2. Assets and threats to assets in the Corangamite Region

The SHS aims to guide investment in a range of actions that will enhance natural and built assets in the Corangamite region and protect them from a number of soil-based threats or threatening processes.

2.1 Asset identification

In this strategy, 'assets' are natural or built features in the landscape that are valued by the community. The SHS recognises asset classes that it aims to protect from various 'threats'. For the SHS, these threats are those specifically or generally related to soil health.

The Corangamite Regional Catchment Strategy has identified a range of primary and secondary asset classes that are applicable to the entire region. The most relevant and appropriate were selected for use in this Soil Health Strategy.

Selected primary asset classes:

1. Land
2. Water quality
3. Biodiversity
4. Built infrastructure
5. Cultural and heritage.

Secondary asset classes (as subsets of primary asset classes), define assets in greater detail. Secondary asset classes of the primary asset classes are:

- *Land* – urban, peri-urban, horticulture, dairy farming, broadacre cropping, broadacre grazing, forestry, intensive animal production, mining and public land
- *Water quality* – waterways and water supply reservoirs
- *Biodiversity* – wetlands and significant AROT and VROT areas
- *Built infrastructure* – roads and other infrastructure (e.g. telecommunication cables)
- *Cultural and heritage* is treated as one primary asset without secondary classes.

Land

Urban

There are approximately 27,000 ha of urban development within the Corangamite region. Cities and large towns include Geelong, Ballarat and Colac. Smaller towns and villages include Camperdown, Lorne, Lismore, Torquay, Meredith, Cobden, Timboon, Apollo Bay and Port Campbell. The Corangamite region hosts a diverse range of types and sizes of manufacturing and distribution industries, wholesale and retail trading, finance and business services, tourism and community services.

Peri-urban

Peri-urban areas comprise approximately 21,000 ha of the Corangamite region and are generally located around the region's cities and larger towns. Individual peri-urban properties range in size from two to 80 ha. These properties have little, if any, agricultural or forestry production, with the majority of owners having an off-farm income.

Horticulture

Horticultural crops are grown over some 5,000 ha in the region, dominated by potatoes, with more than 4,000 ha, and supported by a diverse range of other crops including vineyards, row-crop vegetables and intensive, 'glasshouse' enterprises including cut flowers. Although found in several localities within the region, the majority of the potato crop area is found on the fertile volcanic soils of the north-east, around Ballarat.

Dairy farming

Dairy farming is carried out over 167,400 ha of the region and contributes about 25% of Victoria's production by milk volume and accounts for approximately 44% of the region's agricultural production by value. Pasture production is predominantly dryland, as opposed to irrigation; calving and milk production are seasonal, as opposed to year-round. The importance of local dairy farming to the region and the state is expected to rise.

Dairy farming is centred in the south-west of the region and in the Colac area, where soils are fertile and rainfall is relatively high.

Broadacre cropping

Broadacre crops are grown over approximately 94,000 ha in the Corangamite region, predominantly on the basalt plains. The principal crops by area are wheat, canola and barley. The area of broadacre crops has been rising for some years as farmers pursue the higher margins per hectare from crops compared to livestock enterprises (meat and wool).

Broadacre grazing

Broadacre grazing covers approximately 592,000 ha in the Corangamite region and supports various livestock enterprises producing wool, sheep meat and beef. Grazing activities are conducted across the full range of soil types and landscapes found in the region, with a correspondingly large variation in pasture productivity.

Forestry

The region's forestry enterprises produce hardwood and softwood timbers on private and public land, involving 164,000 ha in the region, predominantly in the coastal fringes of the Otway Ranges, (Gellibrand, Upper Barwon, Otway Coast and Aire Landscape Zones). Forestry on public land in the region is in decline, but is increasing on private land, particularly with blue gum and pine plantations.

In 2001/02 approximately $160 million was derived from softwood plantation production; $4 million from hardwood plantations; and $68 million from native forests in the region (Central Victoria Farm Plantations Inc 2002).

Intensive animal production

Intensive animal production covers 645 ha of the Corangamite region, including poultry production for meat and eggs, pig meat and on-farm beef feedlots.

Mining

Crushed rock, gravel, sand and clay quarries are found in the Corangamite region. Clay is extracted for brick and tile manufacture and kaolin clay for use in manufacturing industries. A small coal mine is located at Anglesea. Ballarat hosts commercial gold mining.

Public land

There is a diverse range of public land categories in the region under the control of state and local governments. This includes various conservation areas: flora and fauna reserves, national, state and regional parks managed by Parks Victoria and Crown and state forest land managed by the Department of Sustainability and Environment (DSE).

In aggregate, 156,000 ha have been designated as parks or reserves, notably the Great Otway National Park and Lake Connewarre State Game Reserve.

There are many Crown Land allotments and reserves set aside for recreation, conservation and a number of other purposes.

Water quality

There are approximately 19,600 km of waterways in the Corangamite region *(Fig.2.1).* The Great Otway National Park contains some of the most naturally intact waterways in Australia, featuring high water quality. In contrast, other waterways such as the Moorabool and Woady Yaloak rivers have experienced significant degradation and now exhibit poor water quality. Waterways in the Corangamite region have been assessed and valued by the Corangamite River Health Strategy (2006).

Three important Water Supply Proclaimed Areas (WSPA) are located in the Corangamite region, supplying domestic and farm water to areas within and adjacent to the region *(Fig. 2.1).* Management of these WSPA is the responsibility of Barwon Water and Central Highlands Water; in aggregate, these authorities are responsible for supplying 55,000 ML of water annually to urban and industry areas within and adjacent to the Corangamite region.

Regional and local aquifers flow throughout the Corangamite region. Water from these aquifers is pumped out for irrigation and stock and domestic purposes. The quality of this water is important for many rural asset managers across the region.

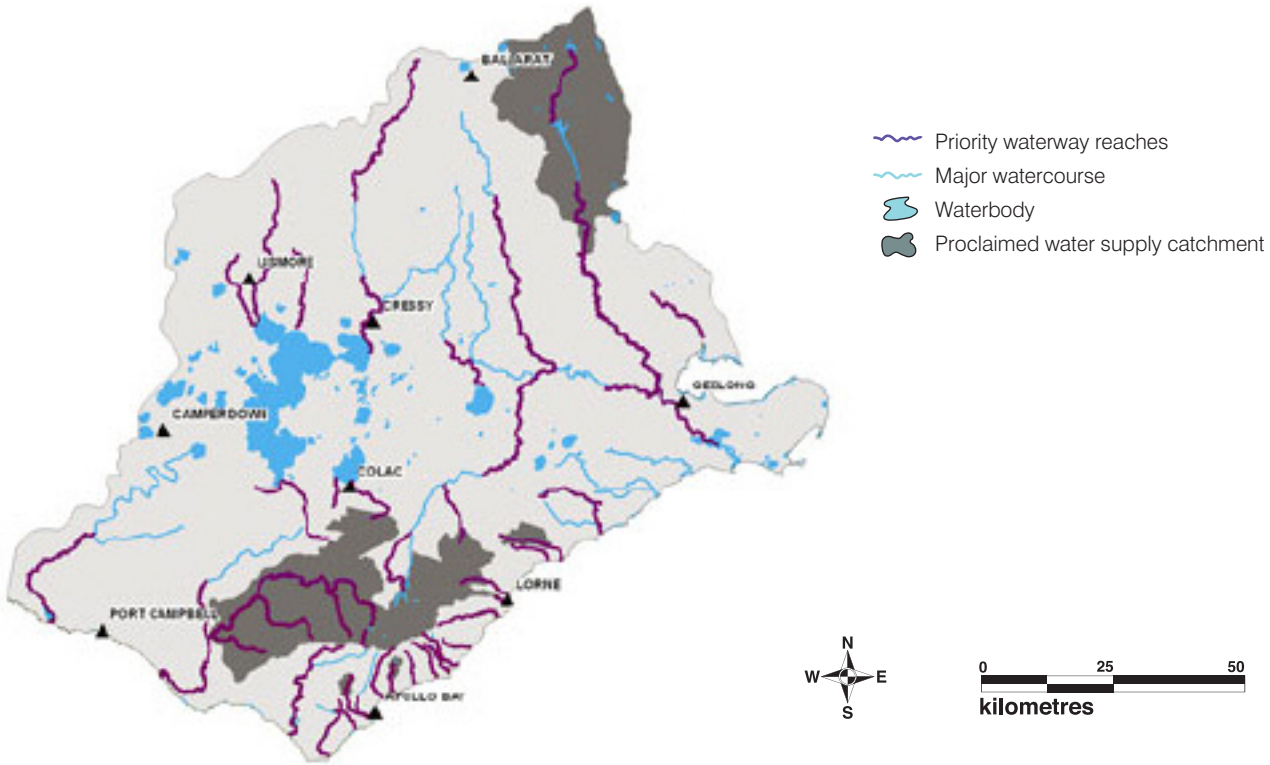


Figure 2.1: Waterways and Water Supply Proclaimed Areas in the Corangamite region

Biodiversity

Bioregions have been designed to help define patterns of biodiversity or ecological characteristics at a landscape scale. Bioregions are particularly relevant for this strategy because their location is strongly influenced by major soil class units and landforms. This influence is reflected in the names of the five bioregions within the Corangamite region *(Fig 2.2)*. Parameters such as climate and local topography also play a major role in determining ecosystem types across the landscape. However, the correlation between bioregions and soil class units highlights the significant connection between soil health and biodiversity conservation.

Regional ecosystems are diverse and complex. Ecological Vegetation Classes (EVCs) tend to be used as a surrogate for biodiversity, in terms of strategic regional priority setting, as they help indicate the value and significance of biodiversity in different areas. EVCs provide a unit, which is relatively well known in terms of condition and extent, as well as security. Vegetation communities provide habitat for fauna species; in many cases the distribution of these species may be poorly mapped or, in some cases, migratory. In general terms, the appropriate conservation of vegetation communities is considered to provide security for biological assets more generally.

Less than one quarter of the original extent of (pre-European) native vegetation cover remains within the Corangamite region. This vegetation is defined as 'remnant vegetation.' Of this remnant vegetation, approximately half is considered to be under threat.

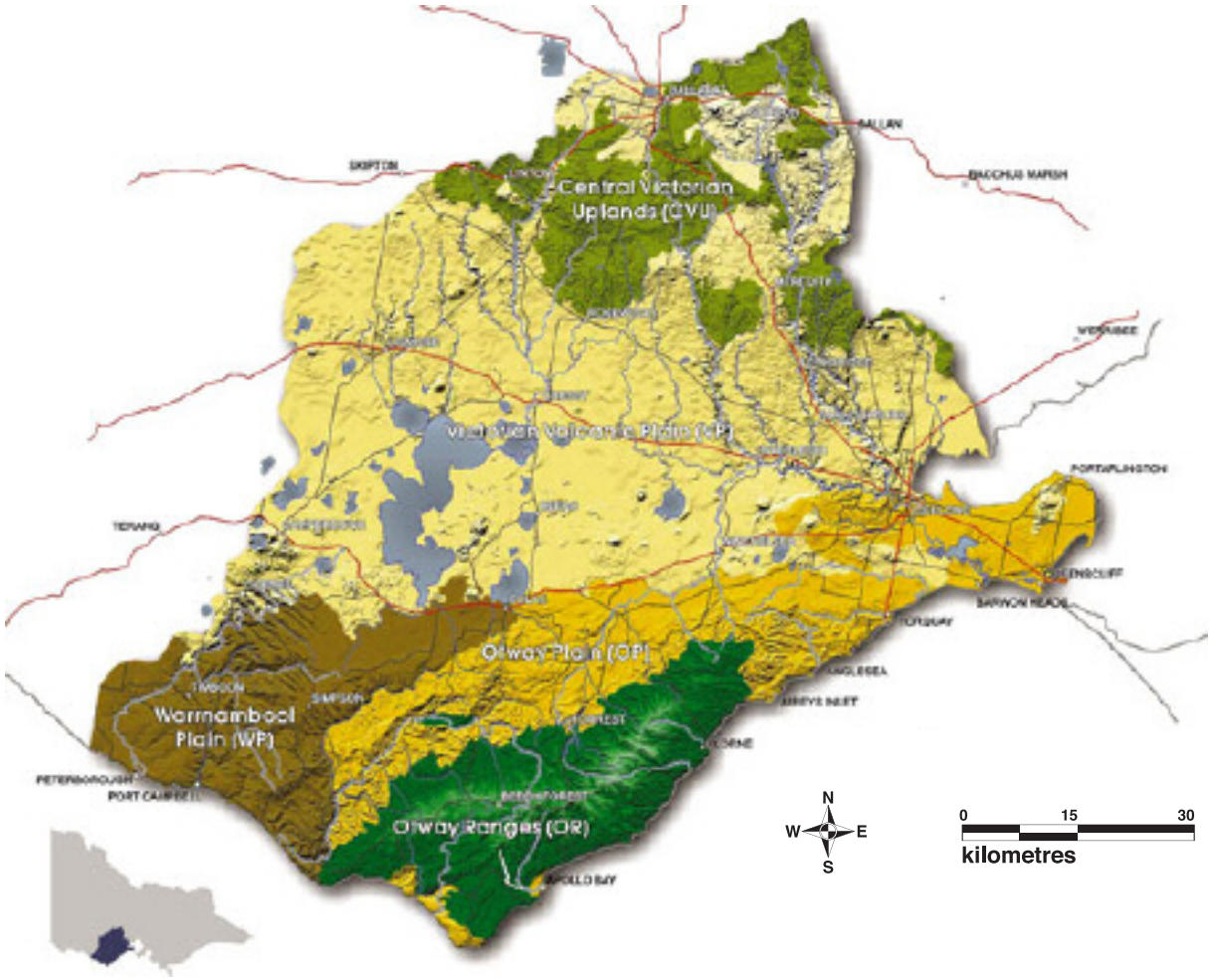


Figure 2.2: Bioregions defined for the Corangamite region

Wetlands

There are 1500 wetlands of varying size found in the region, widely distributed in aggregate they cover approximately 64,300 ha *(Fig. 2.3)*. Thirteen Ramsar and 340 other significant wetlands are found in the region.

Threatened species

The Corangamite region contains 19 fauna and 50 flora species which are listed as Australian Rare or Threatened Species (AROTS) and more than 300 Victorian Rare or Threatened Species (VROTS) (CCMA 2003). Many of these species are uniquely endemic to the region and so if they become extinct from the region they are lost altogether.

Estimated Conservation Significance

Throughout this strategy, Estimated Conservation Significance (ECS) has been used as a means of identifying areas of high value biodiversity assets. ECS is a Geographic Information System (GIS) layer, which has been recently developed by DSE as a derivative of several other GIS layers. The ECS layer takes into consideration the Bioregional Conservation Status (BCS) of EVCs (a default condition score based on status) and a landscape context score that considers vegetation patch size and landscape connectivity. *Figure 2.3* indicates the range of medium to high ECS areas across the region.

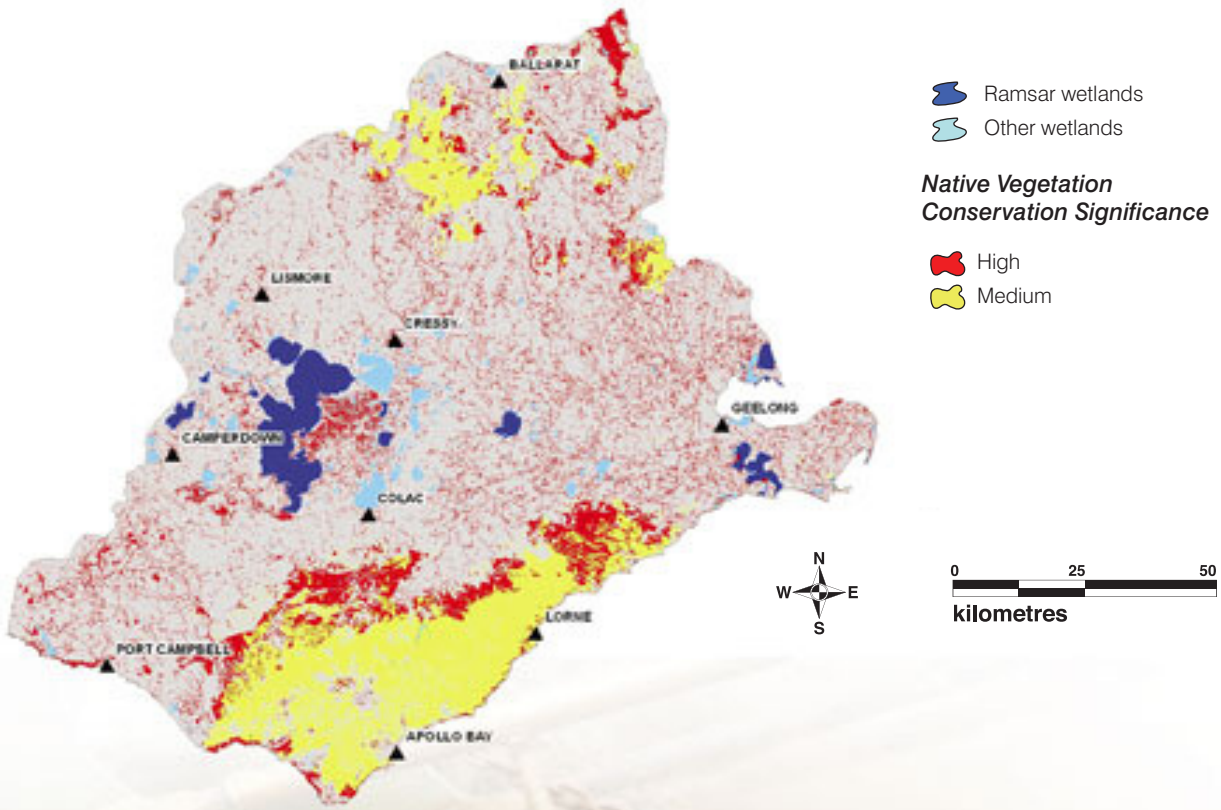


Figure 2.3: Wetlands and significant biodiversity areas in the Corangamite region

Built infrastructure

In the period since European settlement and especially during the 20th Century, a vast network of roads, tracks, railways, towns, villages and farms have been developed in the region, supporting and sustaining agricultural, industrial and urban development. These older-origin built infrastructure assets are augmented by more contemporary built infrastructure assets including electrical power and telephone cables, various communications towers and gas and water pipelines.

The Corangamite region has more than 10,600 km of public roads, managed by local government and VicRoads. A gas pipeline runs from Port Campbell to Lara, part of the Melbourne gas supply network. A range of fibre optic, microwave and conventional telecommunication networks, reticulated water networks and sewage schemes service the region.

These assets are of immense value and are subject to tight management by a range of private and publicly owned enterprises.

The Corangamite region has a large manufacturing industry concentrated in Geelong and Ballarat, featuring food processing, fabric, petrochemical, fertiliser, agricultural machinery and automobile manufacturing. Geelong is a major port for the region, with facilities for import and export of the region's manufacturing, forestry and agricultural industries.

Cultural and heritage

It is likely that humans have inhabited the Corangamite region for at least 35,000 years (Mulvaney and Kamminga 1999). Prior to European settlement it is estimated that the region's Aboriginal population varied between 2500 and 4000 people (Clark 1990), but it seems that these predominantly nomadic hunter/gatherer groups travelled across the landscape during the winter and early spring, taking advantage of the region's diverse plant and animal food types found on land and in water bodies. In the summer and spring, longer periods were spent near permanently fresh water bodies.

With strong evidence of relatively high indigenous populations, it is likely that there are a number of cultural heritage sites, including scarred trees, middens, quarry areas, mounds, stone arrangements and burial sites, to be found across the region. Exact locations are still not identified.

Post-European settlement sites of cultural heritage value are also found in the region and are generally more easily identified and capable of protection.

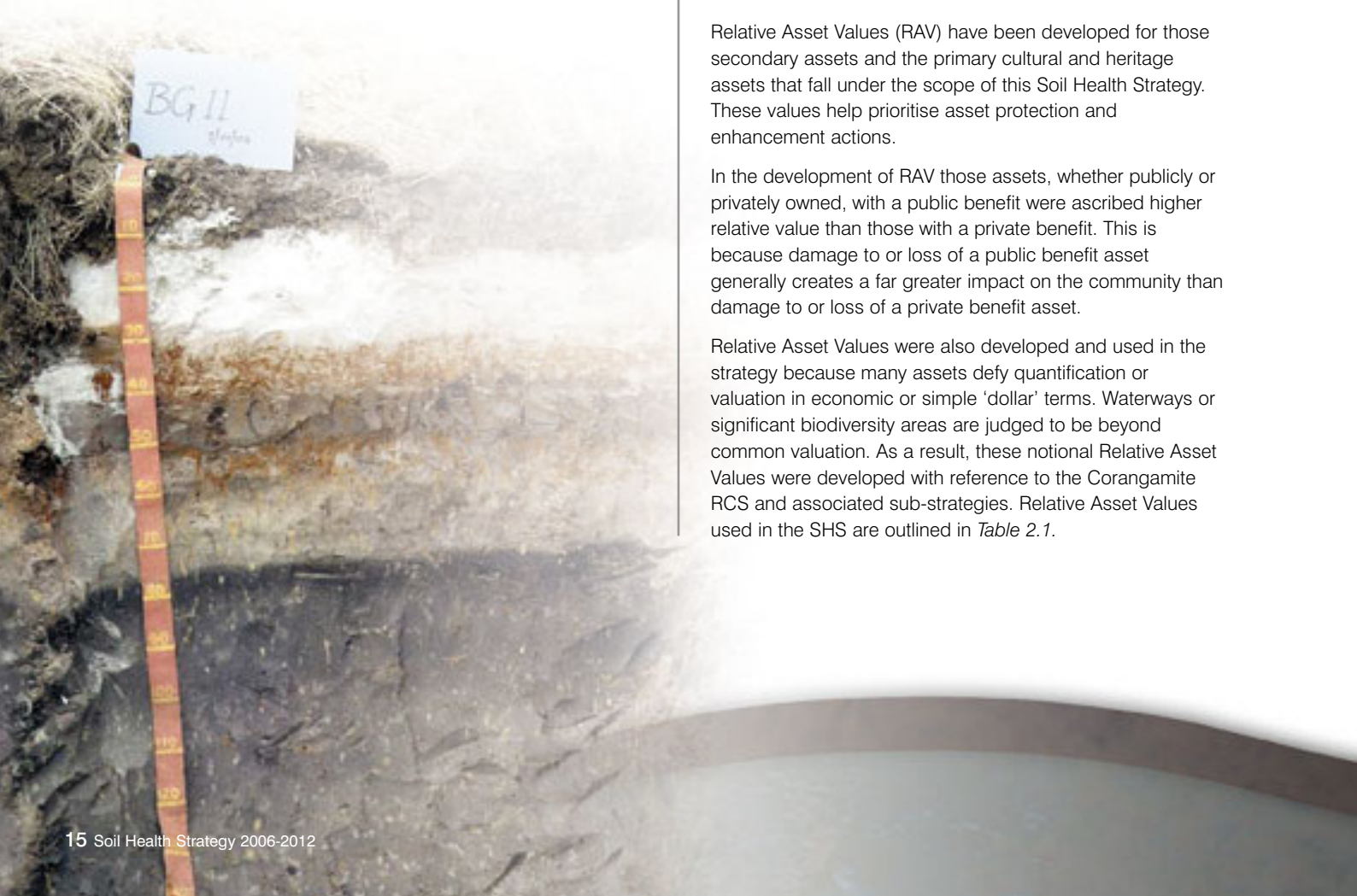
Notwithstanding these qualifications, more than 450 significant cultural and heritage assets have been identified in the region and are included on the Register of the National Estate. These range from historic buildings, town precincts, gardens, road and rail bridges, basalt stone walls, lakes, volcanic cones and other natural features such as the 'Twelve Apostles' rock formations off the coast near Port Campbell.

2.2 Relative Asset Values

Relative Asset Values (RAV) have been developed for those secondary assets and the primary cultural and heritage assets that fall under the scope of this Soil Health Strategy. These values help prioritise asset protection and enhancement actions.

In the development of RAV those assets, whether publicly or privately owned, with a public benefit were ascribed higher relative value than those with a private benefit. This is because damage to or loss of a public benefit asset generally creates a far greater impact on the community than damage to or loss of a private benefit asset.

Relative Asset Values were also developed and used in the strategy because many assets defy quantification or valuation in economic or simple 'dollar' terms. Waterways or significant biodiversity areas are judged to be beyond common valuation. As a result, these notional Relative Asset Values were developed with reference to the Corangamite RCS and associated sub-strategies. Relative Asset Values used in the SHS are outlined in *Table 2.1.*



Primary Asset	Secondary Asset	RAV	Justification of RAV
Land	Urban	9	Urban areas support the communities, including secondary and tertiary industries, essential for modern community life.
	Peri-urban	7	Support the urban centres.
	Mining	8	High-value outputs per unit land area. Essential to urban and rural communities.
	Animal production	7	Intensive animal production is expanding, and has high value per unit land area.
	Horticulture	5	High-value production in contrast to other enterprises on the same land. (Potato crop gross margins 2005/06: $8,070/ha).
	Dairy	4	Medium-value production in contrast to other enterprises on the same land. (Dairy gross margins 2004/05: $1,323/ha).
	Cropping	3	Relatively low-value production per hectare. Average gross margins for cropping for 2004/05: $291/ha.
	Forestry	3	High-value at harvest but annual contribution factors in a lower Relative Asset Value.
	Grazing	2	Relatively low-value production per hectare. (Average livestock grazing gross margins for 2004/05: $275/ha).
	Public land (non-conservation use)	7	Public land used for recreation, infrastructure and utilities. Generally already impacted by development in one form or another.
	Public land (conservation use)	10	This includes the Great Otway National Park and other terrestrial, aquatic and marine conservation areas and reserves. Irreplaceable if lost.
Water quality	Water Proclaimed Supply Areas	10	Urban and agricultural water supply resources, essential for the community. Invaluable.
	Waterways	10	At least 19,630 km of waterways including some of the most intact in the state (Otway Ranges).
Biodiversity	Wetlands	10	13 Ramsar-listed wetlands and 345 significant wetlands are listed in the region. Irreplaceable if lost. Invaluable.
	Significant flora & fauna	10	Regional AROTS include 19 fauna and 50 flora species, and more than 300 VROTS. Irreplaceable if lost. Invaluable.
Infrastructure	Roads	10	More than 10,600 km of roads service the region. An essential asset for the community. Generally high intrinsic value and replacement cost if damaged or lost.
	Utilities and services	10	Regional electrical power, gas, telecommunication conduits and transportation corridors are extensive. Generally high intrinsic value and replacement cost if damaged or lost.
Cultural and heritage	Heritage sites	10	The region has significant numbers of Aboriginal archaeological sites and Victoria's earliest pastoral settlements. Irreplaceable if lost. Invaluable.

Table 2.1: Relative Asset Values (RAV) assigned to secondary and cultural and heritage asset classes

2.3 Identifying threats to assets

This strategy identifies 12 threats to assets that relate to soil health. These 12 pose sufficient threat to assets that they need to be addressed. Some of these threats act locally, virtually in situ with the asset, while other threats may be seen as 'mobile' in that they have the potential to impact other, off-site assets. For example, a landslide will have a local impact at its site and falling into a watercourse, but may have off-site impacts through the transportation of clay particles into other areas, affecting water quality, plant and animal life.

Table 2.2 shows the threats to high RAV assets. Greater detail about the processes, condition and management of the threatening processes is given in *Appendix A.*

Table 2.3 shows the 12 threats addressed by the SHS, providing an illustrative example of each and their distribution in the region.

Most threats to assets recognised in this Soil Health Strategy are natural processes, albeit some are the consequences of land clearing, agricultural, forestry and urban development and ongoing activity. The consequences of these threats impacting on assets have also become greater. For instance, built infrastructure has spread across wider areas, with a larger proportion of the population served by various utilities, roads etc. A growing and expanding human population requires larger volumes of water. High value biodiversity, wetlands and cultural heritage sites are considered more significant and valuable as their number has declined.

Table 2.4 outlines the threats and what triggers them to pose a risk to assets. The table also outlines the consequences that threats pose to assets.

		Soil-related Threatening Processes											
Primary Assets	**Secondary Assets**	1. Landslides	2. Water Erosion	3. Acid Sulphate Soils	4. Secondary Salinity	5. Waterlogging	6. Soil Structure Decline	7. Wind Erosion	8. Soil Nutrient Decline	9. Soil Acidification	10. Soil Contamination	11. Soil Organic Carbon Decline	12. Soil Biota Decline
Land	Urban/Peri-urban	■	■	■	■			■			■	■	■
	Agriculture/Forestry	■	■	■	■	■	■	■	■	■	■	■	■
	Public Land	■	■	■	■			■			■		
Biodiversity	Wetlands	■	■	■	■			■			■		
	Significant flora and fauna species	■	■	■	■			■			■		
Cultural Heritage Sites	Cultural and heritage sites	■	■	■	■			■					
Built Infrastructure	Infrastructure and utilities	■	■	■	■			■					
	Roads	■	■	■	■			■					
Water Quality	Water (dams, lakes, rivers etc.)	■	■	■	■			■			■		

Table 2.2: Identification of potential risk of soil-related threatening processes to asset classes

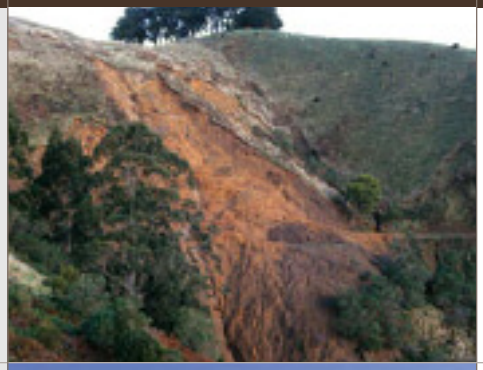
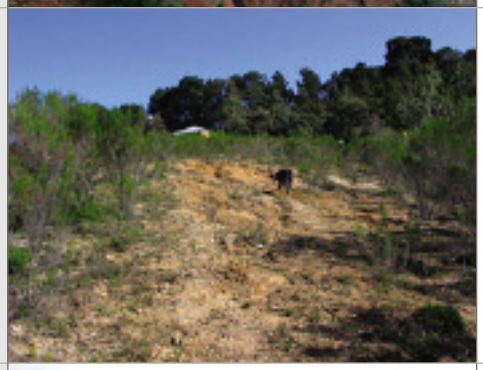
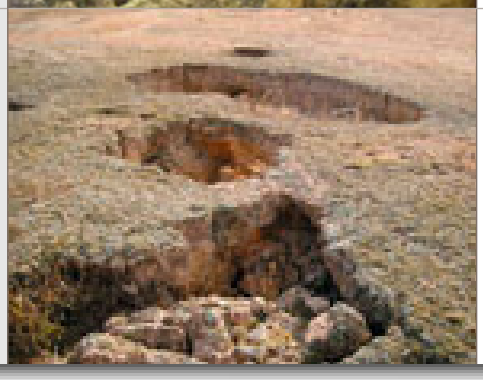
Definition of soil-threatening processes	Photograph of threat to asset	Distribution of soil-threatening process
Landslide – the movement of soil or rock down a slope. Landslides occur episodically, driven by gravity. Photograph: A. Miner 2005		
Sheet/rill erosion – soil particles suspended in water run-off are transported. Once sheet erosion water concentrates into small channels or streams, its speed leads to rill erosion as soil is moved from the stream base and banks. Photograph: W. Feltham 2006		
Gully erosion – normally involves a range of interacting factors and processes, involving larger volumes and closer concentration of water flow. Gullies start simply, leading to upstream and downstream complex erosion sites. Photograph: P. Dahlhaus 2003		
Tunnel erosion – occurs underground and is initiated by water movement along surface channels and cracks into dispersive subsoils that erode into the water moving below the soil surface.		*Map not available*

Table 2.3: Definition of soil-threatening processes addressed by the SHS, with illustrative photographs and distribution in the Corangamite region *(continued over page)*

Definition of soil-threatening processes	Photograph of threat to asset	Distribution of soil-threatening process
Acid sulphate soils – when disturbed and exposed to air, these soils produce sulphuric acid as a result of the interaction of naturally occurring iron sulphides with water and oxygen. Disturbed acid sulphate soils may also release toxic quantities of iron, aluminium and heavy metals.		*Inland ASS distribution*  Total area: ~ 54sqkm Percentage of CCMA: ~ 0.40% *Coastal ASS distribution*  Total area: ~ 54sqkm Percentage of CCMA: ~ 0.44%
Secondary salinity – caused by changing land use and management, especially where this results in a change in the water balance and a rising watertable. Rising movement of soil water mobilises and lifts stored mineral salts towards the soil surface. Land clearing for agriculture has been the major cause of secondary salinity in Australia.		
Waterlogging – excess water in the plant root zone reduces soil aeration that is required by roots for plant growth. By changing the environment around the roots, waterlogging may affect the availability of various plant nutrients.		
Soil structure decline – 'Soil structure' describes the aggregation of soil particles (sand, silt, clay) and the pore spaces of the soil. Soil structure decline is a detrimental change in these soil characteristics, generally as a result of certain land use practices.		

Table 2.3: (Cont.)

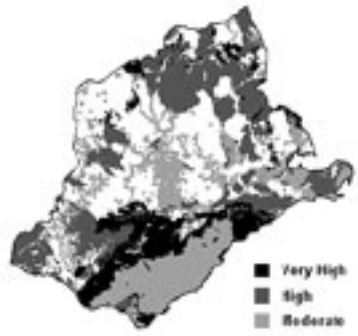
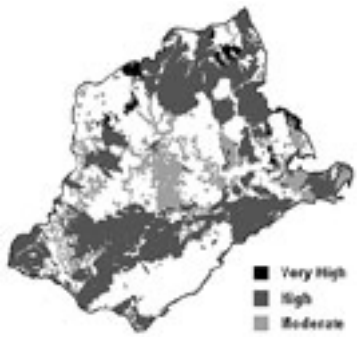
Definition of soil-threatening processes	Photograph of threat to asset	Distribution of soil-threatening process
Wind erosion – the action of wind on exposed sediments and friable rock formations causes erosion (abrasion) and entrapment of sediment and soil particles in the moving air.		
Soil nutrient decline – is the removal or transport of nutrients from soils by plant growth, wind or water erosion and by leaching beyond the root zone of the covering vegetation.		
Soil acidification – although acidic soils occur naturally in Victoria through processes of weathering and leaching, agricultural activities such as continued removal of alkaline plant material, excessive use of nitrogenous fertilisers and nitrate leaching lead inevitably to soil acidification. ***Right: Sorrel, an acid soil indicator***		
Soil contamination – can be the result of a variety of practises, intentional and otherwise. The application of certain agricultural or industrial chemicals may lead to long-lasting soil contamination, affecting soil health, water quality and subsequent land use options.		

Table 2.3: (Cont.)

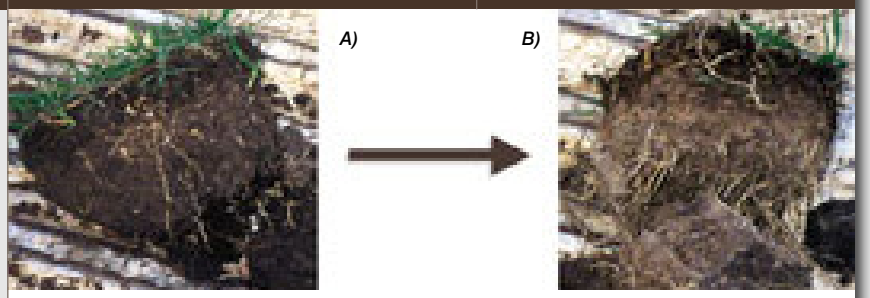
Definition of soil-threatening processes	Photograph of threat to asset	Distribution of soil-threatening process
Soil organic carbon decline – Soil organic carbon is the term used to describe the fractions of decomposed plant and animal material that remain in the soil after the organism's life is ended. Soil organic carbon is an important contributor to soil fertility. Generally, organic carbon is found in higher concentrations near the soil surface. Drought, fire and certain land management practices cause organic carbon decline.	 *Two soils from adjacent paddocks* *A) is high in organic matter and has been managed correctly* *B) is low in organic matter and has been mismanaged*	
Soil Biota Decline – Reduction of the billions of biota (microscopic animals) in the soil as a result of soil management practices.	*Photograph not available*	*Map not available*

Table 2.3: (Cont.)

Soil-threatening process	Triggering factors that result in risk	Common consequences to assets
Landslides	• steep slopes • intense rainfall • poorly drained soils • clearing of forests, woodland or other ground-stabilising cover	• sedimentation of waterways • damage to infrastructure (roads, buildings etc.) • destruction of cultural heritage sites • loss of agricultural productivity • loss of human life • sedimentation of waterways and wetlands • loss of agricultural productivity
Sheet/rill Erosion	• low levels of vegetative ground cover combined with:- – high-intensity rainfall with low infiltration rates – ground slope – degraded surface soil structure – removal of soil organic matter	• sedimentation of waterways • loss of agricultural productivity
Gully/tunnel Erosion	• low levels of vegetative ground cover combined with:- – high intensity rainfall and low infiltration rates – concentrated run-off – dispersive subsoils – clearing of vegetation	• damage to roads, buildings and other built infrastructure • destruction of significant biodiversity areas • loss of cultural heritage sites

Table 2.4: Threats to assets, triggering factors and consequences (continued next page)

Soil-threatening process	Triggering factors that result in risk	Common consequences to assets
Acid Sulphate Soils	• drainage activities or other disturbance and exposure to air	• acidification of the site and waterways • destruction of built infrastructure • death of fish and other aquatic life • destruction of significant biodiversity areas, including wetlands • loss of cultural heritage sites
Secondary Salinity	• removal of vegetation in recharge areas • soil structure decline	• salinisation of waterways • loss of agricultural land • destruction of biodiversity areas • destruction of built infrastructure
Waterlogging	• duration of rainfall or surface run-off in compacted or poorly drained soils	• loss of agricultural productivity • loss of plant or animal life, biodiversity
Soil Structure Decline	• aggregate breakdown caused by a variety of secondary factors including dispersive clay behaviour, compaction by animal or machinery traffic, soil cultivation	• loss of agricultural productivity • increased run-off and higher potential for water erosion
Wind Erosion	• removal of organic matter and vegetative ground cover coupled to high surface wind speed and sandy soils	• air pollution • sedimentation of waterways • loss of agricultural productivity
Soil Nutrient Decline	• removal of nutrients through plants harvested in grazing or crop production • leaching of nutrients beyond the plant root zone • removal or decline in soil biota and organic carbon levels may raise the rate of leaching	• loss of agricultural productivity
Soil Acidification	• replacement of naturally occurring vegetation with introduced crops and pastures • removal of alkaline materials in plants • mineral fertiliser application	• loss of agricultural productivity
Soil Contamination	• intentional or unintentional application of agricultural of industrial chemicals or by-products to soil. NB Significantly different threats and risks if the contaminant is mobile or effectively 'fixed' in the soil	• contamination of waterways • impact to biodiversity • loss of land use options • impacts human and animal health
Soil Organic Carbon Decline	• decline and removal of vegetation • intensive agricultural practices	• loss of agricultural productivity • increased susceptibility to soil structure decline and erosion
Soil Biota Decline	• reduction of soil organic carbon and soil structure • soil acidification and the addition of contaminants to the soil	• loss of agricultural productivity • loss of food for fauna (e.g. worms for birds)

Table 2.4: (Cont.)

2.4 Other potential and real threats

Other potential threats and some opportunities in relation to soil health are outlined in this section of the strategy. Several are becoming more widely discussed in society or are issues not covered under the descriptions of the soil-related threatening processes.

Climate change and implications for soil health

There are undoubtedly relationships between climate change and soil health. For instance, greater uncertainty over annual rainfall and its seasonal distribution may make the farmer's task of managing farm land more difficult. In turn, uncertainty over ground cover may exacerbate the risk of water or wind erosion.

Higher levels of storm activity, drought and other climate events may all contribute to various threats to assets and the risk of adverse outcomes (Anderson 2006, who investigated climate change in the Corangamite region). Land management practices are almost certain to change in response to climate change. Various features of climate change, their implications for soil health and appropriate actions to address risks are outlined in *Table 2.5*.

The forecast climate change in the Corangamite region appears to present no threats or risks to assets that are not already covered by consideration of other, better defined threats (Anderson 2006). Consequently, no specific actions are planned in regard to climate change and its potential impact on soil health. However, research and development projects may be needed in the future to assess the impacts of climate change on soil health and the assets it supports in the Corangamite region.

Agricultural fertiliser application

The relationships between inappropriate application of agricultural fertilisers and the unintended release and effects of nutrients in waterways are becoming better understood.

A recent study in the Curdies Landscape Zone by DPI investigated the loss of applied mineral fertiliser nutrients from local dairy paddocks into waterways. One finding of the study was that on many paddocks, soil phosphorus levels were well in excess of the agronomic optimum of 20 – 25 mg/kg of 'Olsen P'. Ideally, these levels should be progressively cut back into the optimum range through more stringent management of fertiliser application against soil test data. Agricultural fertiliser applications in excess of the soil and pasture's capacity to use fertilisers or hold the applied nutrients is likely to result in unintended losses into waterways, impacting aquatic ecosystems.

Feature of climate change	Implications for soil health	Recognised actions to address the threat
Lower rainfall, higher temperatures	Greater incidence of drought, leading to a reduction in plant growth and soil biota, contributing to reductions in ground cover and soil organic carbon levels. Increase in wind and water erosion is likely. For areas normally located in high rainfall areas, growing conditions may be improved as waterlogging is reduced during winter months.	Adverse or beneficial effect depending on current rainfall and distribution, soil types and enterprises. For instance, may benefit some dairy and some broadacre cropping areas while impacting adversely on others. No specific actions other than already considered for existing circumstances.
More storm events	Potential for more water erosion and landslide activity. Greater costs to asset managers from more severe and sudden damage caused by landslides and erosion.	Addressing erosion and landslide risk through municipal planning schemes. Inform asset managers of where highly susceptible erosion and landslide areas are located. (Already considered for existing circumstances).
Rising sea levels from melting icebergs	Rising sea levels will start to impact coastal cliffs, leading to greater landslides. This may increase the impacts on roads, buildings and other built infrastructure close to the water's edge. Sands dunes will also be washed away by tidal movement, impacting existing high-value biodiversity areas.	Greater controls over future developments along coastal areas that account for rising sea levels and greater landslide risk.

Table 2.5: Features of climate change, implications and potential actions to address threats