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The Impacts of Climate Change and Variability in the Murray Hotham Catchment, Western Australia

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The Earth's climate is changing as a result of natural variability and the enhanced greenhouse effect. This may have serious implications for water resources at a regional scale. In the South West of Western Australia changes in the rainfall pattern have been observed, with noticeable consequences for streamflow. This study aimed to quantify how rainfall patterns have changed in the Murray Hotham Catchment during the last century, and how the catchment has responded o this change. It also aimed to investigate how projected future change in climate characteristics may influence catchment processes.

Rainfall and streamflow data were compared from pre-1975 to post-1975, when a step change has been observed in other parts of the South West of Western Australia. A 10% to 17% reduction in mean annual rainfall was observed, with less very wet years occurring after 1975. This was accompanied by a seasonal shift in rainfall, with a large decrease in autumn and early winter rains, and a much smaller increase in spring and summer rains. No clear trend was observed in the occurrence of extreme rainfall events. The reduction in rainfall caused a much larger reduction in annual streamflow, from 42% to 70% at two gauging stations. The dramatic reduction demonstrates the extreme sensitivity of streamflow to changes in rainfall, soil storage deficits and the threshold of runoff production. Flood frequency analysis indicates the probability of extreme flows may have decreased.

Following investigation of past change, the Land Use Change Incorporated Catchment

(LUCICAT) was calibrated and down-scaled rainfall from a regional climate model, run under the A2 emissions scenario, was used to investigate the impacts of future climate variability. Some problems were encountered in downscaling the present (1975-2004) and projected future (2035-2064) rainfalls. Rainfall was projected to decrease by around 13% in the future scenario, with corresponding 49% decrease in streamflow. Salt load was projected to decrease by 30% due to the slowing of saline groundwater rise.