



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

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Author(s): P. Evan Dresel, Matthew White<sup>2</sup>, Hanna Zydor, Peter Griffioen<sup>3</sup>, Rob Clark, Mark Reid

Department of Primary Industries  
Future Farming Systems Research Division,  
Epsom, Victoria, Australia

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<sup>2</sup> Arthur Rylah Institute for Environmental Research, Heidelberg, Victoria.

<sup>3</sup> Peter Griffioen Consulting, Heidelberg, Victoria.

## 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.

# Contents

<b>1</b>	<b>Introduction</b>	<b>8</b>
1.1	Project Outcome .....	8
1.2	Project Background .....	8
1.3	Project Objectives.....	9
1.4	Status of Victoria GDE Mapping .....	9
<b>2</b>	<b>Trial Areas</b>	<b>12</b>
2.1	Portland Groundwater Management Area.....	12
2.2	Upper Loddon Water Supply Protection Area.....	15
<b>3</b>	<b>Conceptual Sensitivity Model</b>	<b>18</b>
3.1	Drivers of Hydrologic Change.....	18
3.2	Ecosystem Effects .....	19
3.3	Species Tolerance Framework.....	19
<b>4</b>	<b>Method</b>	<b>20</b>
4.1	Species Tolerance Modelling.....	20
4.2	NDVI Change Analysis .....	22
4.3	Hydrogeologic Interpretation.....	24
<b>5</b>	<b>Portland GMA Results</b>	<b>27</b>
5.1	Species Tolerance Model.....	27
5.2	NDVI Difference .....	29
5.3	Hydrogeologic Interpretation.....	31
<b>6</b>	<b>Upper Loddon WSPA Results</b>	<b>50</b>
6.1	Species Tolerance Model.....	50
6.2	NDVI Difference .....	52
6.3	Hydrogeologic Interpretation.....	54
<b>7</b>	<b>Conclusions</b>	<b>69</b>
7.1	Portland GMA Region .....	69
7.2	Upper Loddon WSPA Region.....	70
<b>8</b>	<b>Recommendations</b>	<b>70</b>
<b>9</b>	<b>References</b>	<b>71</b>

## Figures

Figure 1 Potential GDE locations along the Crawford River showing more likely groundwater dependent vegetation along drainages and less likely forest vegetation not conforming to topography .....	11
Figure 2 Portland GMA showing associated GMAs and WSPAs .....	12
Figure 3 Water supply bores in the Portland GMA region .....	14
Figure 4 Water volume allocation for bores with licenses > 50 ML within the Portland GMA region. Volume is split evenly when more than one bore is included in the license.....	14
Figure 5 Upper Loddon WSPA showing associated CMAs and monitoring bore locations.....	15
Figure 6 Water volume allocation for bores within the Upper Loddon WSPA region. Volume is split evenly when more than one bore is included in the license. ....	16
Figure 7 Species tolerance model for Victoria showing locations of the Portland GMA and the Upper Loddon WSPA .....	21
Figure 8 Image date zones for Glenelg Hopkins CMA region NDVI difference maps.....	23
Figure 9 Image date zones for North Central CMA region NDVI difference maps.....	24
Figure 10 Catchment and monitoring bore locations in the Portland GMA region .....	25
Figure 11 Catchment and monitoring bore locations in the Upper Loddon WSPA region.....	25
Figure 12 Species tolerance model for Glenelg Hopkins CMA region showing maximum value for overlain tolerance models. Darker colours are higher values.....	27
Figure 13 Median value of species tolerance model results within each potential terrestrial GDE in the Portland GMA region .....	28
Figure 14 Histogram of median species tolerance model values for potential GDEs in the Portland GMA region .....	29
Figure 15 Difference in NDVI value between 1995 and 2002 in the Glenelg Hopkins CMA region. Positive values indicate a decrease in NDVI from 1995 to 2002 and positive values indicate an increase. ....	30
Figure 16 Difference in NDVI value between 1995 and 2002 for potential GDEs in the Glenelg Hopkins CMA region. Negative values indicate a decrease in NDVI from 1995 to 2002 and positive values indicate an increase. ....	30
Figure 17 Monitoring bore locations and potential GDEs with median species tolerance values 15 or higher for the Crawford River, Stokes River, and Wannon River catchments .....	32
Figure 18 Declining trends in depth to groundwater (below natural surface) in nested bores 146025 and 310082, near the Crawford River, showing seasonal fluctuation with lowest water levels in late summer.....	33
Figure 19 Depth to groundwater for bore 146032, near the upper Crawford River, showing seasonal variation with lowest water levels in late summer and declining trend.....	34
Figure 20 Species tolerance model and NDVI difference values for a portion of the Crawford River catchment. ....	35
Figure 21 Monitoring bore locations and potential GDEs with median species tolerance values 15 or higher for the Fitzroy River catchment.....	36
Figure 22 Monitoring bore locations and species tolerance value of potential GDEs for the vicinity of Condah Swamp .....	37

Figure 23 Depth to groundwater trend for nested bores 146031 and 146023, near the Crawford River, showing upward gradient and seasonal fluctuation with lowest water levels in summer in the deeper bore.....	38
Figure 24 Depth to groundwater trend for nested bores 146029 and 120248, west of Condah drain, showing seasonal fluctuation and upward gradient except in summers since 2007 .....	39
Figure 25 Depth to groundwater for bore 120248, west of Condah Drain, showing seasonal variation with lowest water levels in summer and declining trend .....	39
Figure 26 Depth to groundwater trend for nested bores 146026 and 146027, near the head of Sunday Creek showing a downward gradient.....	40
Figure 27 Species tolerance model results for potential GDEs along the Fitzroy River.....	41
Figure 28 Depth to groundwater hydrograph and regression analysis for shallow bore 67043 along the Fitzroy River showing slightly artesian head.....	42
Figure 29 Eumeralla, Shaw, and Moyne River catchments showing water supply bore locations .....	43
Figure 30 Species tolerance model results for the Eumeralla River, Shaw River, Moyne River, and Murray Brook catchments showing location of bores with water level data .....	44
Figure 31 Hydrograph plot and regression analysis for nested bores near the upper Shaw River showing minimal vertical gradient.....	45
Figure 32 Plot of depth to groundwater and regression analysis for bore 141306, located in the upper part of the Murray Brook catchment, showing lowest water levels in winter .....	45
Figure 33 Plot of depth to groundwater and regression analysis for bore 141302, located in the upper part of the Murray Brook catchment, showing lowest water levels in winter .....	46
Figure 34 Hydrograph and regression analysis for bore 141305, located in the upper part of the Murray Brook catchment, showing lowest water levels in autumn/winter and a damped seasonal variability .....	46
Figure 35 Species tolerance model and NDVI difference results for potential GDEs in a portion of the middle Eumeralla River Catchment showing similarities to Condah Swamp.....	47
Figure 36 Nested Bores west of Port Fairy showing seasonal variation with lowest water levels in autumn and minimal vertical gradient .....	48
Figure 37 Nested bores north of Port Fairy showing seasonal variation with lowest water levels in autumn and slight upward vertical gradient.....	49
Figure 38 Nested bores west of Port Fairy showing seasonal variation with lowest water levels in summer and minimal vertical gradient .....	49
Figure 39 Species tolerance model for North Central CMA and Upper Loddon WSPA region showing maximum value for overlain tolerance models. Darker colours are higher values. ....	50
Figure 40 Potential terrestrial GDEs in the Upper Loddon WSPA region with median species tolerance values 15 or above.....	51
Figure 41 Histogram of median species tolerance model values for potential GDEs in the Upper Loddon WSPA region.....	52
Figure 42 Difference in NDVI value between 1995 and 2002 in the North Central CMA region. Positive values indicate a decrease in NDVI from 1995 to 2002 and positive values indicate an increase. ....	53
Figure 43 Difference in NDVI value between 1995 and 2002 in the Upper Loddon WSPA study area. Positive values indicate a decrease in NDVI from 1995 to 2002 and positive values indicate an increase. ....	54

Figure 44 Depth to groundwater in bore 116580, west of Joyces Creek in the Loddon River Catchment. Height of reference point above ground surface not recorded .....	55
Figure 45 Nested bores east of Middle Creek in the Loddon River catchment showing downward gradient .....	56
Figure 46 Depth to groundwater in bore 320252, near Middle Creek in the Loddon River Catchment.....	56
Figure 47 Nested bores west of Middle Creek in the Loddon River catchment showing upward hydraulic gradient prior to 2008 and current downward gradient.....	57
Figure 48 Species tolerance model results and NDVI difference for the lower part of Joyces Creek in the Loddon River catchment.....	58
Figure 49 Species tolerance model results for potential GDEs in the Tullaroop Creek Catchment and monitoring bore locations.....	59
Figure 50 Species tolerance model results and NDVI difference for the lower part of Tullaroop Creek and Merrin Merrin Swamp.....	60
Figure 51 Depth to groundwater in bore 135563, in the Tullaroop Creek catchment.....	61
Figure 52 Depth to groundwater in bore 62336, in the Tullaroop Creek catchment.....	61
Figure 53 Depth to groundwater in bore 133827 near Merrin Merrin Swamp in the Tullaroop Creek catchment .....	62
Figure 54 Depth to groundwater in bore 145192 near Merrin Merrin Swamp in the Tullaroop Creek catchment .....	62
Figure 55 Location of water level bores and potential GDEs between Creswick Creek and Birch Creek, near Clunes .....	63
Figure 56 Bores near Tourello Creek east of Creswick in the Tullaroop Creek catchment showing change from artesian head above surface level to a head below surface .....	64
Figure 57 Depth to groundwater in bore G8010282/01 near Tourello Creek in the Tullaroop Creek catchment .....	65
Figure 58 Depth to groundwater in bore nest SP068256 and SP068257 near Birch Creek in the Tullaroop Creek catchment showing upward gradient .....	65
Figure 59 Species tolerance model results for potential GDEs in the Mount Emu Creek Catchment and monitoring bore locations.....	66
Figure 60 Bore in the western Mount Emu Creek catchment showing declining water levels ...	67
Figure 61 Bores in the Mount Emu Creek catchment showing a downward hydraulic gradient from volcanics to the deep lead .....	67
Figure 62 NDVI difference for potential GDEs with species tolerance scores 15 or above in the Mount Emu Creek catchment. High difference indicates higher NDVI prior to the drought.....	68

## Tables

Table 1. Attributes assigned to each potential terrestrial GDE location.....	10
Table 2 Groundwater Management Units in the Portland study area.....	13
Table 3. Image Dates for CMA Region NDVI Zones.....	23