Department of Parks and Wildlife

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Science and Conservation Division

Understanding the responses of aquatic fauna to altered hydrology in Wheatbelt wetlands

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Background

As part of the State Salinity Strategy, the Department of Parks and Wildlife commenced a program in 1997 to monitor trends in biodiversity at 25 wetlands (later 28) across the Wheatbelt (Cale *et al.* 2004), including in the Natural Diversity Recovery Catchments (NDRCs). This program builds on the monitoring of depth and salinity in south-west wetlands conducted by the department since 1977 (Lane *et al.* 2013). Waterbirds, invertebrates, vegetation and wetland habitat characteristics have been monitored. The program was designed to investigate the ongoing effects of salinisation on the biota of representative Wheatbelt wetlands, but the data has also been used for other purposes, including state of the environment and regional reporting, monitoring effectiveness of wetland management (e.g. at Lake Warden, see below) and investigating particular conservation concerns. The current focus is to analyse and publish the collected data.

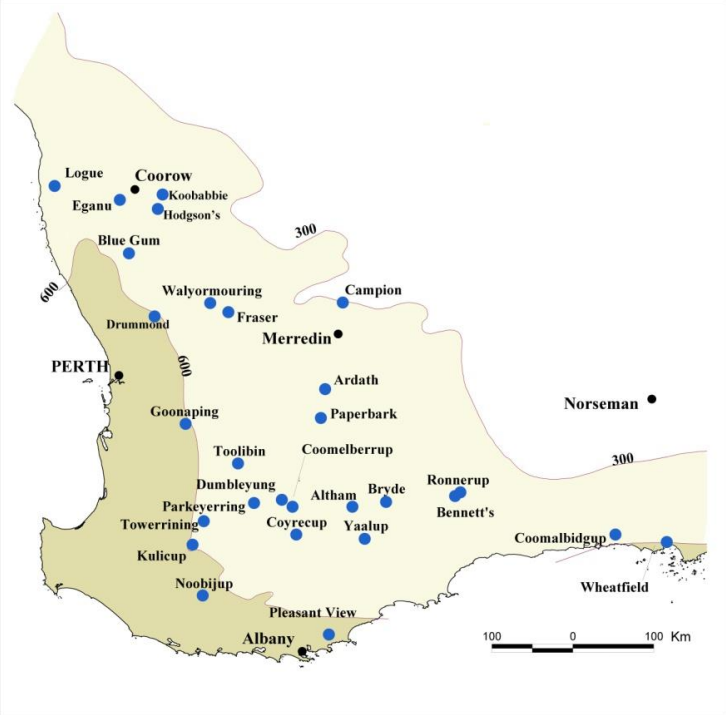

Figure 1. The 28 wetlands sampled for the Wheatbelt Wetlands Biodiversity Monitoring Program

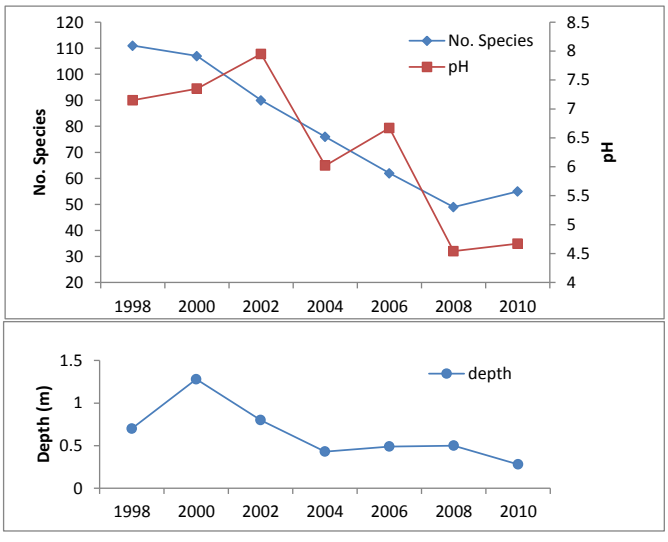

Figure. 2 Declining species richness at Noobijup Swamp as unprecedented low water levels result in acidifying chemistry

Findings

- This project has provided an unprecedented understanding of how climate and salinity drive the dynamics of biodiversity in representative Wheatbelt wetlands. With this knowledge we can assess the significance of observations in similar wetlands and predict consequences of land use changes, climate change and management.
- Some wetlands have been comparatively stable (especially fresh seasonal wetlands) while others have shown considerable inter-annual variability, but few have experienced significant directional change. An exception is Noobijup Swamp where an acidification event, associated with declining rainfall and groundwater tables, has resulted in a corresponding decline in

invertebrate richness (Fig. 2). Other wetlands are filling less frequently (e.g. Lake Logue) or are declining in depth (e.g. Kulicup Swamp), allowing us to examine the consequences of a drying climate.

- The data is providing an understanding of community resilience. For example, at Lake Bryde, following several years of mild salinisation, a filling event saw the return of a freshwater invertebrate fauna, including species whose eggs had probably lain dormant in the sediment waiting for a return to fresh conditions. Other species would have colonised from nearby fresher wetlands, showing the value of managing wetlands at a catchment scale.
- The program is also providing data with which to measure the effectiveness of catchment management, such as the pipeline to drain excess water from Lake Wheatfield near Esperance which has reduced depth of connected wetlands and contributed to increased shorebird abundance and diversity at Lake Warden (Fig. 3).

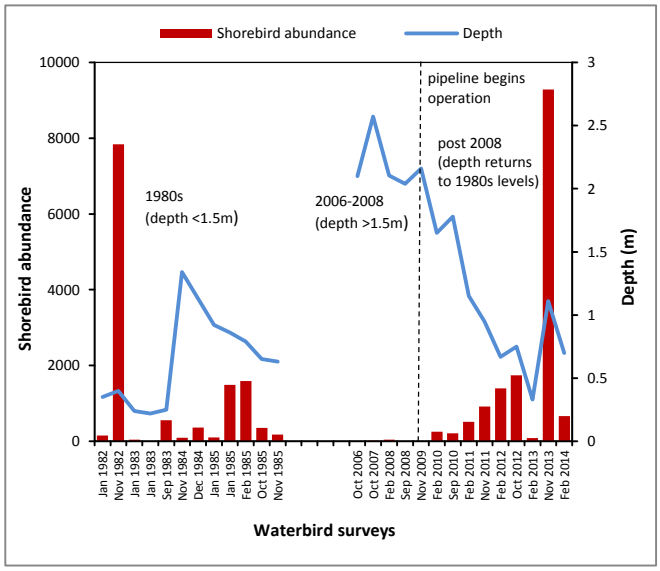

Figure 3. Abundance of shorebird species at Lake Warden has returned to 1980s levels following the installation of a pipeline to drain excess water from connected wetlands

Management Implications

- This project provides a medium-term dataset suitable for assessing the significance of changes to Wheatbelt wetlands and for a variety of other research and planning purposes.
- Our data contributes to identification of priority wetland assets, management targets and limits of acceptable change for planning processes (e.g. Drummond, Toolibin and Bryde NDRC plans).
- Monitoring at Lake Wheatfield in the Lake Warden NDRC has shown that simple engineering solutions to altered hydrology can result in rapid recovery of target wetlands while retaining values of others.
- Declines in superficial aquifers in areas with acid sulphate soils can impact upon aquatic biodiversity at least as much as salinization (e.g. Noobijub Swamp).
- High annual variability of invertebrate community composition partly reflects seasonal colonisation of species from outside a wetland and indicates that management of wetland suites is required to ensure the persistence of diverse communities for some threatened wetlands.
- Resilience in some mildly salinised wetlands will contribute to the success of remediation efforts, as demonstrated by results from Lake Bryde and Lake Wheatfield.

Cale DJ, Halse SA and Walker CD (2004) Wetland monitoring in the Wheatbelt of south-west Western Australia: site descriptions, waterbird, aquatic invertebrate and groundwater data. *Conservation Science Western Australia* **5**: 20-136.

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Robertson D and Massenbauer T (2005) Applying hydrological thresholds to wetland management for waterbirds, using bathymetric surveys and GIS. In Zerger A, Argent RM (Eds), MODSIM 2005 International Congress on Modelling and Simulation. Modelling and Simulation Society of Australia and New Zealand, December 2005.

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