under the forest practices system, with minimal disturbance on the breeding eagles. Aerial activity checks during the eagle management constraint period are not covered by the FPA/NRE approved eagle management course.

9.2 When can nest activity be checked?

Activity checks should occur between mid-October and the end of December. Prior to mid-October, the risk of an inconclusive check is high. Very late activity checks (January onwards) should not be undertaken because of the risk of disturbing late-stage nestlings (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.

9.3 Methods for assessing nest activity

There are two main methods for checking the activity of a known nest:

1. ground based activity check
2. aerial activity check (rotor-wing or fixed-wing).

Nest checks may also be undertaken using other techniques authorised by the FPA.

9.3.1 Ground based activity checks

Ground based nest activity checks are generally discouraged and can only be undertaken under exceptional circumstances following consultation with FPA.

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. Consider adding any nests for

which the outcome of an activity check is essential to forest practices activities to the annual aerial nest activity check program undertaken by the FPA.

In situations where a ground based activity check is the only or preferred option, refer to the following procedures.

1. If you require a ground based activity check to confirm the activity of a nest(s), contact the FPA to ensure that nest checking is co-ordinated to reduce duplication. The FPA may also have nest information that could mean some nests would not require checking.
2. Check nest locality and vantage point information. Correct and current nest location co-ordinates can be downloaded from the [NVA](#). Nest localities which are unverified or have a low site recording accuracy should not be assessed during the management constraint period. Vantage points must be established outside of the management constraint period. Under no circumstances should a ground based activity check be undertaken without a pre-established vantage point. Vantage point visibility may change over time (due to changes in vegetation etc.) and it may not be possible to undertake the inspection from an observation point used previously. Therefore, the vantage point should be reviewed for each check.
3. Nests that cannot be clearly seen into should not be ground checked and aerial methods (Section 8.3.2) should be considered to reduce the chance of incorrectly assessing the status of nests.
4. Use the approach outlined in Table 2 to minimise the disturbance related to undertaking ground based checks
5. For each nest checked, a *Raptor Nest Activity Check Form* must be completed and submitted to the FPA via the Raptor Notifications Database. The FPA will then make the final determination as to whether a nest is considered active or not. This form can be downloaded from the [FPA website](#).

Table 2. Ground-based activity checks should be conducted in a manner that avoids disturbance, following the approach provided below:

Disturbance factor	Mitigation
Personnel	A maximum of two accredited people are required to undertake the activity check. Wearing hi-vis equipment during the check should be avoided as this may result in raptors flushing from the nest leaving eggs, or chicks exposed.
Weather	Ground checks must not be conducted on days when the temperatures are extreme (<10°C or >30°C) or when it is raining.
Timing	No more than 20 minutes is to be spent between 100 m to 200 m of a nest to assess if the nest is active and record observations.
Noise	Noise during the inspection must be kept to an absolute minimum, there should be no need for any significant noise, especially loud talking etc.
Distance	Only approach the nest as closely as you need to make the observations, but do not approach closer than 100 m of the nest site.
Direction	Plan to conduct the inspection upslope of the nest to provide the best possibility of observing the nest surface and any associated nest contents.
Eagle in area	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). This includes any birds observed from the time you exit your vehicle and during your approach to the nest observation point.

9.3.2 Aerial activity checks

Aerial activity checks are an economical way to check multiple nests or multiple operational areas. Helicopters (rotor-wing) are the preferred aircraft for aerial activity checks, but fixed-wing aircrafts can also be used for this work. You must contact the FPA if you wish to undertake aerial activity checks. The FPA may already have nest information that would mean some nests would not require checks to determine their activity status.

Companies/individuals that would like to have nest(s) included in the FPA's annual aerial activity check program should contact the FPA by mid-September at the latest.

9.4 When is a nest considered active?

Due to the potential inter-annual variation in the timing of breeding events, it is recommended that all known nest sites are managed as 'active' during the management constraint period unless otherwise confirmed by the FPA. If a nest is adequately assessed, at an appropriate time and by a trained assessor, then the nest is deemed active when there is a visible egg, chick or adult in incubating posture on the nest, and inactive if none of these are present.

The final determination of the activity status of a nest is undertaken by the FPA. Each nest will be classified into one of the following three classifications.

- Active – nests that are confirmed active as a result of an activity check
- Inactive – nests that are confirmed not active as a result of an activity check
- Manage as Active – nests classified in this way could not be confidently assessed during a nest activity check¹.

10. Conducting nest condition assessments

The condition of a nest, as assessed outside the eagle management constraint period, has the potential to reflect the likelihood of the nest being used in the near future. However, there is currently no endorsed management pathway between nest condition assessments and subsequent management decisions for a nest, due to a lack of research data supporting this association. Despite this, some practitioners may choose to conduct nest condition assessments as part of their eagle management practices and these data can be used as part of long-term monitoring of nest condition.

Nest condition assessments can be undertaken from the ground or using Unmanned Aerial Vehicles (UAV) or using a rotor-wing aircraft (helicopter).

A *Raptor Nest Condition Assessment* Form should be completed for each nest assessed. These forms can be submitted via the Raptor Notifications Database as supplementary information for advice requests or provided directly to the NVA. This form is available on the [FPA website](#).

10.1 Guidelines for conducting Unmanned Aerial Vehicle (UAV) nest condition assessments

When using UAV (drones) to conduct nest condition assessments, the following guidelines (adapted from Yee, 2022) should be followed.

- All use of UAV must be in accordance with Civil Aviation Safety Authority (CASA) regulations.
- Flights must only be conducted between April and June.
- The location of the nest should be confirmed prior to initiation of UAV flight. Where available, a photo of the nest and nest tree should be taken into the field to help expedite relocating the nest tree.

¹ For reasons of safety to both eagle and personnel during aerial assessments, nests may be deemed active if eagles are observed in close proximity.

- UAV take-off point should be from the base of the nest tree or a vantage point with a good view of the nest. The UAV must remain within direct, unaided (e.g. without binoculars) view of the UAV pilot during flight.
- A dedicated eagle observer must be present to monitor the flight operation for eagles, monitor the UAV, and be in direct communication with the pilot.
- Nests should be promptly photographed or videoed.
- If an eagle is seen within 500 m of the nest or UAV, the flight must be aborted.
- If an eagle attacks, the UAV should be flown directly upwards at full thrust to evade any possible interaction with the eagle and returned to ground when safe to do so.
- Any incidences involving injury to an eagle must be immediately reported (within 24 hours) to the FPA and NRE Tas.

Any incidences of eagle inquisitiveness, approach, aggression, or attempted attack directed towards the UAV and/or personnel are also to be immediately (within 24 hours) reported to the FPA and NRE Tas.

11. Guidelines for minimising disturbance associated with browsing animal management operations

Browsing animal management activities have the potential to result in significant disturbance to a nest site if not carefully considered.

It is recommended that every effort is made to conduct browsing animal management (within the 500 m, or 1 km line-of-sight of the nest) outside of the management constraint period (see section 4.2). 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 both costly and generates additional nest site disturbance through the subsequent restoration and rehabilitation efforts.

Table 3 provides guidelines to implement browser management control within 500 m, or 1 km line-of-sight of eagle nests during the eagle management constraint period. 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 (excluding twilight) 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 to contact the FPA before undertaking browser management activities in the vicinity of eagle nests.

Table 3. Guidelines for conducting browser management operations during the eagle management constraint period^{*1}

Browser management	Distance from nest					
	<200 m		200 to 500 m		> 500 m	
	NIGHT	DAY	NIGHT	DAY	NIGHT	DAY
Light vehicle access ^{*2}	✓	✓	✓	✓	✓	✓
Browser 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

^{*1} Note that these guidelines only apply to nest sites with an intact 10 ha reserve supported by the FPA (see section 6.2). Please contact the FPA for further advice via the Raptor Notifications Database 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 operation area only. Every effort should be made to avoid stopping a vehicle within 500 m of a nest if in direct line-of-sight of the nest.

^{*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 3 (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 3 (above).

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

^{*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. As a result, this method is not recommended to occur within eagle nest management exclusion areas.

12. Guidelines for minimising disturbance associated with planting operations

Planting and associated activities can result in significant disturbance to a nest site if not carefully considered. During the eagle management constraint period planting outside a 300 m radius from a nest is permitted in accordance with the provisions provided below. Contact the FPA for advice if planting is required within 300 m of a nest. For all nests the following should be applied:

- The number of people undertaking planting works within 500 m, or 1 km line-of-sight should be kept as minimal as practical.
- If safety requirements allow, wearing discreet clothing reduces disturbance on eagles.
- Vehicles should not enter within 300 m of any nest site during planting (unless on formed roads).
- Planting should begin at the closest point to the nest and move away as planting progresses. Planting should be done in such a way that workers are not consistently directing activities toward the nest, such as planting in a line that draws closer and closer to the nest. Such actions are considered to create a higher level of disturbance to (nesting) eagles.
- Lunch and tea breaks must be taken outside the 500 m nest site exclusion area.

- f) Vehicles should be parked outside 500 m of the nest site at all times. Vehicles may be used to supply products to workers (no closer than 300 m) and where possible products should be stockpiled during each supply in order to reduce the number of vehicle visits within 500 m of the nest site.
- g) Workers should remain in close proximity to each other when working (where practical). This is less threatening to eagles than people being spread out over hundreds of metres.
- h) Noise must be minimised within 500 m of the nest site (e.g. vehicles engine noise, radios and talking). Four-stroke quad bikes (ATV) and side-by-sides (UTV) may be used (outside 300 m), as long as the exhaust is not modified in any way, to ensure that noise levels are kept to a minimum.
- i) Planting under the cover of darkness is permitted year-round. The use of large powerful spotlights is not recommended. Standard torch lights are acceptable.
- j) Ensure that the contractors undertaking planting activity are made aware of the general location of the eagle's nest when conducting work and are advised of all recommended actions.

12.1 Precautions during planting

The operation should cease immediately and the FPA must be contacted prior to work re-commencing if eagles are noticed flying low and or vocalising when planting occurs.

13. Management of planned burns

Tasmanian forests have a long relationship with fire so Tasmanian eagles are thought to have a greater tolerance for disturbance by fire than other types of disturbance. There are two main ways fire can impact eagles: by destroying the nest site or impacting the breeding attempt.

Planned burns should be designed to minimise risk to eagle nests and nest reserves. High intensity regeneration burns should not be allowed to enter the nest reserve at any time of the year. However, a low intensity burn may enter the nest reserve outside the management constraint period, provided that there is a low risk of the nest tree being deleteriously affected.

If a nest is lost during a wildfire event the nest may be rebuilt within a few months if the tree has not suffered structural damage. A rebuild is most likely to be attempted if the site has been successfully used in previous breeding seasons.

There is a risk that planned burns can impact breeding attempts, as heavy smoke may cause adults to abandon a nest site or suffocate a chick. Therefore, the timing of regeneration burns should be planned to ensure that any monitoring and extinguishing activity occurs prior to the eagle management constraint period to prevent and minimise possible disturbances from these actions. Bark heaps in close proximity to a nest should be burnt as early as possible before the commencement of the eagle management constraint period and extinguished prior to the management constraint period commencing.

If bark heaps require burning within 500 m, or 1 km line-of-sight of a nest during the management constraint period contact the FPA for advice prior to the commencement of any burning.

14. Further reading

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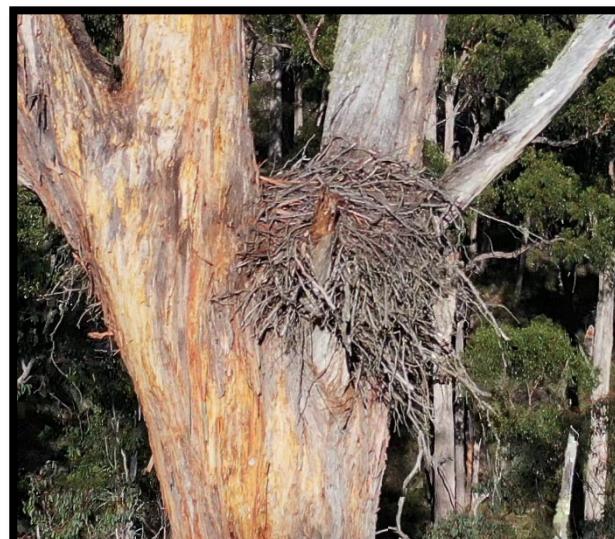
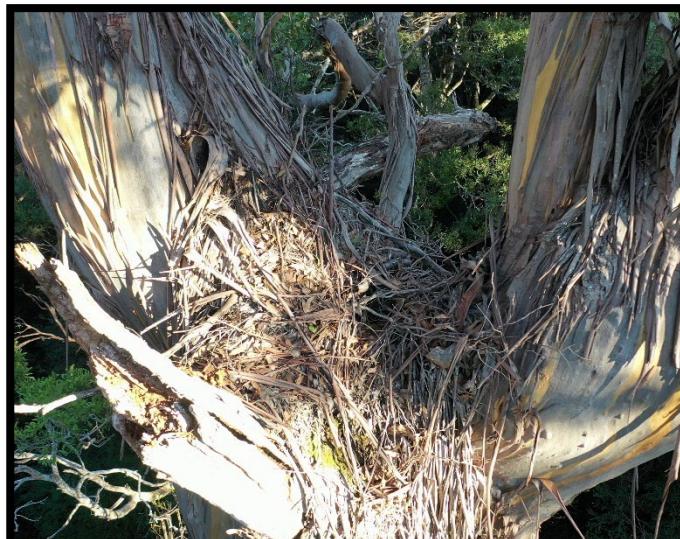
Yee, M 2022, 'Using Drones to Assess Eagle Nest Condition – Final Report', Technical Report 02/2022, Certification Branch, Sustainable Timber Tasmania.

15. Appendix. Examples of derelict nests

Examples of nests classified as derelict because they are slumping out of the tree.



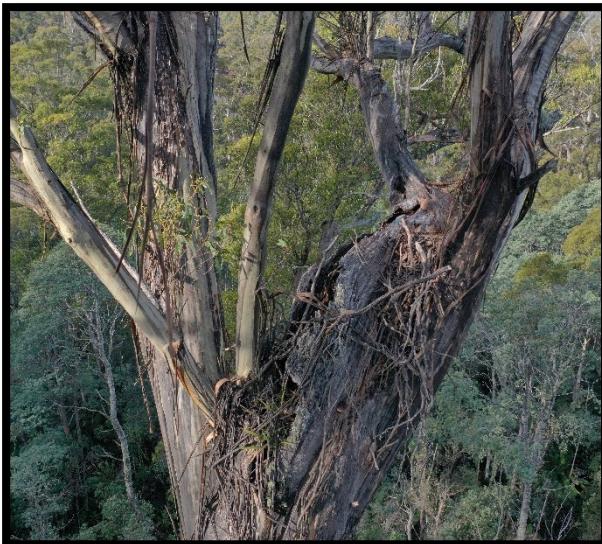
Examples of nests classified as derelict because they have a loose nest form indicating they have not been maintained for a very long time



Example of a nest classified as derelict because it is falling down due to the loss of a key support structure



Example of derelict nests that are only a remnant of a nest. These nests may soon become 'absent' nests



Example of derelict nest that has not been maintained for so long that the nest structure has completely gone



Example of derelict nest that has a large branch across the nest that means the birds can no longer use it



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