



Development of a Method to Map Sensitivity of Groundwater Dependent Ecosystems in Victoria

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Executive Summary

An outcome of the 1994 Council of Australian Government's Water reform framework was that water allocation planning is required to protect ecosystems, including Groundwater Dependent Ecosystems (GDEs) that have an important function or conservation value. The unprecedented dry conditions from 1997 to 2009 have highlighted the significant role that groundwater plays in maintaining many natural systems. It is important to understand the sensitivity of ecosystems to different stresses. GDE sensitivity includes impacts of changes to water levels, chemistry, recharge, or discharge volume. GDEs may be altered by indirect or direct effects of climate change, changes in surface water management, groundwater pumping for water supply, changes in water quality, or land use changes.

This project phase developed a methodology based on available data for assessing potential sensitivity of the GDEs to perturbation of the hydrologic system. This project phase successfully integrated species tolerance modelling with the Victoria-wide GDE mapping. The species tolerance model provides a basis for assessment of GDE sensitivity.

Mixed results were obtained from calculations of the change in NDVI between summer 1995 satellite data (pre- 1997-2009 drought; high water table) and summer 2002 satellite data (mid-1997-2009 drought; low water table). The calculated value is sensitive to image dates, as expected, so care needs to be applied to comparing values between zones. Furthermore, the calculated values are sensitive to local spatial and temporal climatic effects such as recent precipitation. However some general trends were seen in the two trial areas, the Portland Groundwater Management Area (GMA) and the Upper Loddon Water Supply Protection Area (WSPA).

A number of potentially significant GDEs were noted in the Portland GMA region. Of these, the potential GDE areas at the periphery of Condah Swamp and Lake Condah, along Condah Drain, and along the upper part of the Eumeralla River are considered highly sensitive due to the species tolerance model values, the relatively high groundwater extraction, and the declining groundwater levels in the lower mid-Tertiary aquifer. Areas of possible moderate sensitivity to change for GDEs include the Crawford River catchment and the lower Fitzroy River. The Shaw/Moyne River areas should be considered potentially moderately sensitive to change until greater understanding of the relationship of the hydrogeologic system and GDE locations is obtained. Coastal areas, although potentially including GDEs, do not generally show groundwater level trends indicating negative effects of climate change or groundwater usage.

Few potential GDEs are mapped in the Upper Loddon WSPA but the sensitivity evaluation suggests possible narrow, unmapped GDEs may be located along a number of incised creeks. NDVI difference values suggest these areas often had considerably lower NDVI in 2002 than in 1995, even though surrounding agricultural land shows higher NDVI values. The Upper Loddon is generally an area of groundwater recharge but local to intermediate scale groundwater flow systems are likely present and may support GDEs. These flow systems are probably less resilient to changing recharge or competing groundwater use than regional scale flow systems. Thus, remaining potential GDEs, although small, appear sensitive to perturbation.

The study should provide an initial basis for incorporating GDE considerations into water resource policies. The methodology is generally applicable to other areas. It is recommended that the trial area results of this study be evaluated to determine if sufficient concern regarding sensitive GDEs exists for follow-up.

Ultimately, field study is needed to make more definitive statements regarding the presence and sensitivity of GDEs. This study serves to identify locations of potential concern within the trial areas and presents a viable methodology to apply to other areas of interest. The results indicate further method testing and refinement would be productive.

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