

ENVIRONMENTAL HYDROLOGY AND STYGOFAUNA IN THE JEWEL CAVE KARST SYSTEM, SOUTHWESTERN AUSTRALIA

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ABSTRACT

The Jewel Cave karst system comprises extensive watertable maze caves developed within a shallow aquifer in coastal Quaternary dune limestone, Southwestern Australia. The karst system supports a groundwater-dependent fauna community associated with submerged tree roots in caves. These aquatic root mat communities are listed as Critically Endangered due to declining groundwater levels, which have dropped > 1 m during the previous 22 years. Southwestern Australia is a region notable for a prolonged and significant decrease (20%) in winter rainfall over the period since 1968, although rainfall in the study area decreased only 1% over the same period. Groundwater recharge to the karst aquifer does not occur during every winter season, and is dependent on rainfall intensity and antecedent conditions. Groundwater pumping and tree plantations have not contributed to the watertable decline as earlier implied.

Mean groundwater recharge rates decreased 29% after 1979-80, corresponding with a significant change in fire regime within the karst catchment - fire frequency decreased from an average 4.3 fires per decade to less than 0.5 fires per decade.

The virtual absence of fire during the previous 25 years has allowed a dense growth of understorey vegetation and accumulation of ground litter, which through interception and evapotranspiration of rainfall, is hypothesised to be a major contributing factor to the watertable decline.

A prescribed burn will be undertaken and the effects of fire treatment on groundwater recharge will be investigated with BACI monitoring of rainfall, leaf area index, ground fuel load, soil moisture, infiltration rates and watertable response.

The distribution of the threatened ecological community has been extended from a single locality (10m² area) to multiple localities (> 2km² area). Species in the threatened ecological community either do not have an obligate dependence on tree roots for survival, and/or occur widely in other groundwater and surface habitats, which has important implications for conservation management.

The ecological requirements and conservation status of the groundwater communities are reviewed, and management strategies suggested.