Fauna Technical Note No. 6:

Wedge-tailed eagle nesting habitat model

FPA
FOREST PRACTICES AUTHORITY

The Fauna Technical Note Series provides information for Forest Practices Officers on fauna management in production forests. These technical notes are advisory guidelines and should be read in conjunction with the requirements of the Forest Practices Code.

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

1. Introduction

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

Technical guidelines for FPOs and planners state that nest searches should be conducted in areas with a high probability of containing a nest, as determined by forest type, topography (slope, aspect and relief) and nearest neighbour distance (FPA 2006). Spatial models can be used to help practitioners identify areas likely to contain an eagle nest which should be searched prior to any forest operation commencing. Modelling of wedge-tailed eagle nest site characteristics started before the species was listed as threatened and has undergone steady improvement as new information has become available (Mooney 1988; Brown & Mooney 1997).

This technical note provides a brief overview of the latest version of the wedge-tailed eagle nesting habitat model (development and limitations) and explains how the model should be used for nest searches.

2. Model development

All wedge-tailed eagle nests listed in the Natural Values Atlas that had accurate locality records (<20m) and were located in areas mapped as forest (as determined from the TasVeg layer) were used in the construction of the wedge-tailed eagle nesting habitat model. Expert knowledge was used to select 10 habitat variables that may relate to eagle nesting sites and for which spatial data was available. The program MaxEnt was used to relate the habitat variables to the nest locality data. Model outputs were used to identify any habitat variables that were not contributing to model fit. These variables were iteratively removed until only variables contributing to model fit were included in the model. The final result is a map indicating the relative likelihood of nest occurrence across the state.

Experts agreed that the habitat variables associated with eagle nests may vary across the state, so three different models were constructed; (1) areas under 850 m elevation (excluding the north-west of the state), (2) areas higher than 700 m elevation (excluding the north-west of the state), and (3) areas in the north-west of the state. There was overlap between the low and high elevation models because nests in this altitude range vary in whether they are 'typical' of low elevation or high elevation nests. The north-west of the state was defined as including IBRA 5 region 'King' (excluding King Island) and the northern section of IBRA 5 'West' for areas below 250 m elevation.

The variables used in the final models largely related to the presence of mature crowns (which provide a structure in which nests can be built) and shelter from wind (e.g. aspect, wind protection index, morphological protection index).

For further details on model development and results, refer to FPA (2013).

3. Using the WTE nesting habitat model

The WTE nesting habitat model is a high resolution tool that forest planners can use when deciding where to concentrate eagle searches (Figure 1). The model is available via the Biodiversity Values Database on the FPA website. A shapefile of the model can be accessed from the Natural Values Atlas website (www.naturalvaluesatlas.tas.gov.au).

There are three components to the model; the low elevation model (L850), the high elevation model (G700) and the north-west model (NW). There is some overlap between the low and high elevation models and for these areas it is recommended that both are examined.

The different 'gridcode' values in the model indicate the relative likelihood that an eagle nest will be found in a particular area. For example, a gridcode value of '8' indicates a nest is very likely to be found (similar to a probability of presence value of 0.8-0.9), while a gridcode value of '0' indicates a low likelihood of finding a nest (probability <0.1). There is no set level at which nest surveys must be conducted, but the larger the search area the more nests are likely to be located.

Table 1 can be used to determine the gain (in terms of proportion of nests expected to be located) resulting from changes in effort (area to be searched). The three columns in Table 1 correspond to the three regions that were modelled separately. The information under 'forest nests' indicates the percentage of known nests (in the area covered by the model) that are located in the specified gridcodes. The information under 'area' indicates the percentage of the forested area that is classified as this or higher gridcodes. A worked example for interpreting the table is provided below.

It is evident from Table 1 that to capture most nests (70-80%), areas of gridcode '3' and higher should be searched. However, the model will be inaccurate in some areas, and on-ground information should be used to refine the search area. FPA Fauna Tech Note 1 (FPA 2006) can be used to identify potential habitat when conducting searches.

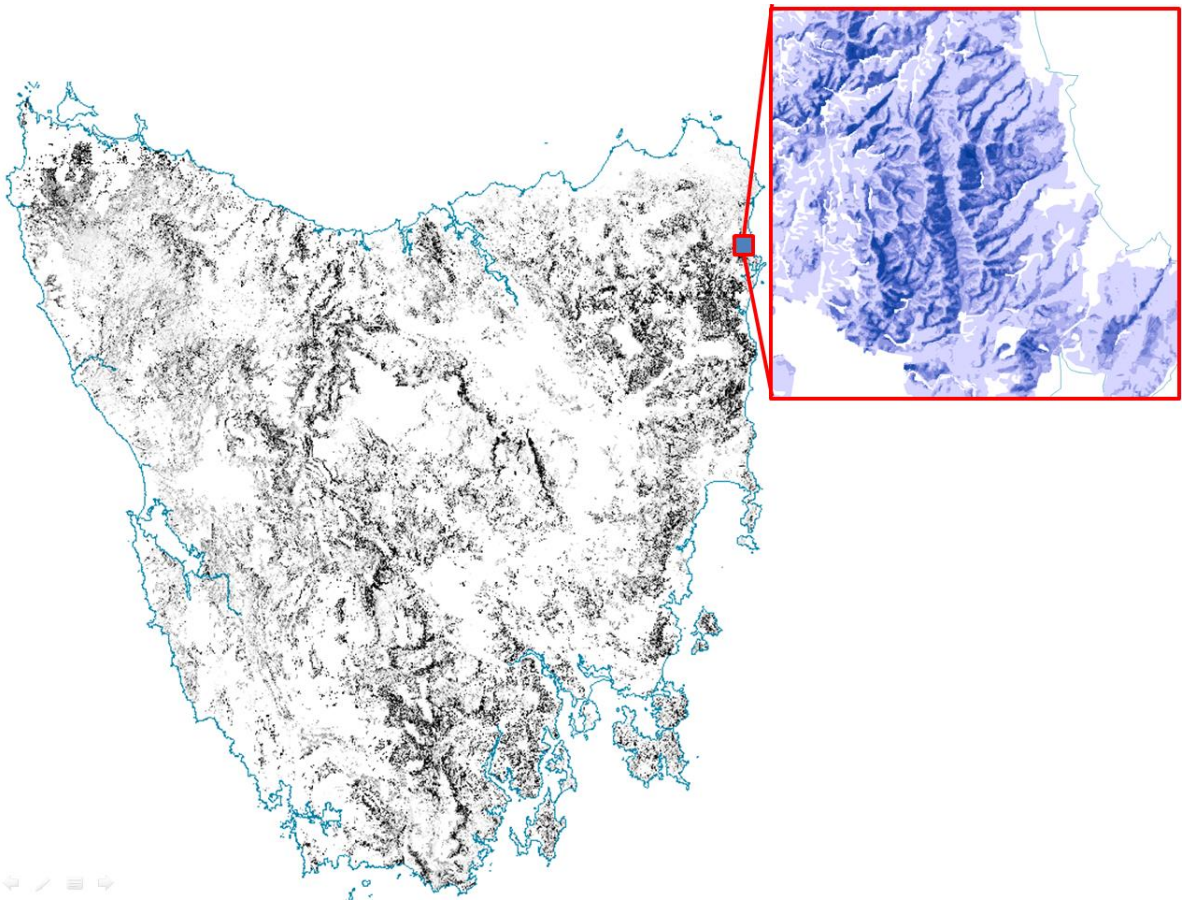

Figure 1. The wedge-tailed eagle nesting habitat model for Tasmania, darker areas have a higher likelihood of containing a nest. The insert shows the fine-scale nature of the model.

Worked example

A forest planner in the north-west has decided they have resources to survey about 20% of the planned area. In looking at Table 1 they can see that 20.5% of the area modelled in the north-west is classified as gridcode 4 or higher, and that by searching these areas they would be expected to find about 67.9% of nests. However, the planner wants greater certainty that they have found most nests, so they decide to look at areas mapped as gridcode 3 or higher, which should capture 78.6% of nests (and covers 32.8% of the north-west model area). When they look at the map for their particular planning area they are pleased to find that only 23% of the area is gridcode 3 or higher.

Table 1. The percentage of wedge-tailed eagle nests and the percentage of forest area captured by the model for the three study areas. Nests included were those that had accurate locality information (<20 m) and were located in areas mapped by TasVeg as being forest. The gridcode values are used in the mapping layers and correspond roughly to likelihood values, with higher gridcode values indicating higher likelihood of locating a nest. The '+' symbol indicates this gridcode value and all higher gridcode values.

Model	All areas of the State (excluding the NW)				NW of the State	
	Areas under 850m elevation (low elevation)		Areas over 700m elevation (high elevation)			
	Forest nests	Area	Forest nests	Area	Forest nests	Area
GRIDCODE	680 nests	3,156,724 ha	94 nests	646,692 ha	56 nests	170,834 ha
9+	0.0%	0.0%	0.0%	0.0%	1.8%	0.01%
8+	4.1%	0.2%	14.9%	0.4%	7.1%	0.6%
7+	25.9%	1.9%	28.7%	1.7%	25.0%	2.8%
6+	48.2%	5.0%	40.4%	3.7%	42.9%	6.7%
5+	62.2%	8.9%	48.9%	6.8%	53.6%	12.7%
4+	71.2%	13.4%	67.0%	11.2%	67.9%	20.5%
3+	79.6%	20.5%	71.3%	17.2%	78.6%	32.8%
2+	88.8%	31.8%	87.2%	25.7%	83.9%	49.9%
1+	95.7%	49.3%	95.7%	37.9%	89.3%	68.7%
0+	100%	81.4%	100%	68.8%	92.9%	86.0%

4. Limitations

- The map is a model. Like any model it is a representation based on the best available information. It will help locate most, but not all nests. As such it does not provide a definitive answer for which areas should or should not be searched for new nests.

- Most nests in the NVA were located during forestry activities and nest searches, and hence there is a bias in the nest locality data. This may create some bias in the predictive maps, but this bias cannot be addressed until greater searching for nests is done in reserves. The map is expected to be primarily used as part of industry activities and so the conservation implication of any bias is expected to be minimal.

- Older nests are likely to have lower accuracy, but changes in habitat selection may have occurred over time due to disturbance in the landscape. To cater for potential changes in habitat selection we used older nests despite a lack of knowledge about the accuracy of the locality records. The use of these nests may have had some impact on the model results, but the potential contribution of these nests was considered more important than the risk of not including them.

Further reading

Brown, W.E., Mooney, N.J., 1997. Modelling of Nesting Habitat of the Wedge-tailed Eagle (*Aquila audax fleayi*) in Tasmania. In, Unpublished Report to the Tasmania RFA Environment and Heritage Technical Committee, Commonwealth of Australia and State of Tasmania. Unpublished Report to the Tasmania RFA Environment and Heritage Technical Committee, Commonwealth of Australia and State of Tasmania, Hobart.

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This technical note has been prepared by Amy Koch (FPA). It should be cited as:

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1.0	26/6/14	Amy Koch	Finalise technical note after endorsement by the Board

Stages required for release outside FPA

Category of advice		**A2**
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