Monitoring the effectiveness of the biodiversity provisions of the Tasmanian *Forest Practices Code*

2013–14 summary report

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Report for the Board of the Forest Practices Authority and the Secretary of the Department of Primary Industries, Parks,Water and Environment

Hobart

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Disclaimers

The information presented is a broad overview of information considered relevant (by the authors) to the aim of this report. Whilst the authors have used best endeavours to ensure accuracy, they do not warrant that the material is free of error. Consequently, the information is provided on the basis that the authors will not be liable for any error or omission. However, should any error or omission be notified, the authors will use their best endeavours to correct the information.

Front page photograph: Checking pygmy possum nest boxes in wildlife habitat clumps (A Koch).

Acknowledgements

Many thanks to the large number of people that have contributed to the different projects mentioned in this report. The main collaborators are acknowledged in the relevant sections. The full project reports should be referred to for greater detail, ethics approvals, scientific permits and for information on the funders who have supported the projects. We have only supplied information on funders here if no other report or publication is available.

Special thanks to the people who have allowed us to include the results from their research, undertaken independent of the Forest Practices Authority, which provides information that can be used to assess the effectiveness of the *Forest Practices Code* provisions.

Citation

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1. Introduction

The overarching objective of Tasmania's forest practices system is to achieve sustainable management of Crown and private forests with due care for the environment. The sub-objective for the management of biodiversity is to conduct forest practices in a manner that recognises and complements the contribution of the reserve system to the maintenance of biological diversity, ecological function and evolutionary processes through the maintenance of viable breeding populations and habitat for all species (Forest Practices Authority, 2014).

The *Forest Practices Code* (Forest Practices Board, 2000) and associated planning tools deliver a variety of actions that aim to meet the management objective for biodiversity in areas covered by the system. The processes, policies and strategies involved are reviewed in Chuter and Munks (2011). These have been developed from a mixture of expert judgement, practical experience and the outcomes of research and monitoring.

Two types of monitoring are generally undertaken in forest management, and both are extremely important for determining whether conservation management strategies are working:

- Implementation monitoring (or monitoring of compliance) – used to determine whether prescribed management is actually conducted.
- Effectiveness monitoring – used to determine whether the management specified has achieved its objective and whether the outcome was actually a consequence of management.

The Tasmanian forest practices system follows an adaptive management framework which includes an emphasis on research, review and continuing improvement (Forest Practices Authority, 2014). It is widely recognised that ongoing research and monitoring is important for the scientific credibility of the Code's provisions applied in forest management plans (Commonwealth of Australia and State of Tasmania, 1997; Davies et al., 1999; Wilkinson, 1999). There is also a legislative requirement to monitor the effectiveness of Code provisions applied in forest practices plans (FPPs). The Tasmanian *Forest Practices Act 1985* states that, 'the Board must…assess the implementation and effectiveness of a representative sample of forest practices plans'. There is also an obligation to monitor the effectiveness of management actions for threatened species under Clause 7 of the procedures for the management of threatened species agreed with the Department of Primary Industries, Parks, Water and Environment (FPA and DPIPWE, 2014). With ongoing public scrutiny of forest practices in Tasmania, the scientific basis for particular management actions needs to be clear.

Information on the effectiveness of the biodiversity provisions of the *Forest Practices Code* was reviewed in 2012 (Koch et al., 2012). This review identified gaps and these were used as the basis for determining priorities for effectiveness monitoring of the *Forest Practices Code* (FPA, 2012). To identify priority monitoring projects, the management objectives and threats to values were linked with management actions. All threat/action pairs were assessed and ranked according to a range of attributes, such as the proportion of forestry operations or land area that may be affected, the effort to conduct effectiveness monitoring, the expected effectiveness of management, and degree of uncertainty about whether the management action is effective. This assessment was done both for the general *Forest Practices Code*

provisions for biodiversity and the specific management recommendations for threatened fauna delivered via the Threatened Fauna Adviser. See Box 1for the highest priorities for each group of management actions (FPA, 2012). Note that this assessment has not yet been undertaken for the management actions for threatened flora species or communities.

Each year the FPA attempts to implement a number of the priority effectiveness monitoring projects. The actual projects implemented depend on available funds, logistic considerations and staff/student availability.

This report summarises the findings from the projects worked on during the 2013–14 financial year. This report includes projects that have been implemented by the Forest Practices Authority in collaboration with other research providers. Projects implemented by other researchers have also been included if the results contribute information that can be used to evaluate the effectiveness of the actions implemented for biodiversity values, in areas covered by the forest practices system.

Box 1. Project areas identified as a priority to evaluate the effectiveness of the biodiversity provisions of the *Forest Practices Code* (FPA, 2012).

The priorities identified for monitoring the effectiveness of the general biodiversity-related code provisions are:

1. evaluate the degree to which the coupe dispersal guidelines limit the amount of harvesting within a subcatchment and thereby reduce impact on water flow;
2. determine the degree to which mature habitat availability is changing across the forest estate in Tasmania;
3. determine if the hygiene measures help prevent the spread of *Phytophthora cinnamomi ;*
4. determine whether significant habitat definitions for threatened species are adequate;
5. determine whether wildlife habitat clumps help maintain forest birds, hollow users, fungi and bryophytes in forestry areas;
6. determine whether the Mature Habitat Availability Map can be used to assess the availability of mature forest features (e.g. hollows and coarse woody debris);
7. determine the degree of mature forest connectivity across the production forest state;
8. determine whether water quality is maintained in streams under current management;
9. determine whether soil productivity is maintained over the long-term by current forestry practices.

The priorities identified for monitoring the effectiveness of the threatened fauna management provisions are:

1. assess the effectiveness of giant freshwater crayfish management recommendations for managing changes in stream morphology and water quality;
2. assess the effectiveness of skemps & burgundy snails management recommendations for managing loss of habitat;
3. assess the effectiveness of grey goshawk management recommendations for managing loss of foraging habitat;
4. assess the effectiveness of keeled snail management strategy;
5. assess the effectiveness of eagle management recommendations for managing breeding failure due to disturbance;
6. assess the effectiveness of grey goshawk management recommendations for managing loss of nesting habitat;
7. assess the effectiveness of swift parrot management recommendations for maintaining breeding habitat;
8. assess the effectiveness of masked owl management recommendations for maintaining potential nesting habitat.

2. Summary report on FPA effectiveness monitoring covered in 2013–14

2.1. General *Forest Practices Code* provisions for biodiversity

The focus of work done in 2013–14 that looked at the effectiveness of the general Code provisions for biodiversity were project areas 5 and 6 (Box 1).

2.1.1. Wildlife habitat clumps: survival

Wildlife habitat clumps are small patches of trees retained within or adjacent to harvested areas to assist in the *'maintenance of the habitat requirements of oldgrowth dependent fauna species, particularly hollow dependent fauna, and enhance(s) recolonisation of areas following harvesting*' (Forest Practices Board, 2000). The objective of wildlife habitat clumps can probably only be achieved if suitable trees are retained, and if the trees survive into the long term.

A long-term study was initiated by the FPA in 1999 to look at the mortality rates of trees retained within wildlife habitat clumps in partially logged areas (Duhig et al., 2000). Ten coupes were selected for study, and two to three clumps were established as monitoring sites in each coupe. All eucalypt trees over 10 cm dbh were measured and tagged. These trees were re-surveyed between 2005 and 2009. Between 2006 and 2009 control clumps where established near nine of the coupes (one coupe had no intact suitable forest nearby to use as a control).

In 2013–14 the study clumps were re-surveyed. Data analysis and writing up the results of the study will be done in 2014–15.

2.1.2. Wildlife habitat clumps: use by fauna

In 2007 a number of pygmy possum nest boxes were established by FPA researchers and an independent researcher (Don Hird) in one logged and one unlogged site in eastern Tasmania. At the logged site nest boxes were installed in two wildlife habitat clumps, one wildlife habitat strip, and two isolated trees. At the unlogged site the nest boxes were installed in two different areas of mature forest. These nest boxes have been examined intermittently since they were installed for the presence of nesting material and pygmy possums.

In 2013–14 FPA hosted a visiting overseas forestry student (Nora Ohlsen). As part of her work with the FPA Nora examine the use of the nest boxes by pygmy possums. The original aim of the study was to examine how pygmy possums use the harvested landscape and the retained areas, but issues with low capture rate and poor transmitter attachment resulted in little data. Data was collected, however, on the relationship between occupied nest boxes and surrounding habitat variables.

At the logged site 11 of the 17 nest boxes (65%) were found to have nesting material at some stage between 2007 and 2014. The nest boxes with nesting material were located in the wildlife habitat strip, in one of the two wildlife habitat clumps, and in the two isolated trees

that had nest boxes. At the unlogged site five of the 11 nest boxes (45%) were found to have nesting material. Nesting material was found in only one of the two areas that had nest boxes. The area where there were signs of nest box occupation was the area of wetter forest that had larger trees than the unused area.

The results of this pilot study suggest that pygmy possums will den in wildlife habitat clumps and strips retained in harvested areas if suitable habitat is available. A qualitative examination of data on nest box use and habitat variables suggests that increased vegetation cover around suitable denning sites increases the likelihood they will be used by pygmy possums (Figure 5). This study, while limited in data, supports previous work indicating that wildlife habitat clumps do provide habitat and enhance recolonisation of harvested areas as the surrounding forest regenerates.

This project was done in collaboration with Nora Ohlsen and Lisa Cawthen.

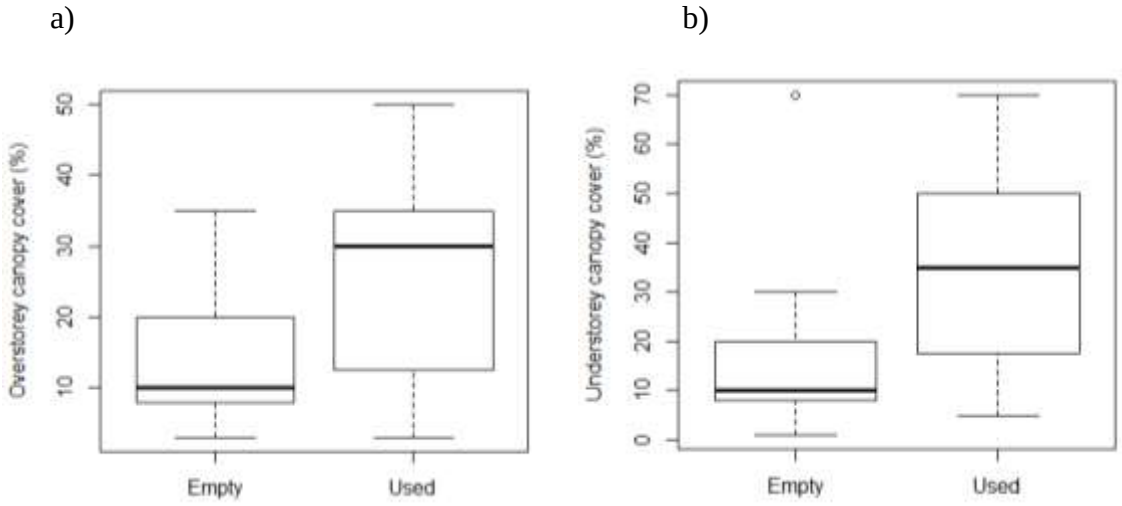

Figure 1. Boxplots of the (a) the overstorey and (b) the understorey cover in the 5 m around used (n = 16) and empty (n = 12) nest boxes. The box length is the interquartile range and the circles are outliers.

2.1.3 Value of a multi-spatial scale approach to habitat retention (bats)

The *Forest Practices Code* promotes a multi-spatial scale approach to managing biodiversity in timber production landscapes. An FPA-supported doctoral study on the effectiveness of a multi-spatial scale approach to forest management for bats was completed by Lisa Cawthen (UTas) (Cawthen, 2014). The thesis aimed to assess if retained forest provides suitable habitat for bats, thereby facilitating recolonisation of harvested areas and maintaining bat populations in timber production landscapes. A combination of radio-tracking and acoustic surveys was used to assess habitat use and species diversity by the eight species of bat found in Tasmania, all of which are dependent on tree hollows for roosting and forest habitat for foraging . This study found that individual bat species have different habitat preferences and use the landscape differently, particularly when selecting breeding habitat. It was also shown that small patches and strips of retained forest are more valuable in landscapes where mature forest is in low abundance (Figure 6). This study supports the use of a multi-spatial scale

approach to forest management for maintaining bat species and supporting breeding populations of bats in timber production areas.

The study was done under the supervision of Dr Stewart Nicol (UTas), Dr Bradley Law (NSW Forest Service) and Dr Sarah Munks (FPA). For details on the organisations that supported this research, see Cawthen (2014).

a)

b)

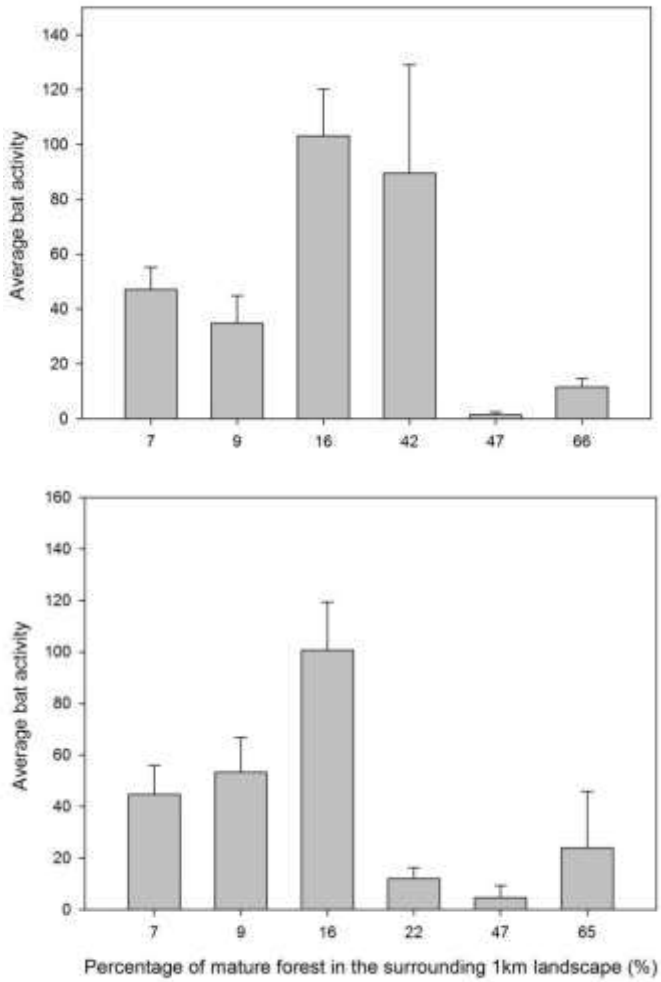

Figure 1. The relationship between average (± standard error) bat activity in relation to the percentage of the area that is comprised of mature forest in a 1 km radius around the site for (a) large strips and (b) small patches, as recorded between January and April

2.1.1. Assessing the effectiveness of the mature habitat availability map

The FPA mature habitat availability map is a planning tool designed to help FPOs manage this seral stage that is important for hollow-using species (including threatened species) (Forest Practices Authority, 2012). Knowledge of the accuracy of this map is important in order to determine the degree to which it should be used when making management decisions.

A doctoral researcher from the Australian National University, Dejan Stojanovic, published a paper in 2014 in collaboration with the FPA that examined the effectiveness of the mature habitat availability map for predicting the availability of hollow-bearing trees in dry

Eucalyptus pulchella forest in eastern Tasmania. The study found significant differences between the map categories in the number of potential hollow-bearing trees and number of potential hollows per tree (Figure 3). The study also showed that ground-based estimates of hollow availability over-estimate the actual availability of hollows, with only 5.1% of potential hollows observed from the ground being suitable for wildlife and only 12.5% of the trees assessed containing hollows suitable for use by wildlife (Stojanovic et al., 2014a). This study concluded that the map may be a useful management tool in the forest type studied, but only when considering larger spatial scales (Stojanovic et al., 2014a).

A similar study testing the accuracy of the mature habitat availability map for predicting the availability of hollow-bearing trees in wet *Eucalyptus obliqua* and *E. regnans* forest has been established by the FPA. Data collection is nearly complete. Data analysis and write-up will be completed during the 2014–15 financial year. Lisa Guia, Inger Visby and Jason Wiersma assisted with the field data collection.

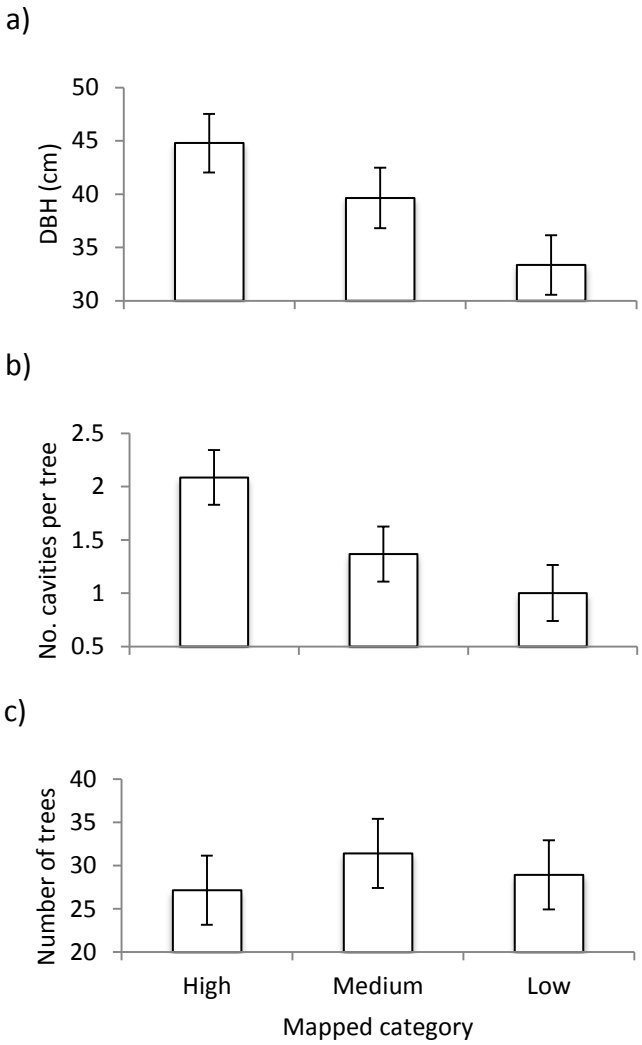

Figure 2. Predictions (± standard error) among mature habitat availability map categories (high/medium/low) from the statistical models produced in the original paper for: (a) diameter at breast height (cm), (b) number of potentially cavity bearing trees per transect, (c) number of trees per transect. These figures have been reproduced from the original publication in Austral Ecology.

Some research has also been done looking at how well the mature habitat availability map reflects use of the landscape by hollow-using species. Doctoral researcher, Lisa Cawthen (see section 2.2.1) examined the use of landscapes by bat species in Tasmania and showed that the higher categories of the map are used more frequently for roosting than is expected by their availability, but that areas in the lower map categories can still provide suitable habitat (Figure 4) (Cawthen, 2014). This research supports the use of the map for landscape-scale planning of habitat for hollow-using species.

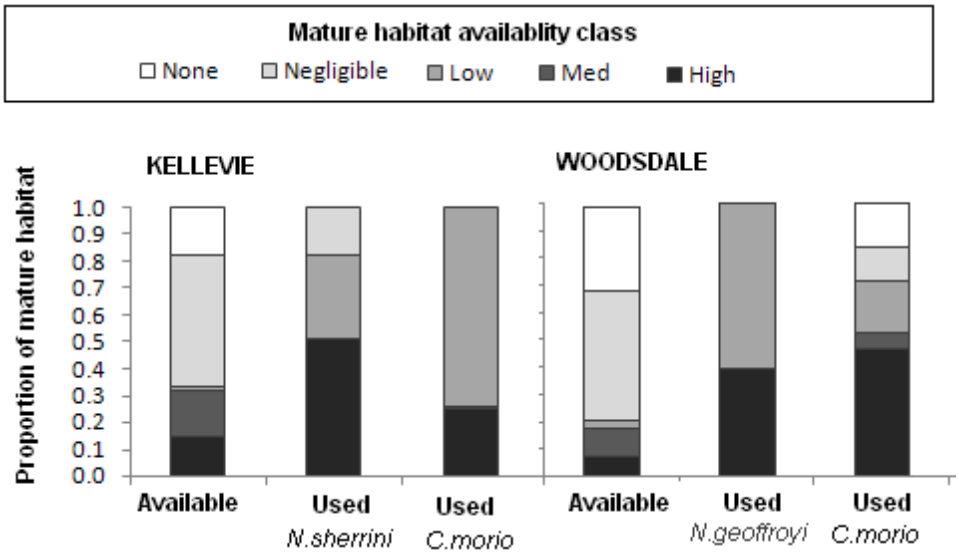

Figure 3. The location of roost sites for three bat species in relation to the mature habitat availability map category, compared to the availability of the map categories in that landscape.

2.2. Threatened fauna provisions

The focus of work done in 2013–14 that looked at the effectiveness of the provisions for threatened fauna species were project areas 4 and 5 (Box 1).

2.2.1. Keeled snail management strategy

A strategic management plan (Fauna Strategic Planning Group, 2006) was developed for the keeled snail following work done on the distribution and habitat requirements of the species in the 1990s (Bonham, 1997; Regan et al., 2001). The aim of the plan was to retain a contiguous network of native forest (including forest greater than 30 years of age) throughout the range of the species, particularly in areas of intensive plantation development. It was recommended that the network should cover a minimum of 20% of the range of the species to maintain viable breeding populations. The plan was referred to in the Threatened Fauna Adviser (FPA and DPIPWE, 2002).

Work on assessing the effectiveness of the strategic management plan for keeled snails (*Tasmaphena lamproides*) was started in 2013 (Bonham, 2013). The 31 sites sampled in the original study in 1992, in the Togari forest block in north-west Tasmania, were sampled again in 2013. From the data collected Dr Bonham concluded that there has been a slight reduction

in the population size over the last 20 years, even accounting for differences in survey effort, but the population is expected to persist under current management. As per the 1992 survey, the presence and abundance of keeled snails was lower in young native regrowth forest compared to mature forest (Table 1). This result suggests that focusing management on the older seral stages is appropriate. The presence of keeled snails in harvested but unburnt areas (Table 1) suggests it may be the regeneration burn which limits the presence of keeled snails in young native regrowth. However, snails were found in relatively young plantation areas (Table 1), potentially due to the relatively high rate of litter accumulation in these areas. This study concluded that keeled snails are being maintained under the current management strategy, although at slightly lower abundance than previously.

This work was done in collaboration with Dr Kevin Bonham. Ms Nora Ohlsen assisted with field surveys. To date no publication has been released on this project.

Table 1. The number of keeled snails found for the matched sites surveyed in both 1992 and 2013, indicating the growth stage of the forest at each time of survey. Numbers in brackets are estimated ages of the forest stands. # indicates the number of sites surveyed. Details are provided on the number of sites at which a keeled snail was found (pres), the number of sites at which a live keeled snail was found (live at), the number of individual keeled snails found TB = Togari Block, BT = Bond Tier. Live adult (LA), live juvenile (LJ), dead adult (DA) and dead juvenile (DJ).

1992	2013	#	1992							2013						
			Pres	Live at	LA	LJ	DA	DJ	Sum	Pres	Live at	LA	LJ	DA	DJ	sum
Mature (TB)	Mature (TB)	12	7	5	7	3	10	2	**22**	8	2	4	1	5	13	**23**
Regen (30)	Mature (TB)	2	1	1	1	0	2	0	**3**	1	0	0	0	0	2	**2**
Regen (7)	Regen (50)	1	0	0	0	0	0	0	**0**	0	0	0	0	0	0	**0**
Mature	Plantation (<5)	1	1	1	1	0	0	0	**1**	0	0	0	0	0	0	**0**
Mature	Plantation (>5)	3	3	1	0	1	7	1	**9**	2	2	2	4	0	1	**7**
Mature	Freshly logged	2	2	1	3	1	2	1	**7**	2	2	2	0	2	1	**5**
Mature	Regen	5	5	3	5	4	7	8	**24**	1	1	1	0	0	0	**1**
(Total TB)	**(Total TB)**	**26**	**19**	**12**	**17**	**9**	**28**	**12**	**66**	**14**	**7**	**9**	**5**	**7**	**17**	**38**
Mature (BT)	Mature (BT)	2	1	0	0	0	1	0	**1**	2	1	0	1	2	2	**5**

2.2.2. **Wedge-tailed eagle management actions**

FPA researchers continued the annual aerial monitoring of wedge-tailed eagle nest success in 2013–14. The rate of nest success in the 2013–14 season was found to be well within the range observed during the last seven years of survey (Figure 5) (Koch, 2013).

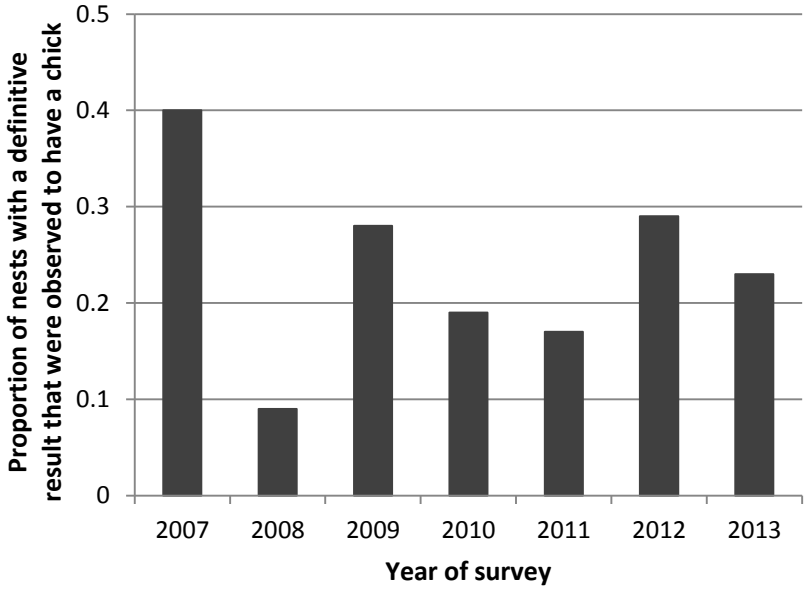

Figure 5. The rate of nest success (proportion of nests with a definitive result that had a chick) during the last seven years of survey. Note: sample sizes vary between years (n = 47, 47, 105, 104, 116, 169, 172 for the successive years).

In 2013–14 the FPA research biologist co-supervised a university honours student, Tierney O'Sullivan, who aimed to investigate the response of eagles to forestry activities during the breeding season (O'Sullivan, 2014). Observations at 12 active nests were conducted from bird hides established prior to the breeding season. Approach of the nest by the researcher was designed to minimise any impact on birds. However, despite the precautionary (and DPIPWE and ethics approved) field techniques used, the eagles were found to be extremely sensitive to pedestrians approaching the nest, with very high rates of flushing off the nest (Figure 6) and a high level of nest failure. The sample size was small and so the results are not conclusive, but the data suggests birds became more sensitive over time to this type of disturbance rather than habituating. This study confirmed that ground-based nest checks should be minimised wherever possible, particular at the times during the breeding season when the birds are most sensitive to disturbance. The original intent of the study was to examine the effectiveness of the 500 m management constraint zone around active eagle nests but the study was aborted before this could be assessed due to the impact on the birds. However, this study has paved the way for future behavioural work using different field techniques to commence in the next financial year.

Tierney used annual data from the Forest Practices Authority (2007-present) to determine if the timing of the breeding season and breeding success were influenced by climate, prey availability or road density. She found that breeding seasons tended to be later following

colder winters or wet springs. Breeding success was also lower following wetter springs, and where nest density in a three-kilometre radius (an estimated territory size) was high.

This project was done under the supervision of Prof Elissa Cameron (UTas), Dr Clare Hawkins (DPIPWE) and Dr Amelia Koch (FPA). Expert advice on species ecology and project design was provided by Mr Jason Wiersma (FPA). Financial support for the project was provided by FPA, Norske Skog, SFM and Forestry Tasmania.

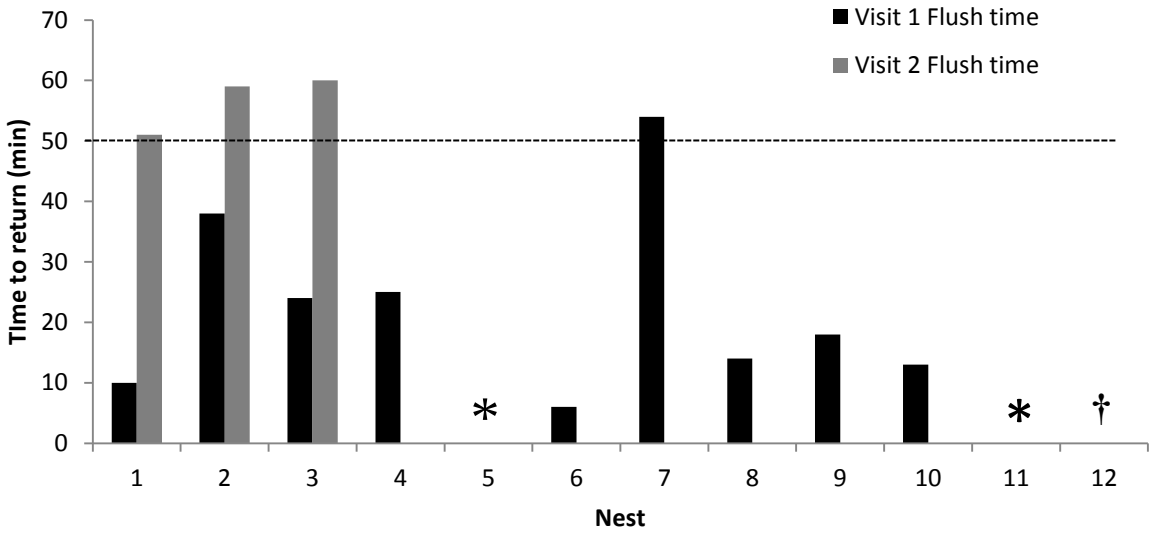

Figure 6. The time to return after flushing from the nest by Tasmanian wedge-tailed eagles for each survey visit. Nests marked with * indicates nests where the eagles did not flush during the approach, while † indicates that the nest was a nest failure by the first visit. The dashed line at 50 minutes corresponds to the threshold at the survey was to be terminated if the bird hadn't returned, so each bar that crossed this threshold represents the time observed off the nest, and the total time to return is unknown.

3. Other Tasmanian project outcomes that contribute to our understanding of the effectiveness of *Forest Practices Code* provisions for biodiversity in 2013–14

These studies have mostly been done independently of the Forest Practices Authority, but the results have either been published as a thesis or a scientific publication, so only a summary of the results relevant to the forest practices system are presented here.

3.1. General *Forest Practices Code* provisions for biodiversity

3.1.1. Forest retention measures to promote recolonisation

Forest retention is an important management approach used in the forest practices system to provide habitat for biodiversity and promote recolonisation of harvested areas (e.g. wildlife habitat strips and wildlife habitat clumps). A recent publication looked at the recolonisation by bryophytes of harvested areas in relation to the distance to mature forest, in wet forest

areas of Tasmania (Baker et al., 2013). Establishment of bryophytes decreased with distance from mature forest up until 50 m from the forest edge, after which the retained area did not influence bryophyte establishment. This study supports the use of forest retention measures in wet forest, such as wildlife habitat clumps and strips, to promote recolonisation of harvested areas by different biota.

3.2. Threatened fauna provisions

3.2.1. Quolls

The spotted-tailed quoll (*Dasyurus maculatus*) is an endangered marsupial carnivore. A PhD submitted in 2014 by Shannon Troy looked at the spatial ecology of this species. She found that the most suitable habitat for Tasmanian quolls occurs off-reserve (Troy, 2014), highlighting the importance of off-reserve management. She found that home range size increased with habitat loss and fragmentation, which suggests that quolls need larger areas to meet their resource requirements in fragmented landscapes. She produced a predictive model of suitable habitat for this species, and concluded that management of remnant forest in productive landscapes with high predicted habitat suitability may be an important management strategy for this species. This research has been used to inform and improve the range boundaries, habitat descriptions and management recommendations delivered through the forest practices system for this species.

This work was done under the supervision of Dr Menna Jones (UTas), Dr Chris Johnson (UTas), Dr Clare Hawkins (DPIPWE) and Dr Sarah Munks (FPA).

3.2.2. Swift parrot

The swift parrot (*Lathamus discolor*) is an endangered species that relies on tree hollows for nesting, and forages primarily on the flowers of *Eucalyptus globulus* and *E. ovata.* Management recommendations for this species in areas covered by the forest practices system are provided in the Threatened Fauna Adviser.

Recent research confirms that the location of breeding swift parrots in any given year is related to the occurrence of flowering, but the strength of the relationship varies between years according to how extensive the flowering is across the breeding range (Webb et al., 2014). This research emphasises the need to manage foraging and nesting habitat for the species throughout its breeding range, as is currently promoted by the management recommendations in the Threatened Fauna Adviser.

A recent publication has used cameras to monitor the fate of swift parrot nests, and found they are heavily predated by sugar gliders (*Petaurus breviceps*) (Stojanovic et al., 2014b). On mainland Tasmania a positive relationship was found between nest survival and increasing mature forest cover at the landscape scale (Stojanovic et al., 2014b). This research confirms the need for landscape-scale management of habitat for this species, and the need for retention of larger patches of intact habitat over smaller patches. This result supports the management approach recommended in the Threatened Fauna Adviser.

3.2.1. Mount Mangana stag beetle

The Mount Mangana stag beetle (*Lissotes menalcas*) is a threatened saproxylic beetle that is managed in areas covered by the forest practices system. A PhD was submitted in late 2013 that examined the biology and conservation ecology of this species (Yaxley, 2013). As part of this study some modelling was done to look at habitat use at the microhabitat, site and landscape scales. Results suggest that in unharvested areas beetles are more likely to occur in areas with a mature eucalypt element, while their presence in regrowth areas is probably influenced by logs retained from previous disturbance. This study supports the management of mature forest elements in production forest areas for the ongoing maintenance of habitat for this species.

4. Discussion and 2014–15 priorities

In 2013–14 there has been a strong focus on the importance of managing at multiple spatial scales. Several studies showed the importance of landscape-scale management of habitat for some values (e.g. for swift parrots and bats). In contrast a study on wedge-tailed eagle breeding behaviour showed the importance of fine-scale studies and management targeted to protect particular values (like nests). Several studies showed the importance of managing mature forest elements in the production estate (e.g. for bryophytes and saproxylic beetles), which may require a multi-scale approach to cater for the diverse requirements of different species. An important focus for future research will be to continue assessing whether the provisions of the forest practices system (off-reserve measures), in combination with formal reserves, ensure adequate management of habitat at a range of spatial scales and maintenance of viable breeding populations and habitat for all species across the landscape.

The study on the effectiveness of a forest block management strategy for keeled snails suggests that this scale of planning has been appropriate for this species. Planning tools are needed to facilitate planning at this larger spatial scale, and the limited research to date suggests the mature habitat availability map could prove useful in the management of habitat for hollow-dependant species. Further research is required to assess the value of landscape planning tools, and landscape-scale management strategies for other species.

The monitoring program for 2014–15 will continue to focus on the effectiveness of the multi-scale approach to managing biodiversity in the production landscape. Project areas 5 and 6 for the general Code provisions (Box 1) will continue to be the focus in 2014–15. Project areas 2, 5 and 6 (Box 1) will be the focus for the threatened species provisions. The priorities for 2014–15 are outlined below.

- Continue testing the accuracy of the mature habitat availability map for reflecting availability of tree hollows in wet forest areas.
- Complete the study examining the survival of trees retained in wildlife habitat clumps.
- Examine the effectiveness of skemps snail (*Charopidae* sp. “Skemps”) management, by re-surveying historic sites of this species.

- Examine the effectiveness of burgundy snail (*Helicarion rubicundus*) management, by re-surveying historic sites of this species and areas that were recently burnt by wildfire.
- Continue the work on eagle breeding behaviour and the effectiveness of management for this species.
- Model the habitat used by grey goshawks (*Accipiter novaehollandiae*) to assess the management approach for this species.

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