Case study 2

Biodiversity

Predicting the impacts of climate change on biodiversity and ecosystem function in biodiverse shrublands

The Eneabba sandplain, located 300 kilometres north of Perth, Western Australia, is a world-renowned biodiversity hotspot, and supports native vegetation known as Kwongan — the Aboriginal word for low hard scrub and heathland. Kwongan of the Eneabba region is extremely diverse and contains many species, a large percentage of which are endemic to the region. As well as being biologically important, the area is popular among tourists and botanists who visit Eneabba during the wildflower season.

The sandplain soils have very low water holding capacity, and during the hot summer months dry out to considerable depth, rewetting in winter when rain falls. Many species survive the summer drought with deep root systems capable of accessing water held deep in the soil profile in unconsolidated aquifers, which recharge when winter rain falls. Other species are less reliant on groundwater and have alternative mechanisms for surviving Eneabba's hot and dry summers.

Since the mid 1970s, rainfall in south-west WA has declined, with less rain falling at the beginning of winter. The Indian Ocean Climate Initiative has attributed this in part to anthropogenic climate change, with further drying predicted to continue as greenhouse gases accumulate in the atmosphere. What impact will climate change have on the extraordinarily diverse plant species and communities that make up the Kwongan at Eneabba?

To answer this question scientists from the Department of Environment and Conservation, Murdoch and Edith Cowan universities, and The University of Western Australia have teamed up in a new project to investigate the relationship between climate, groundwater dynamics, plant ecophysiology and population dynamics (demography).

Specifically, the project will:

- quantify diurnal and seasonal patterns of water storage and distribution in the soil profile together with plant water use for a range of species in the Kwongan;
- quantify experimentally the effects of decreased winter rainfall and increased daytime temperatures on plant species' ecophysiology and demography to identify critical climate thresholds;
- analyse the evidence for climate-driven range contraction during the past 30 years among plant species of the Kwongan;
- develop and calibrate models linking climate soil water dynamics, plant water use and demographic response to predict future climate change impacts.

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