WaterSmart Dams

Vegetated dam

Introduction

On their mixed farming property near Boscabel in Western Australia's Shire of Kojonup, Brad and Sarah Ashton manage an 8.2 ML dam, that has surrounding native vegetation including sheoaks and paperbarks. As part of the WaterSmart Dams project, this trial evaluated how this natural solution helps water security and drought resilience. The farm-scale water management trial evaluated how vegetation at the site reduces wind turbulence across the dam, thereby lowering evaporation and saving water.

Objective

By capturing real-time environmental data and simulating scenarios with and without vegetation, the study sought to quantify whether strategic planting can serve as a viable, low-cost intervention to conserve water during extended dry spells.

This project is jointly funded through the Australian Government's Future Drought Fund (FDF) and the Western Australian state government's Agriculture Climate Resilience Fund.

Key Players

This project was conducted with the following partners:

- Ashton's Family – Landholders
- University of Western Australia (UWA) – Technical support
- Department of Primary Industries and Regional Development (DPIRD) – Technical support
- Grower Group Alliance (GGA) – Project management
- Southern Dirt – Grower group support

Challenges

While vegetation can reduce evaporation, it can also introduce practical challenges.

Thick vegetation may limit dam access for maintenance or inspections, and deep-rooted species near the dam wall can increase seepage or compromise structural integrity.
Vegetation also influences wind patterns reducing airflow, which can be beneficial for evaporation suppression but may also prevent helpful surface and deep mixing under certain conditions.

Solution & Approach

Floating on dam and fixed bank weather stations were installed to capture critical near-surface microclimate conditions. Depth sensors monitored water levels and temperature of the dam, including stratification.

Using this data, researchers simulated the dam's performance both with and without vegetation using the General Lake Model (GLM), isolating the impact of vegetation on evaporation loss.

Catchment Size: Water is supplied to the dam via a channel intercepting runoff from surrounding farmland.

Dam Dimensions

Capacity: 8,185m^3 (8.2ML)

Max depth: 6m

Mixed farming enterprise with a focus on sustainable water solutions.

A densely vegetated dam with a mosaic of fringing Melaleuca quinquenervia (broad-leaved paperbark) and predominantly Allocasuarina (sheoak) on the bank and surrounding land, with larger eucalyptus trees lining the outer basin; ranging from 2 to 20m in height.

The Process

01 Site instrumentation & data collection:

A hybrid floating pontoon and fixed-bank weather station was installed at the dam to record meteorological data, alongside water level and temperature (various depths) across 10-minute intervals, from 2023 to 2025.

The data captured seasonal variations and dry-season behaviour.

02 Simulation modelling:

The General Lake Model (GLM) was used to simulate dam performance under both vegetated and non-vegetated scenarios, helping isolate the specific impact of vegetation on evaporation.

03 Comparative analysis:

Data from real-world monitoring was compared with modelled outcomes, providing insights into how vegetation affects wind, stratification, and net water retention.

Rationale

Vegetation controls wind and thermal dynamics around farm dams, with nuance to the benefits of sheltering.

Overall water loss was significantly reduced, reinforcing vegetation as a valuable, evaporation control strategy.

Results & Insight

Over the six-month dry period, this vegetated dam (presuming initial full condition) saves 627,000 litres of usable water compared to unvegetated conditions:

- Vegetation reduced annual evaporation by ~29%
- Vegetation is most effective in Summer, reducing evaporation by 38% during that season
- It is less effective in Spring (28%), Autumn (19%) and Winter (15%) (evaporation reduction)

Under most conditions, fringing vegetation reduces evaporation by reducing wind speed, but can cause water stratification and higher surface temperatures:

- Very specific climate (wind) and water stratification conditions can cause short-lived high evaporation.
- Overall, vegetation was found to reduce evaporation by about 30%

Modelling the effectiveness of vegetation in different regions, found efficiency varied by ~4% from Hines Hill to Gardiner:

- Greater benefits in drier, windier southern regions
- Sheltering effects outweigh occasional high-wind evaporation anomalies

Take-home Message

Well-planned vegetation around your dam, especially in the prevailing wind direction, acts as a natural windbreak, reducing evaporation losses especially in hot, windy conditions. Vegetation can be a low-cost way to stretch your water further during dry spells.