Summary

The Wimmera Catchment Management Authority (WCMA) region in western Victoria contains the Wimmera River catchment and part of the Millicent Coast Basin to the South Australian border. The region forms the south-west part of the Murray Darling Basin and covers 23 500 square kilometres or 10.3% of Victoria's total area. It extends from the Grampians Ranges in the south to Lake Albacutya in the north, and from the South Australian border in the west to Navarre in the East. The Wimmera River (largest terminal river in Victoria) is the major waterway in the region and is the focus of many social, cultural and environmental values.

Most of the Wimmera has been cleared for broadscale agriculture with cropping the main enterprise making agricultural land a key asset. Management of the land and soil affects a wide variety of natural resource management issues. The prominent regional industries of agriculture and tourism are dependent on the conservation and sustainable use of the natural assets such as the soil.

Soil is a key regional asset and provides the basis for agricultural production, acts as a buffer against environmental pollution, is a repository for wastes, and forms the hydrological interface between rainfall, runoff, recharge, groundwater storage and streamflow. Soil is therefore pivotal and fundamental in the provision of agricultural production and ecosystem services, both of which can be compromised if land is inappropriately managed. Land use and land management choices rely on maintaining the versatility of soil. Protection, maintenance and enhancement of soil quality are the requirements for sound management and necessitate a thorough knowledge of soil differences. Land resource assessment provides understanding of the range of soils and their relationships in the landscape and is an essential tool for any land use activity, from agriculture to waste disposal.

This 1:100 000 scale land resource assessment (LRA) project for the WCMA region was commissioned to develop and provide consistent land resource information across the region. This study provides the science and improves the platform of knowledge from which policy and strategies (e.g. Wimmera Regional Catchment Strategy, Wimmera Soil Health Strategy) can be developed. Future emphasis on research into sustainable farming systems, catchment condition target setting and program development at a regional scale is now required.

The primary objectives of the LRA project were:

- To undertake an inventory of soils and landforms to establish a continuous spatial dataset for the WCMA region. As the first consolidated dataset of this type for the region, the information from the soil point data and the spatial mapping will become key datasets for input into catchment and natural resource modelling applications.
- To provide land degradation hazard susceptibility information to identify potential on-site and off-site impacts to underpin decision making regarding current and future land use.
- To provide information that will enable future land capability assessment for the catchment; designed to attract investors to the region and to ensure that investment takes place in areas where there is low economic and environmental risk.
- To increase the efficiency and effectiveness of natural resource utilisation in the region.
- To provide specialist land resource assessment (LRA) training to Catchment and Agricultural Services (CAS) staff and other stakeholders.

The data and information derived from this project can be used for spatial analysis of future landscapes (possibly for condition, classification or resource definition), as well as identifying land management issues including land hazards, land capability, soil decline, natural assets (e.g. soil and

soil ecosystems). This information, in combination with modelling to identify areas of risk, can support priority setting for initiatives, programs or policies to implement and manage land use change.

This report provides a consistent soil-landform dataset that will assist future opportunities to develop sustainable primary production (farming systems) and processing enterprises, as well as maintain ecosystem services within this region.

To enable stakeholders and the community to use the information the data has been made available on CD-ROM that is a stand-alone product and does not require any extra software to open and use it. This allows easy access to the information via Adobe Acrobat Reader and enables the user to print maps, land unit information and the text of the report.

In presenting this report, the authors would like to emphasise three points:

- That the report and information products generated by this project be available at regional locations to enable stakeholder and community access.
- That assessment of future land use change should be carried out with respect to hydrological processes such as salinity recharge and discharge, groundwater and surface water availability for irrigation, and surface water quality impacts. Such assessment would utilise the soil-landform mapping as a basis for scenario modelling.
- That stakeholders and the community be directed to the Victorian Resources Online website (www.dpi.vic.gov.au/vro) for additional information on land and water resources in the WCMA region.

The nominal scale recommended for use of this spatial dataset and soil-landform inventory is 1:100 000. This is appropriate for broadscale assessment of land capability and regional planning. Local government may find the data strategically useful, but finer resolution mapping (particularly of map unit boundaries) is recommended for reconciliation with local government planning scale (1:40 000). The soil inventory (soil descriptions and associated chemical data) may be used to inform future mapping at finer scale (farm planning for example). This report draws substantially on a suite of soil surveys that have been conducted in the region over the past 60 years that have generated numerous maps and detailed soil descriptions, many of which are included in this report.

Map units and boundaries published in the earlier surveys have been modified to reflect the new geomorphological framework for Victoria. This framework is hierarchical and is based on a top-down approach to landscape analysis and includes at the highest level the four geomorphic divisions: the Western Uplands, Northern Riverine Plains, North West Dunefields and Plains, and Western Plains. Progressive subdivisions of these units have been made in this study, with the resultant 1:100 000 soil-landform map units forming a fourth tier in the hierarchy.

The region has been divided into over 100 soil-landform units, and for each of these the principal land elements have also been described and presented in a series of tables. In spite of the variety and complexity of the plains and uplands, there are many features of the region's soils that are held in common, regardless of the parent material from which they have been developed (otherwise known as Wimmera Soil Groups).

Interpretation of the regional soil and land qualities that affect susceptibility to different forms of land degradation has been used to generate maps of land degradation hazard. These maps do not represent current land condition or actual land degradation.

The inventory has enabled production of inherent land degradation susceptibility maps for the Wimmera that include:

- gully and tunnel erosion
- sheet and rill erosion
- wind erosion
- soil structure decline (compaction)
- soil sodicity (topsoil and subsoil)
- soil pH (topsoil and subsoil).

The land degradation analysis has indicated that there are substantial areas at risk from land and water degradation in the WCMA region. The following tables provide a breakdown of the area (given in hectares and as a percentage) into different risk categories for the above land and water degradation themes, soil pH and soil sodcity.

Hazard	High and Very High		Moderate		Low and Very Low	
	(ha)	(%)	(ha)	(%)	(ha)	(%)
Gully and tunnel erosion	132443	5.7	1076613	46.5	1107970	47.8
Sheet and rill erosion	63401	2.7	985185	42.5	1268422	54.8
Wind erosion	1001457	43.2	1098882	47.4	216668	9.4
Soil structure decline (compaction)	436212	18.8	770353	33.2	1110443	48.0

Sodicity	Very strongly sodic (ESP > 25		Strongly sodic (ESP 15–25)		Sodic (ESP 6–15)		Non sodic	
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Topsoil	117686	5.1	0	0	576971	24.9	1622371	70.0
Subsoil	846019	36.5	477772	20.6	660388	28.5	332830	14.4

Soil pH	Acid (pH < 5.5)		Neutral (pH 5.5–8.0)		Alkaline (pH >8.0)	
	(ha)	(%)	(ha)	(%)	(ha)	(%)
Topsoil	89750	3.9	1551669	67.0	675590	29.1
Subsoil	1994	0.1	987044	42.6	1327971	57.3

In the WCMA region it is apparent that particular soil-landform units are naturally prone to land and water degradation and the following generalisations can be made:

- The hills and mountains (Grampians, Pyrenees and Langi Ghiran range) in the Western Uplands along with colluvial granite and sedimentary slopes are extremely prone to tunnel and gully erosion, and sheet and rill erosion especially where cleared.
- The Little and Big deserts, and the sandy dunes and ridge crests in the north of the region are highly susceptible to wind erosion.

- Landscapes thought most vulnerable to soil structure decline include the sedimentary slopes and plains of the Western Uplands with hard setting soil surfaces, massive cracking clay soils and sodic texture contrast soils of the North West Dunefields and Plains.
- Sodic soils are common in the north and west of the region along with hardsetting alluvial plains associated with prior streams and modern stream channels in the east of the catchment.
- Higher rainfall (> 500 mm) areas typically have acidic soil surfaces that trend towards neutral in the subsoil including the plains south of the Little Desert and Western Uplands landscapes.
- Further north (e.g. Jeparit, Peppers Plains) topsoil pH values are often alkaline with some surface values near 10. Subsoils here are still alkaline but may become neutral at depth (>1.5 m).