Corella, 2009, 33(3): 66-70

A SURVEY OF WHITE-BELLIED SEA-EAGLE *Haliaeetus leucogaster* NESTS IN TASMANIA IN 2003

SHAUN D. THURSTANS

Bluewings Ecological Consultants, P.O. Box 3065, West Hobart, Tasmania 7000
Email: s_thurstans@hotmail.com

Received: 30 January 2008

The Tasmanian Department of Primary Industries and Water maintains a database of raptor nests through its Natural Values Atlas for the purpose of nest-site management (the Tasmanian Raptor Nest Database). During late spring 2003, 79 of the 237 White-bellied Sea-Eagle *Haliaeetus leucogaster* nests then listed in the database were surveyed. Three nests were found to be misidentified and four new nests were located; these 80 nests apparently represented 40 White-bellied Sea-Eagle territories, of which 31 were occupied and 30 nests were active during 2003. Twenty-two recorded nests were found to have disappeared: 11 were lost through natural attrition, seven (i.e. 9% of total nests recorded) to human activity, and four to unknown causes. The results of this analysis suggest that there is a turnover of White-bellied Sea-Eagle nests, and therefore a need to conserve potential nesting habitat where replacement nests can be constructed.

INTRODUCTION

The White-bellied Sea-Eagle *Haliaeetus leucogaster* is listed as *vulnerable* on the Tasmanian *Threatened Species Protection Act 1995*, *threatened* under the *Victorian Flora and Fauna Guarantee Act 1988*, *endangered* in the South Australian *National Parks and Wildlife Act 1972*, and *migratory* under the Commonwealth of Australia *Environment Protection and Biodiversity Conservation Act 1999*. The main threats include loss and degradation of breeding habitat and human disturbance at nest sites, leading to reproductive failure, abandonment of traditional nests, enforced use of marginal sites, and/or increased competition with Wedge-tailed Eagles *Aquila audax fleayi*, and ultimately to population decline with the incremental loss of breeding territories (Marchant and Higgins 1993; Dennis 2004; Dennis and Lashmar 1996; Stokes 1996; Threatened Species Section 2006; Dennis and Baxter 2006). In coastal south-eastern Australia and Tasmania, these problems are particularly acute and apparently increasing in areas densely settled or frequently visited by humans.

Part of the Tasmanian Department of Primary Industries and Water's (DPIW) conservation and management strategy for the White-bellied Sea-Eagle is to maintain a database of raptor nests, including White-bellied Sea-Eagle nest sites (Tasmanian Raptor Nest Database, TRND). The aims of this study were: to visit a sample of nests recorded on this database, and assess whether nests were still present, actively being used for breeding in 2003, or affected by any disturbance or environmental change; to detect and correct inaccuracies in recorded nest co-ordinates; and, to investigate the current status of the White-bellied Sea-Eagle population in Tasmania at the time.

METHODS

The survey was carried out between 10 November and 15 December 2003, towards the end of the breeding season but before most chicks had fledged. Nests were visited under Forest Practices Board protocols designed to minimise disturbance to breeding pairs (Brown and Wood 2002). Approaches to the nest trees were avoided when it was evident that a pair was actively occupying a nest site. The status of each territory was defined as 'occupied' if adults or chicks were present within a two-kilometre radius from a known nest. 'Active' status was ascribed to nests that had signs of breeding activity, including the presence of adults, chicks on or adjacent to nests, and the presence of whitewash, green leaves, fresh sticks, feathers and prey remains in, and under, nests. Only one visit per nest was possible within the time constraints of this project. It was usually impractical to try to distinguish between 'active' nests (i.e. eggs or chicks) and 'occupied' nests (adults in residence, breeding not confirmed), so they are here combined as 'active'. Quick visits and the lack of knowledge of suitable vantage points meant that breeding success or productivity could not be assessed for most nests.

Locations of nests already recorded in the nest database were used as a guide to finding nests in 2003. Some positions had large error ranges, so searches were generally over an area at least 200 metres radius around the documented points. GPS co-ordinates were obtained as close as possible to non-active nests, and entered into the nest database along with the accuracy of the readings. Nests were classified as 'gone' when there was confidence that the entire area around a recorded nest had been searched, and there was no evidence of a nest. In some territories, error ranges of the original nest records may have been greater than 200 metres radius (many nests having been recorded before the advent of GPS technology and often from a verbal description of the location). Consequently, such sites, along with those where dense forest was present (and hence a nest might be missed, or GPS unit might not function properly), could not confidently be recorded as 'gone', so were categorised as 'not found'.

The number of occupied territories, as a proportion of all territories in a region, was not obtainable, because it could not be assumed with confidence that all nest locations were known. In most regions not all known nests were visited, owing to time constraints, difficult access to sites, or declined access permission from landowners. This limitation led to a bias towards more accessible nests (excluding, for example, offshore islands).

RESULTS

Seventy-nine White-bellied Sea-Eagle nests were checked out of the then 237 listed on the Tasmanian Raptor Nest Database. Three were found to be misidentified and four new nests were found. Forty territories were searched (many containing more than one nest), of which 31 were occupied, and within these 30 active nests were located (Figure1; Table 1). Most known nests were concentrated on the east coast and Tasman / Forestier peninsulas, with minor clusters of nests also on the north-west coast and the d'Entrecasteaux Channel / Bruny Island. These largely reflected survey effort.

The proportion of nests in the database that were found to be intact varied across regions, as did the proportion of known nests that had disappeared by 2003. The greatest proportional retention was on the north-west coast, the d'Entrecasteaux Channel / Bruny Island and Tasman / Forestier peninsulas, and the greatest loss on the east coast (Table 1). These data from the Tasman and Forestier peninsulas were obtained from an ongoing study, and because the nest-retention rate there was compared with that known only a year prior, it was expected to have a higher rate than other less intensively studied areas. Three recorded nests (two on the east coast, one on the north-

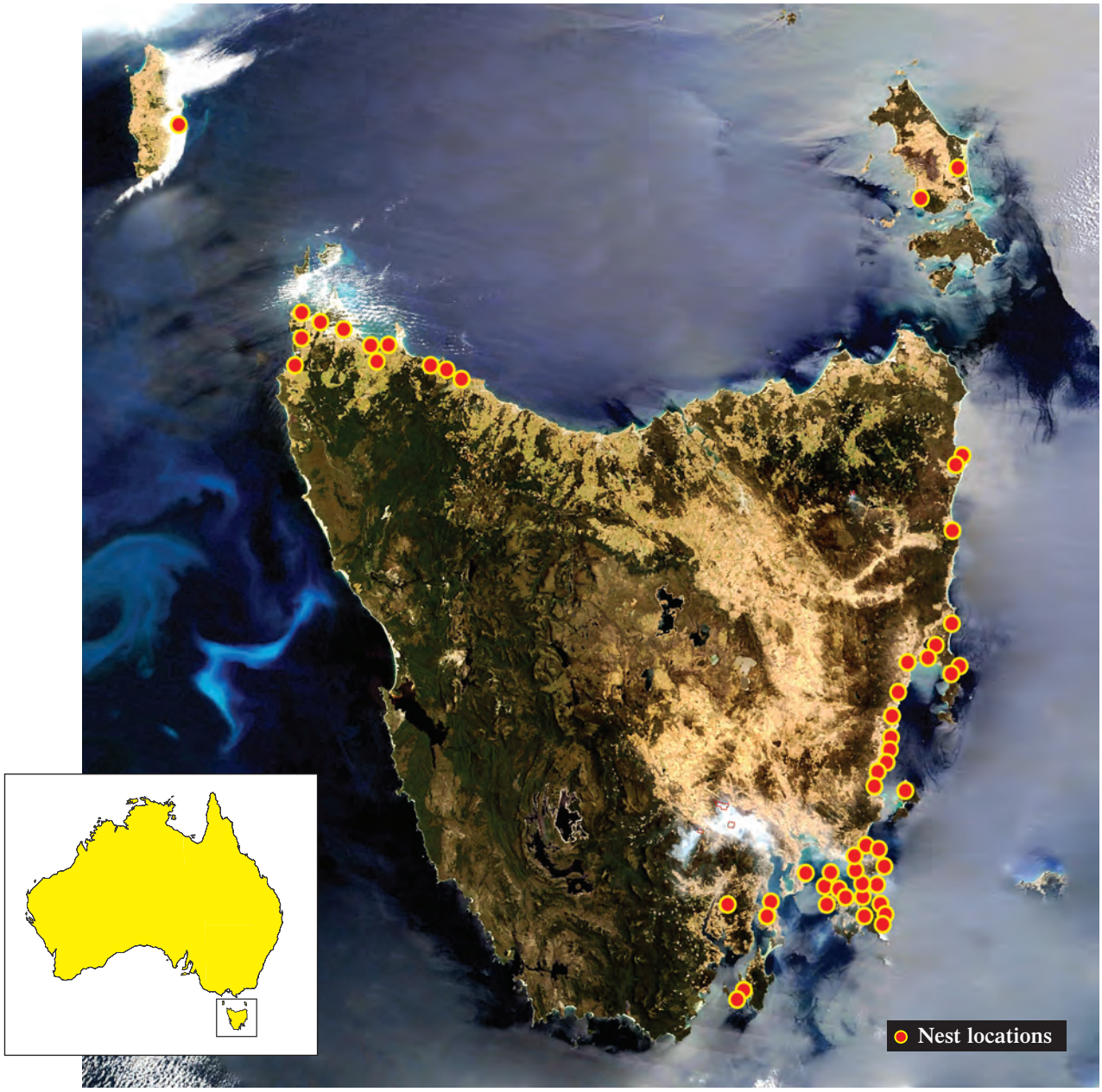

Figure 1. *Locations of assessed White-bellied Sea-Eagle nests. Image courtesy of NASA's Visible Earth.*

TABLE 1

Summary of White-bellied Sea-Eagle nest survey in Tasmania, 2003: number of territories assessed, number found to be occupied that year, number of nests assessed, number (%) found to be intact, number (%) disappeared, number of previously documented nests not found (but not definitely absent), and number of nests active (maximum one per territory).

Region	Territories		Nests				
	assessed	occupied	assessed	intact (%)	gone (%)	not found	active
East Coast	10	9	25	9 (36)	14 (56)	2	8
South Arm	1	1	1	1 (100)	–	–	1
Channel/Bruny Is	6	6	8	6 (75)	2 (25)	–	6
North-west Coast	7	7	19	13 (68)	4 (21)	2	7
Flinders Is	2	2	3	2 (67)	1 (4)	–	2
King Is	1	1	1	1 (100)	–	–	1
Tasman + Forestier Pen.	13	5	23	22 (96)	1 (4)	–	5
Total	**40**	**31**	**80**	**54 (68)**	**22 (28)**	**4**	**30**

west coast) were found to be either misidentified or built after an eagle nest disappeared at the site, and are excluded from Table 1; one was used by Grey Goshawks *Accipiter novaehollandiae* and two were probably nests of the Forest Raven *Corvus tasmanicus*.

Those nests that had definitely disappeared were assessed for possible reasons of attrition (Table 2). This information was sometimes apparent at the site, and other events were relayed by anecdotal evidence from local people. If no human disturbance was apparent, the cause was recorded as 'natural', as with those nests known to have blown down or where the nest tree had fallen over. In one case a known nest was abandoned after a new one was built at a new site in the same territory.

On mainland Tasmania, of 10 recorded territories on public land (in state reserves or informal reserves in state forest), nine were occupied in 2003 and the status of one was uncertain, as the known nest had disappeared. Of 24 recorded territories on private land, 14 (58%) were occupied in 2003, two (8%) were unoccupied (although they may have had unsuccessful breeding attempts before the survey), and the status of nine (38%) was uncertain as the known nests were inactive, had disappeared or the nest could not be found. In two cases a pair rebuilt on private land after their previous nests were lost through human activity, and in one case a pair rebuilt in an adjoining reserve after the nest on private land was lost as a result of human activity.

Of 14 recorded nests on public land of mainland Tasmania (excluding the Tasman and Forestier peninsulas), nine (64%) were active in 2003, four (29%) had disappeared (three for natural, one for unknown, reasons) and one (7%) could not be found. Of 39 nests on private land, 13 (33%) were active (two of which were unsuccessful), seven (18%) were inactive, 16 (41%) had disappeared (six for natural reasons, three for unknown reasons and seven for the human-related reasons listed in Table 2), and three (8%) were not found (one for natural reasons, two for suspected human-related reasons). Of the 22 recorded nests that had disappeared by 2003, half were attributed to natural causes, seven (i.e. 9% of total nests) to human activity, and four to unknown causes (5%, Table 2).

TABLE 2

Causes of disappearance of White-bellied Sea-Eagle nests in Tasmania, 2003.

Reason	Nests definitely absent	Nests not found
Natural (e.g. tree/nest fell)	11	1
Subdivision/residential development	2	
"Grazing, no regeneration"	3	
Land clearing (agricultural)	1	
Road construction	1	
Unknown	4	1
People roaming		2
Total	**22**	**4**

DISCUSSION

This study of 80 White-bellied Sea-Eagle nests found that 54 (68%) were still intact, 22 had definitely disappeared (28%) and four (5%) could not be found. Of those nests found intact, 30 (55%) were found to be actively used in the 2003 season. The rate of territories occupied was found to be 31 of 40 (77%), although a snapshot of this kind is not definitive in detecting whether nests or territories are inactive. The rate of activity may be different on some islands, where there are apparently both higher densities of territories and rates of activity. For example, on Hunter Island (up to 7 km wide and 23 km long) four of six Sea-Eagle nests were active, where food (Short-tailed Shearwaters *Puffinus tenuirostris*) was abundant and there was little risk of human disturbance (Skira 2001). Nesting sites may be less restricted on predator-free islands, where eagle nests can be situated on the ground (Marchant and Higgins 1993). Because the present survey did not cover offshore nest locations, it was biased towards areas with higher levels of human disturbance.

The key finding is the 28 per cent loss of nests known from 20 years of recording. Half of this loss was attributed to natural causes, which may reflect the selection of: older trees for nesting, with the consequence that these trees are more susceptible to fire damage (burnt-out bases), rot and attrition through senescence (thus increasing susceptibility to wind throw); remnant trees that are now more exposed than when they were part of an intact stand; or emergent trees that are more susceptible to lightning strikes (McEwan and Hirth 1979). With a further 31 per cent of nest losses recognised as the result of human disturbance, the overall loss suggests that a regular replacement of nests is necessary to preserve the current breeding capacity of the population. This finding counters the perception that nests are long-term fixtures and that focussing management on current nest sites is an effective strategy for the conservation of this species (and other similar species, i.e. Wedge-tailed Eagles).

Legislation reform is needed to better protect existing nests and potential nesting habitat. Currently, the *Threatened Species Protection Act 1995* only offers protection against 'disturbance' of a nest of a listed species where the nest is the subject of a conservation covenant or management plan. It is also an offence if found to be 'taking' or knowingly disturbing a listed species (disturbing to the point of desertion and the death of a chick could be deemed 'taking', but proving that the act was done 'knowingly' can make successful prosecution difficult). There needs to be stronger protection of all nests, which could avoid the type of incompatible development next to nest sites seen in this study, such as rural-residential subdivisions (two in the south and three in the Tamar Valley), industrial development cases, and a tourism development on the Tasman Peninsula. Of four White-bellied Sea-Eagle nests monitored for over 10 years on the Tamar River, only one is now viable (J. Wiersma pers. comm.).

Identifying the most useful potential nesting habitat for the species can be carried out by modelling areas with the same attributes as those selected by the species and the environment at existing nest sites (Thurstans 2009). This approach can lead to a very focussed area of land being protected, which provides the habitat elements needed to maintain the breeding capacity of the population.

Other elements of legislative change could include mandatory provision of nest reserves when land is developed, which, in conjunction with expanded coastal reserves, would provide a buffer from the encroachment into White-bellied Sea-Eagle habitat, as seen in a recent property boom. These types of legal protections provide more proactive solutions for conserving habitat, and can therefore prevent the need for compensation when development is belatedly denied, but the latter situation is also a necessary last resort. A proactive approach is necessary because a lack of suitable habitat for replacement nests will lead to a drop in the productivity of the population. This drop may not be immediately observable because there is a long lag-time in raptor populations between a decline in productivity and a decline in the population (Lamberson *et al.* 1992).

Other disturbance includes the human activity that goes with grazing, and the degradation of forest areas through poor management such as inappropriate fire regimes, wood-cutting and understorey removal. Modelling of nesting habitat could identify areas where efforts can be focussed to best conserve nesting habitat, perhaps through fencing to protect remnant patches of forest, a practice that can also benefit farm productivity (Walpole 1999).

The location and construction of walking tracks on the coast is another potential disturbance, as new tracks placed too close to nests can lead to their permanent abandonment (many of these tracks are unauthorised). Similarly, maintenance of tracks within the breeding season can also lead to disruption of breeding. There is a need to inform land managers and tourism operators and increase their awareness of the risk of disturbance to White-bellied Sea-Eagles, so informed decisions can be made.

The Tasmanian Raptor Nest Database was found to be incomplete, as can be expected of any biological database with gaps in geographical coverage, with inaccurate co-ordinates for several nests (many were recorded before modern GPS facilities) and a few misidentified nests. The dynamic nature of biological data such as raptor nests requires ongoing updating of the Tasmanian Raptor Nest Database. It would be useful to include a column in the database in which the year of first discovery could be entered. This facility would allow better judgement of the rate of nest turnover, and temporal comparisons (although not as definitive as regular surveys).

A snapshot like the survey described here has only limited value for assessing trends in the status and productivity of a population, so a more regular survey is required for accurate temporal comparison of the status of the nesting population. Such a survey regime should include a randomly chosen set of nests, visited three times in a season (two to ascertain incubation, and one at least six weeks into the nestling period, to ascertain the likelihood of fledging), to determine breeding success and the proportion of territories that are active. Such surveys can include airborne observation if nest positions are well known by the observers. Aerial survey by fixed-wing aircraft is highly effective and has many advantages over ground-based searches, e.g. more nests can be checked in short periods (Mooney 1988), but it can be less reliable for ascertaining the reproductive status of nests. False negatives can occur though, if single fly-overs are relied upon.

Education is a vital element in the effort to conserve the species. It raises the awareness of the needs of the species in the community, and in particular those groups that have disproportionate potential to disturb nests. Occasional confused records in the Tasmanian Raptor Nest Database, and dialogue with local naturalists, suggest the need for protocols for amateur and professional observers to maintain the reliability of the database and reduce disturbance at nests (cf. Mooney 1986). Well-meaning investigation of nests can stress breeding pairs, which can lead to abandonment of nesting attempts. Tourism operators have also led groups up to the base of nest trees, possibly unaware that this activity is detrimental to the breeding success of the eagles, and one standing camp has been built under a nest tree.

CONCLUSIONS AND RECOMMENDATIONS

The key finding of a turnover of nests used by White-bellied Sea Eagles suggests that a change in management of habitat is required. The important mechanisms for this change in management require a reform of the legislation relating to the protection of habitat of the species.

1) Legislation regarding the management of threatened species needs to be changed to include:

   - Greater protection of existing nests, so they remain viable.
   - Legal protection of potential nesting habitat, so there is available habitat for new nests to replace those that are lost to natural and human-borne causes.
   - Mandatory provision of nest reserves in large coastal land parcels.
   - Expanded coastal reserves, with the use of habitat modelling to identify key areas of potential White-bellied Sea-Eagle habitat.
   - A clear process for the avenues of compensation, if necessary, to maintain the integrity of habitat on private land.

2) A regular survey of White-bellied Sea-Eagle nests is required for accurate monitoring of the species in Tasmania and to keep the nest database up-to-date. Such a survey regime should include a randomly chosen set of nests, visited three times per season on a regular basis to allow a temporal comparison of breeding success and the proportion of territories that are active.

3) Educational material should be developed to raise awareness of the needs of the species, to make naturalists, scientists, land managers and tour operators aware of the danger of disturbance leading to nest abandonment. This should result in informed decisions on land that supports White-bellied Sea-Eagle nesting and roosting habitat.

ACKNOWLEDGEMENTS

Thanks to those who assisted and/or operated their own surveys which supplemented this snapshot of Sea-Eagle nests: George Crozier, Skye Jacob-Miller, Allyson Lawrence, Deborah Miller, Simon Plowright, Terry Reid, Andy Sculthorpe, Vanessa Shoobridge, Tom Terry and Andrew Welling. Thanks also to Dr Sally Bryant and the Threatened Species Section of DPIW for vital assistance and resources for this project as well as those who helped review drafts of this article: Bill Brown, Stephen Debus, Nick Mooney, Associate Professor Alastair Richardson and Jason Wiersma.

REFERENCES

Brown, W. E. and Wood, S. (2002). 'Wedge-tailed Eagles: nest activity checking'. Draft for comment only. *Fauna Technical Note Series* No. **16**. (Forests Practices Board: Hobart.)

Dennis, T. (2004). Conservation status of the White-bellied Sea-Eagle, Osprey and Peregrine Falcon on western Eyre Peninsula and adjacent offshore islands in South Australia. *South Australian Ornithologist* **34**: 222–228.

Dennis, T. E. and Baxter, C. I. (2006). The status of the White-bellied Sea-Eagle and Osprey on Kangaroo Island in 2005. *South Australia Ornithologist* **35**: 47–51.

Dennis, T. and Lashmar, A. F. C. (1996). Distribution and abundance of White-bellied Sea-Eagles in South Australia. *Corella* **20**: 93–102.

Lamberson, R. H., McKelvey, R., Noon, B. R. and Voss, C. (1992). A dynamic analysis of Northern Spotted Owl viability in a fragmented forest landscape. *Conservation Biology* **6**: 505–512.

McEwan, L. C. and Hirth, D. H. (1979). Southern Bald Eagle productivity and nest site selection. *Journal of Wildlife Management* **43**: 585–594.

Marchant, S. and Higgins, P. J. (Eds) (1993). 'Handbook of Australian, New Zealand and Antarctic Birds, vol. 2'. (Oxford University Press: Melbourne.)

Mooney, N. J. (1986). Sea-eagles' greatest problem is nest disturbance, says NPWS. *Fishing Industry News Tasmania* **9**(4): 39–41.

Mooney, N. (1988). Efficiency of fixed-wing aircraft for surveying eagle nests. *Australasian Raptor Association News* **9**: 28–29.

Skira, I. (2001). 'Hunter Island Fauna Survey 10–18 October 2001'. Unpublished report, (Nature Conservation Branch, Department of Primary Industries, Water and Environment: Hobart.)

Stokes, T. (1996). Helicopter effects upon nesting White-bellied Sea-Eagles and upon smaller birds at an isolated protected location (Eshelby Island, Great Barrier Reef, Australia). *Corella* **20**: 25–28.

Threatened Species Section (2006). 'Threatened Tasmanian Eagles Recovery Plan 2006–2010'. (Department of Primary Industries and Water: Hobart.)

Thurstans, S. D. (2009). Modelling the nesting habitat of the White-bellied Sea-Eagle *Haliaeetus leucogaster* in Tasmania. *Corella* **33**: 51-65.

Walpole, S. C. (1999). Assessment of the economic and ecological impacts of remnant vegetation on pasture productivity. *Pacific Conservation Biology* **5:** 28–35.