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Understanding peat wetland resilience: evaluating the impact of climate and landuse change on the hydrodynamics and hydrogeochemistry of peat wetlands in the Warren (Muir-Byenup) District

Wetlands Conservation

Project Core Team

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Approved and active

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Project Team	granted
Program Leader	granted
Directorate	granted

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Context

Peat wetlands are relatively rare in Western Australia but constitute an important habitat for biodiversity where they occur, especially in the far south-west of the State, providing refugia from seasonal and long-term drying for a range of restricted flora and fauna. Some peat wetlands in the Muir-Byenup Ramsar wetland suite are threatened by acidification and some have already acidified as a result of declining groundwater levels. Drying is also making these organic wetlands much more prone to catastrophic fires. The peat also stores a range of toxic metals and metalloids which are released to the environment as they dry. The major aim of this project is to undertake a risk assessment of fire susceptibility and release of acidity and other contaminants. The project will deliver a map of the distribution of at-risk peat wetlands, combined with recommendations for fire management and maintaining water balance.

Aims

- To determine current hydrogeological and hydrochemical conditions of four representative peat wetlands (eg water and chemical conditions and gradients)
- To map and quantify peat wetland carbon and acid stores
- To identify and assess the transient behaviour of major threats to the health of the peat wetlands studied (eg role of drying climate in changing water retention in peat sediments and the source and mobility of acidity and salinity)

Progress

- High resolution groundwater monitoring on shorelines of three wetland types showed that resilience was higher where wetlands were discrete in size, rainfall-runoff response was high and aquifers beneath the wetlands were less dependent on local recharge to maintain high (near surface) water levels.
- All wetlands studied had high carbon and acid stores, which were released during sequential wetting and drying of lake sediments, in both summer and winter months,
- Laboratory analyses of peat sediments confirmed they have sufficient buffering capacity to neutralise acidity, but acidity prevailed where changes in surface and groundwater hydrology resulted in lower water retention in the peat sediments.

Management implications

- It is likely that small changes in water balance make a significant difference to peat wetland health. Management of surrounding vegetation will impact water balance and consequently peat wetland health.
- Stores of organic carbon are significant to depths of ~1.5m and persist as wetland substrates dry. Understanding the spatial variability of carbon stores and rate of decline will assist in predicting fire risk.

Future directions

- Undertake mineralogical assessment of acidity to incorporate into hydrogeochemical models to assess affects of wetting and drying under the current climate and make predictions under different conditions.

- Develop a three dimensional understanding of the water, salt and acid stores in order to numerically model the spatial variability and identify wetlands (or areas within wetlands) where interventions are likely to be effective and the risk of peat fires reduced.