

### **Good conservation planning needs to acknowledge that the response of a species to changes in the landscape may be different in different regions.**

When it comes to conservation planning and the protection of habitat for a species it is known that 'more is better' – that's more habitat, less fragmented habitat and higher quality habitat. While that's fairly obvious, the real challenge is how does the amount, fragmentation and quality of habitat at different scales affect the persistence of a species? If this question can be answered by studying animals in one area, can you assume that the answer is the same for the same species everywhere else? Recently published research on koala populations across Australia suggests that habitat relationships and habitat thresholds are different in different areas. This has profound implications for landscape managers.

Conservation planners invariably require either targets for conservation attributes or models quantifying the benefit of different conservation actions. An important target for any species is the minimum amount of habitat needed in a landscape to ensure the persistence of that species.

Appropriate targets can be determined by identifying thresholds in the amount of habitat, below which persistence, abundance or occupancy declines rapidly. The benefit of conservation actions that change the amount of habitat, degree of fragmentation and habitat quality can be estimated using habitat models that relate these quantities to the abundance or occupancy of a species. In recent years predictive modelling of species' distributions has become an important tool for addressing these sorts of questions.

**“...conservation actions to conserve koalas will be different for different places. For example, the greatest conservation benefits may arise from targeting site-scale habitat quality in Noosa, landscape- and patch-scale habitat amount and fragmentation in Port Stephens, and stand-scale habitat quality in Ballarat...”**



*Koalas are leaf eaters, feeding on a wide range of eucalypts, but preferring mainly only a few species in any particular area. Koala habitat generally consists of forest associations containing their preferred tree species, although other factors, such as tree size, water availability and nutrient status can also be important to habitat quality. New research is suggesting habitat relationships and habitat thresholds for koalas are different in different areas.*

While identifying where a threshold might lie is a challenging task, conservation planning undertaken without taking into account possible thresholds can be a futile and counter-productive exercise. What's the point of setting aside an area of land for conservation if it is too small to ensure the persistence of the animal or plant you're aiming to retain in the landscape? Quantifying the response of species to landscape change is also important. What's the point in setting aside areas of habitat to minimise fragmentation if it is really habitat quality that is important for persistence of the species?

A particular species' response to landscape change is likely to vary from place to place due to differences in landscape characteristics, landscape history and land-use patterns. Responses may also vary spatially because of variation in demographic characteristics. This may also lead to variation in threshold responses (if thresholds exist). Understanding spatial variation in population responses to habitat change is particularly important for widely distributed species because demographic and landscape characteristics can vary a lot across their ranges.

Although some studies have identified habitat thresholds and numerous studies have quantified the relationship between different landscape attributes and species occurrence, we currently have little understanding of the extent to which they may vary from place to place. This is critical for establishing whether we can apply the same conservation planning rules across broad geographical regions.

In an effort to explore variations in thresholds and species-habitat relationships in different places, researchers at the University of Queensland, the Australian Koala Foundation, and the Department of Environment and Climate Change (NSW) analysed habitat-occupancy relationships for koalas in three study regions that span much of its geographical range (the research was part of an ARC SPIRT funded project). The regions were near Noosa in SE Queensland, Port Stephens on the central coast of NSW and Ballarat in central western Victoria.

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## **AEDA Info Sheet #2.3 (Nov 07)**

**Conserving species across different regions**

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Using a variety of statistical approaches the researchers first sought to identify habitat thresholds and to quantify the relationship between koala occurrence and the amount, fragmentation and quality of habitat in each region. They then tested whether these quantities varied among the regions.

They found evidence for threshold responses to habitat loss but that the threshold points varied, sometimes substantially, among the study regions. Noosa had the highest threshold points, followed by Port Stephens and then Ballarat. They also found that the most important habitat variables explaining koala occurrence varied among the study regions. There was some consistency in the importance of landscape context and tree species at the site-scale, but the importance of most variables showed considerable variation. These differences may relate to cross-regional differences in landscape history, land-use patterns and demographic characteristics.

This work suggests that appropriate habitat amount targets and conservation actions to conserve koalas will be different for different places. For example, the greatest conservation benefits may arise from targeting site-scale habitat quality in Noosa, landscape- and patch-scale habitat amount and fragmentation in Port Stephens, and stand-scale habitat quality in Ballarat. Also, minimum targets for native forest cover of around 60% in Noosa, 50% in Port Stephens and 30% in Ballarat may be sensible for conserving koala populations. This variation among regions means that we cannot safely transfer simple habitat relationships or targets from one region to another.

This work has profound implications for our ability to make general conservation prescriptions for widely distributed species. Future research should focus on understanding why these variations occur and on developing generic models capable of predicting how different species will respond to different landscape restoration actions.

### **Further reading**

The ideas presented in this AEDA info sheet are based on the papers:

Rhodes JR, Callaghan JG, McAlpine CA, de Jong C, Bowen ME, Mitchell DL, Lunney D, and Possingham HP (2008) Regional variation in habitat-occupancy thresholds: a warning for conservation planning, *Journal of Applied Ecology*, OnlineEarly Articles, Published article online: 14-Nov-2007, doi: 10.1111/j.1365-2664.2007.01407.x

McAlpine CA, Rhodes JR, Bowen ME, Lunney D, Callaghan JG, Mitchell DL, and Possingham HP (2008) Can multiscale models of species' distribution be generalized from region to region? A case study of the koala, **Journal of Applied Ecology**, OnlineEarly Articles, Published article online: 26-Nov-2007, doi: 10.1111/j.1365-2664.2007.01431.x

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