The Mount Lofty Ranges Woodland Bird Monitoring Program

Research Prospectus

We now have a deep understanding of the variability of bird abundance in the MLR system and can untangle the impacts of fire and management intervention from climate effects. If we did not have ten years of data any analysis of fire and management impacts would be confounded by interannual variability.

Background

The native woodlands that once covered the Mount Lofty Ranges landscape have been reduced to a tenth of their former extent. This dramatic loss of habitat has devastating implications for the many native birds that depend on it for survival.

The Mount Lofty Ranges Woodland Bird Monitoring Program provides a way to observe and understand the changes happening now across the landscape. With this information we have the best chance of taking action to reduce the decline of woodland birds in the region.

The monitoring program design and methods for data analysis were developed by a large research project undertaken by the University of Queensland and supported by grants from the Australian Research Council (ARC) and

Commonwealth Environmental Research Facility funds (www.aeda.edu.au) to Professor Hugh Possingham and other minor sources.

Currently, monitoring data is collected by a team of expert and volunteer ornithologists currently funded by the Mount Lofty Ranges NRM Board and coordinated by the Nature Conservation Society of South Australia. The data is subject to a rigorous quality assurance process before being added to a central database.

Data consists of 187 sites on both public and private land measured annually since 1999 (Figure 1). Surveys follow the standard Birds Australia Atlas method (2 hectares surveyed in 20 minutes). Attributes measured include; avian species, number, breeding activity, wind, temperature, precipitation and cloud cover. Sites include stringybark and gum woodlands with various patch sizes.

This data is publicly accessible from www.uq.edu.au/spatialecology/birds. In addition to bird population data, habitat condition information is collected at monitoring sites and can be used to further our understanding of habitat quality and its influence on woodland birds.

This prospectus provides information on the Woodland Bird Monitoring Program as a platform for the development of new research on ecological change and management impact.

Program management and funding

The ongoing monitoring program is managed by the Nature Conservation Society of South Australia in conjunction with the University of Queensland. A large number of experienced and trained field biologists continue to undertake annual surveys at low cost. Funding for program management and data collection has been provided by the AMLR NRM Board until 2013.

Program outcomes so far

The data has already been used in more than 15 scientific papers (see references). Earlier works used the monitoring program as a case study for explaining concepts of monitoring and outlining the requirements for detecting trends and meaningful changes in populations (Field et al. 2002, Tyre et al. 2003, Possingham et al. 2004, Field et al. 2005a). Several of these studies (Tyre et al 2003, Martin et al 2005, Field et al 2005a) involved the development of new statistical methods and have attracted numerous citations in international literature. The research component of the monitoring program is having a global impact on how we monitor biodiversity.

The program has led directly to improved methods for monitoring feral animals on Eyre Peninsula (Field et al. 2005b). It has also explored the most cost-effective ways to undertake scientifically robust monitoring (Joseph et al. 2006, Field et al. 2007), a pertinent issue for natural resource monitoring.

The long-term dataset now held by the program allows for studies to expand our understanding of the changes in bird populations in the Mount Lofty Ranges, including species richness and abundance (Possingham M.L et al. 2006, Possingham H.P et al 2006, Possingham et al. 2008, NCSSA 2010, Szabo et al. 2011) and the effect of landscape pattern on bird species distribution (Westphal et al 2003). Significant findings are detailed below:

- Several common bird species are declining significantly, including the Superb Fairy-wren and Brown Thornbill (Szabo et al. 2011).
- Those species that are increasing are generally large-bodied generalists, such as the White-backed Magpie, Rainbow Lorikeet and Grey Currawong (Szabo et al. 2011).
- Many birds have already disappeared from the region and results suggest that more specialist insectivores are likely to follow (Szabo et al. 2011).
- The total amount of area of native vegetation around a site was found to be the most important determining factor of bird species distribution (Westphal et al. 2003).

- The effect of landscape configuration was also found to be important for distribution of many bird species, with species responding negatively to landscapes with highly linear and isolated patches (Westphal et al. 2003).
- Revegetation programs in the region need to create landscapes with a mean revegetation patch size ranging from 780–4010 hectares in order to maximize the projected number of bird species present across all revegetated sites in the Mount Lofty Ranges landscape (Westphal et al. 2007).
- Same-day survey methods yield fewer species and underestimate total species richness. The different-day repeat survey methods capture significantly more species per unit of survey effort, and yield a higher richness estimate (Field et al. 2002).
- Single 20-minute visits to 2-hectare sites are a more efficient use of survey time than multiple independent 20-minute, 1 hour, or 2 hour visits for recording most species in 38 sites in Stringybark habitat. The additional time used for multiple samples would be better spent on increasing the number of sites surveyed to obtain a better representation of the habitat (Possingham et al. 2004).

Willie Wagtail

Magpie
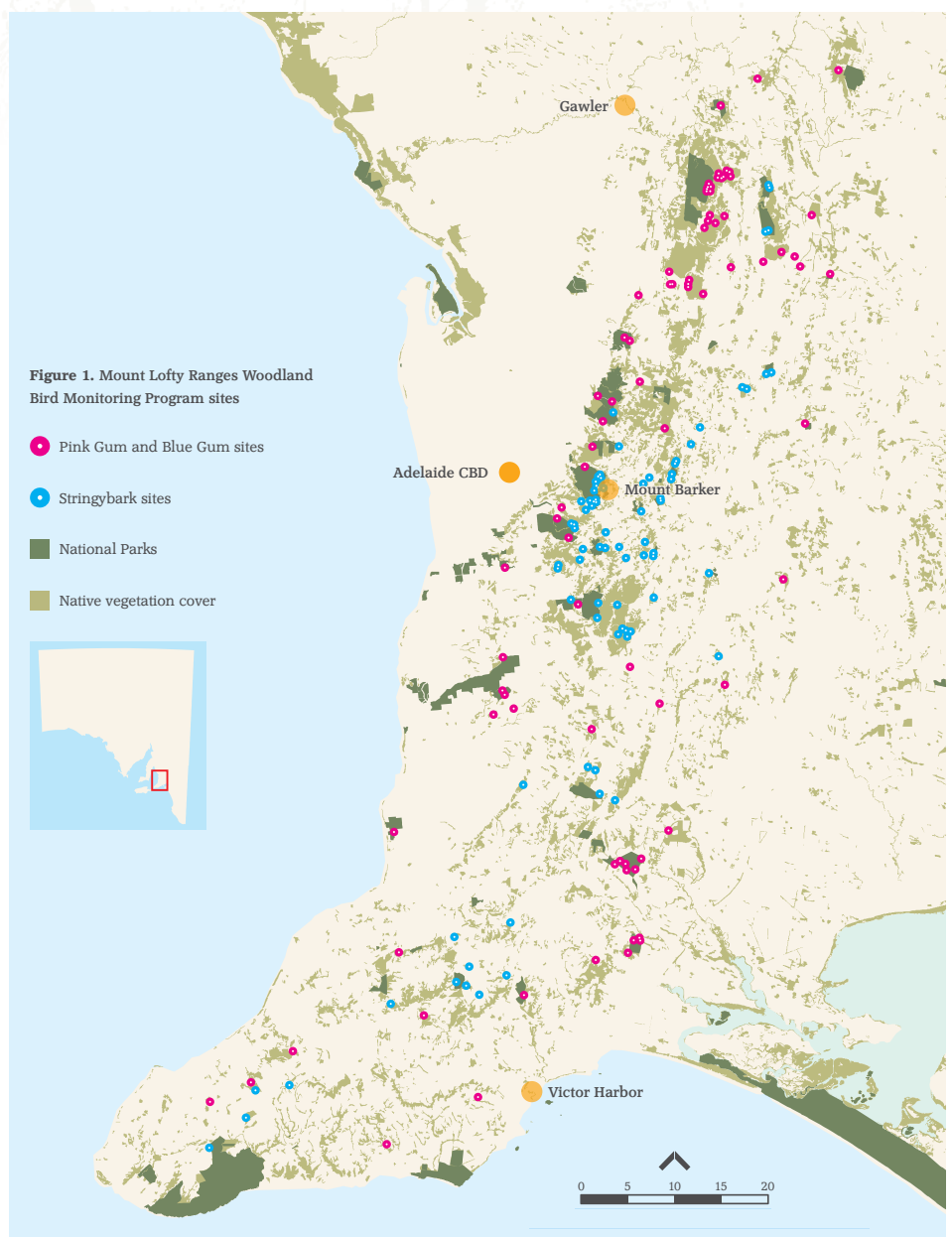
Monitoring program support

The monitoring program provides a strong program management, data collection and communication foundation for collaboration in new research activities.

The monitoring program can support research programs through:

- ongoing data collection in the current network
- provision of data for analysis
- communication on monitoring observations
- program and data management.

The program can also provide in-kind support for new research by providing:

- technical, design and analysis advice and collaboration
- assistance in drafting research proposals and preparing applications for grants
- an expansion of field and office resources of the current program (e.g. field surveyors, project management, office and equipment) where agreed.

Figure 1. Mount Lofty Ranges Woodland Bird Monitoring Program sites

- Pink Gum and Blue Gum sites
- Stringybark sites
- National Parks
- Native vegetation cover

Woodlands in the Belair National Park

Silvereye

Future research topics

Sadly, we know very little about the effectiveness of conservation interventions in Australia – or indeed overseas. This is because of a lack of rigour in monitoring, a lack of analysis and poor baseline data. The MLR Woodlands Bird Monitoring program provides an internationally significant opportunity to determine the impact of government investment at a landscape scale. For example, with expansion of monitoring and careful recording of interventions such as fire, weed management, predator control and habitat restoration, we will be able to determine return on investment from these actions. This is essential information for future investment here and across Australia's fragmented southern woodlands. Such work will require a stronger partnership with the state government environment department.

Whilst the data has already been used for multiple scientific studies, the monitoring program has the potential to be developed to further understand the impacts of management program on biodiversity in general and on bird populations and their distributions within the Mount Lofty Ranges. Key themes for future research around the core monitoring program include studies of the impact of:

- fire management
- fox baiting
- woody weed removal
- thinning of vegetation
- broad and local-scale habitat restoration
- urban development
- council restrictions on cats.

Further data collection and analysis would allow a greater understanding of:

- the priorities for protecting and restoring woodlands
- why small birds are decreasing and what can we do about it
- whether the effects of past changes to the landscape can be repaired
- whether revegetation, weed and fox control programs are a good investment
- what climate change is doing to our birds and ecosystems.

Example research opportunity

The following outlines the new data required to use the existing MLR Woodland Bird Monitoring Program to understand the impacts of fire management in the MLR.

Baseline data

- Background variability of bird populations from 10 years of survey data.
- Baseline vegetation condition measure at existing bird monitoring sites.

New data

- Add bird monitoring sites to areas to be burnt for 1–3 years prior to burns. Use existing monitoring protocols and add to current program dataset.
- Establish a nearby control site in an area which will not be intentionally burnt and monitor using existing protocols.

Or

- Add a monitoring site in areas which have been burnt and which are near to an existing program monitoring site. If an existing program monitoring site is burnt, add a non-burnt control (as similar as possible) as soon as possible. In all cases monitor both the burnt and non-burnt sites for at least 3 years. In all cases include vegetation surveys (focussed on vegetation structure) before and after burns, and 3–5 years after burning.

References

Field, S.A., O'Connor, P.J., Tyre, A.J. and Possingham, H.P. (2007). Making monitoring meaningful. *Austral Ecology* **32**:485-491.

Field, S.A., Tyre, A.J. and Possingham, H.P. (2002). Estimating bird species richness: How should repeat surveys be organized in time? *Austral Ecology* **27**:624-629.

Field, S.A., Tyre, A.J. and Possingham, H.P. (2005a). Optimizing allocation of monitoring effort under economic and observational constraints. *Journal of Wildlife Management* **69**:473-482.

Joseph LN, Field SA, Wilcox C, and Possingham, H.P. (2006). Presence-absence versus abundance data for monitoring threatened species. *Conservation Biology* **20**:1679-1687.

Martin, T.G., Wintle, B.A., Rhodes, J.R., Kuhnert, P.M., Field, S.A., Low-Choy, S.J., Tyre, A.J., and Possingham, H.P. (2005). Zero tolerance ecology: improving ecological inference by modelling the source of zero observations. *Ecology Letters* **8**:1235-1246.

Nature Conservation Society of South Australia (NCSSA). (2010). What is happening to the woodland birds of the Mount Lofty Ranges. *NCSSA Brochure* November 2011: 1-8. http://www.uq.edu.au/spatialecology/docs/Hughs_Bird_Files/POC868-Pamphlet.pdf

Possingham, H.P. (2008). Why monitor the woodland birds of the Mount Lofty Ranges? *Xanthopus* **26**:6-8.

Possingham, H.P., Field, S.A, Possingham, M.L. and Tyre, A.J. (2006). Monitoring woodland birds in the Mount Lofty Ranges. *Birds SA Newsletter* February 2006:1-4.

Possingham, M.L., Field, S.A. and Possingham, H.P. (2004). Species richness and abundance of birds in Mt Lofty Ranges stringybark habitat: 1999-2000 survey. *South Australian Ornithologist* **34**: 153-169.

Possingham, M.L., Field, S.A. and Possingham, H.P.(2006) Species Richness and abundance of birds in Mt Lofty Ranges stringybark habitat: Year 2000 survey. *South Australian Ornithologist* **34** (7-8): 244-257.

Possingham, M.L. and Possingham, H.P. (2008). Species richness and abundance of birds in Mt Lofty Ramges gum habitat: Year 2000 survey. *South Australian Ornithologist* **35** (3-4): 69-85.

Szabo JK, Davy PJ, Hooper MJ and Astheimer LB (2007) Predicting spatio-temporal distribution for eastern Australian birds using Birds Australia's Atlas data: survey method, habitat and seasonal effects. *Emu* **107**: 89-99.

Szabo, J.K., Veskc, P.A., Baxter, P.W.J. and Possingham, H.P. (2011). Paying the extinction debt: the woodland birds in the Mount Lofty Ranges, South Australia. *Emu* **111**: 59–70.

Szabo JK, Fuller RA and Possingham HP (in press) Volunteer bird counts can accurately estimate bird population sizes. *Ibis*.

Tyre, A.J., Tenhumberg, B., Field S.A., Niejalke, D., Parris, K. and Possingham, H.P. (2003). Improving precision and reducing bias in biological surveys: Estimating false-negative error rates. *Ecological Applications* **13**:1790-1801.

Westphal, M. I,, Field, S.A. and Possingham H.P. (2007). Optimizing landscape configuration: A case study of woodland birds in the Mount Lofty Ranges, South Australia. *Landscape and Urban Planning* **81**:56-66.

Westphal, M.I., Field, S.A., Tyre, A.J., Paton. D and Possingham H.P. (2003). Effects of landscape pattern on bird species distribution in the Mt. Lofty Ranges, South Australia. *Landscape Ecology* **18**:413-426.

Additional references

Field, S.A., Tyre, A.J., Thorn, K.H., O'Connor, P.J. and Possingham, H.P. (2005b). Improving the efficiency of wildlife monitoring by estimating detectability: a case study of foxes (Vulpes vulpes) on the Eyre Peninsula, South Australia. *Wildlife Research* **32**:253-258.

'The Mount Lofty Ranges is like a canary in a coal mine for Australia's woodland landscapes—what happens here is an early warning for Australia's other landscapes'

Professor Hugh Possingham