Progress Report SP 2015-001

Advancing the hydrological understanding of key Wheatbelt catchments and wetlands to inform adaptive management

Wetlands Conservation

Project Core Team

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Project Team	granted
Program Leader	granted
Directorate	granted

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Context

Changes in the hydrology of Toolibin Lake and the Lake Bryde catchments, due to land clearing, has resulted in these previously ephemeral fresh water wetlands developing a connection with deeper, saline groundwater and becoming degraded. A decline in average rainfall since the 1970s has seen a further decrease in wetland health as surface water flows and wetland hydroperiods decrease in quantity and quality. Robust management decisions require the main hydrological driver(s) of change to be identified and spatial and temporal fluxes (water and solutes) to be characterised. This project will significantly advance hydrological studies at Toolibin Lake and Lake Bryde by making full use of the data collection and analyses undertaken to date to produce practical tools for answering the key hydrological management questions.

Aims

- To produce quantitative conceptual hydrogeological model(s) for Toolibin Lake and Lake Bryde;
- To produce a numerical groundwater model to assess the Toolibin Lake water balance and determine the effectiveness of groundwater pumping (individual pumps) in returning the lake to a perched status;
- To evaluate catchment water and salt hydrodynamics (groundwater and surface water contributions/fluxes) tested using numerical modeling under different climate regimes (Toolibin Lake);
- To investigate the links between key ecological parameters (eg, tree and understory health, bird breeding, richness of aquatic invertebrates) and hydrological status (Toolibin Lake); and
- To produce risk assessment framework(s) to prioritise conservation actions and assess the transferability of research outcomes.

Progress

- Uploaded over 200 hydrological datasets to the Parks and Wildlife Data Catalogue.
- Collected borehole geophysical data at Lake Bryde to assign aquifers to key bores and report on the spatial distribution of sediments as well as the quality of groundwater and soil water.
- Produced scientific reports detailing the achievements of the last 20+ years of hydrological investigations and monitoring.
- Developed rationalised, long-term hydrological monitoring programs for key wetland assets.
- Facilitated a handover of hydrological data collection and management to the Wheatbelt Region.
- At Toolibin Lake interpreted quality assured data to construct a quantitative conceptual hydrogeological model that is being tested numerically to assess the effectiveness of on-ground management actions.

Management implications

- Proposed activities, including numerical modelling, will provide a much firmer hydrogeological understanding of the threats to high conservation value assets associated within the conservation estate in catchments of interest to the Department.
- New hydrological informing tools will be available to managers to help them make decisions about how best to manage ephemeral wetlands, including maintaining, replacing or redesigning existing hydrology engineering infrastructure and species selection for re-vegetation programs.
- Archiving of Natural Diversity Recovery Catchment data in the Parks and Wildlife Data Catalogue will ensure that maximum value can be made of this high value resource into the future.

Future directions

- Develop a spatio-temporal conceptual model of deep-rooted vegetation resilience on Toolibin Lake and assess hydrological critical criteria that influence the success and decline of different plant species.
- Construct a solute transport numerical model to simulate changes in soil and aquifer water quality and examine results against quantitative conceptual models of changing soil condition and vegetation species resilience (Toolibin Lake).
- Archive Toolibin Lake hydrological modelling database to the Parks and Wildlife Data Catalogue.
- Complete remaining five reports, summarised as a Science Information Sheets, over period 2015-2018.