MOUNT ALEXANDER SHIRE COUNCIL

STATE OF THE ENVIRONMENT REPORT

NOVEMBER 2010

MOUNT ALEXANDER
SHIRE COUNCIL

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INTRODUCTION

This State of the Environment Report follows the basic guidelines and framework recommended by the council-appointed Environmental Advisory Committee. It is based on information gathered through interviews and discussions with a variety of stakeholders, notably Council and other government bodies, and extensive desk-research.

SUMMARY TABLE

INDICATOR	LONG TERM TREND (Improving/Stable/Worsening)	COMMENTS
THEME 1 – PROTECT THE NATURAL ENVIRONMENT		
LAND & WATERWAYS		
Land managed for conservation	Improving	Large areas of state land and small areas of private land. Good data quality.
Weeds	Stable	Stable with a slight increase in weed extent and number of species. Good data quality.
Stream Health	Stable	Stable but in a poor state. Good data quality.
Environmental Flows	Worsening	Inadequate to maintain waterway values. Good data quality.
BIODIVERSITY		
Percentage of Shire covered in native vegetation	Stable	Likely future increase. Good data quality.
Area covered by key habitats	Stable	Likely future increase but declining in quality. Good data quality.
Number and status of threatened species in Shire	Worsening	Habitat disruption and extreme weather events (drought, fire) likely to cause suite of extinctions. Good data quality.
CLIMATE		
Rainfall	Worsening	Large step decline since 2000. Good data quality.
Temperature	Worsening	Temperatures getting warmer and more extreme. Good data quality.
Wild Fire Risk	Worsening	Data available for Victoria, not Shire.
THEME 2 – USE RESOURCES SUSTAINABLY		
GREENHOUSE EMISSIONS		
Council Greenhouse Emissions	Improving	Emissions declining. Moderate data quality.
Community Greenhouse Emissions	Unknown	Inadequate data to assess trend. Poor data quality.
TRANSPORT		
Mode of travel to work	Unknown	Car travel continues to be main mode. Moderate data quality.
WATER USE		
Residential water consumption	Stable	Recent slight increase after significant reduction. Good data quality.
Industrial water consumption	Improving	Trend excludes agricultural use. Good data quality.
Council Water Use	Improving	Water consumption declining. Good data quality.
LAND USE PLANNING		
Number of residential building approvals	Unknown	This does not clearly show environmental impact. Good data quality.
WASTE & CONSUMPTION		
Municipal Waste	Stable	Better data on contamination of recycling needed. Good data quality.
Waste to Castlemaine landfill	Improving	Recyclable materials are increasingly diverted from landfill. Good data quality.

OVERARCHING DRIVERS OF CHANGE

POPULATION GROWTH AND CHANGES IN SETTLEMENT PATTERNS

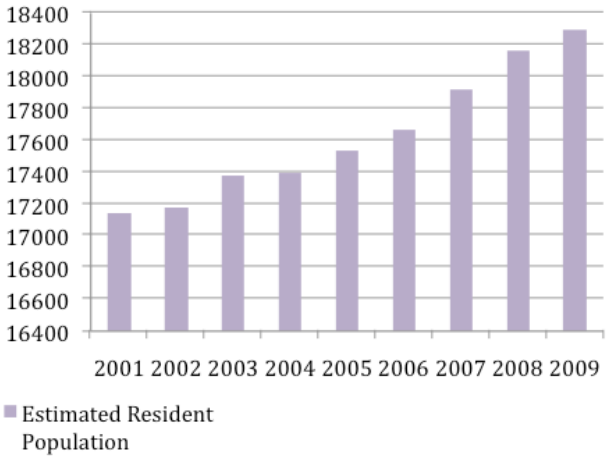
According to the Victorian State of the Environment Report 2008, Victoria's population growth and the expansion of urban areas has resulted in unsustainable levels of resource consumption and waste production[1]. Direct environmental impacts have been observed, including pressures on water and energy supplies, waste production, and loss of land for conservation and agriculture to the built environment.

Population growth and changes in settlement patterns affect all of the indicators considered in the State of the Environment report, hence it is a key overarching driver of change. A major associated variable is affluence — as our population has increased so too has our ability to spend more on consuming resources and land[2].

Mount Alexander Shire continues to experience population growth, particularly as a destination for "treechangers" — those leaving the city for a rural lifestyle. The Shire experienced a population growth of 6.7% between 2000 and 2009[3]. Its population in 2009 was estimated to be 18,293 people — annual population from 2000 to 2009 is shown in the graph below[4].

The State Government predicts that the Shire will experience a similar population growth rate to 2026 to the whole of Victoria — an average annual growth of 1.3%[5]. The number of households will grow even faster because the size of households will decrease as the Shire ages. There will be a large increase in those aged 60 years and over — from 24.6% in 2006 to 37.1% in 2026[6].

Figure 1: Estimated Resident Population Mount Alexander Shire



Source: Australian Bureau of Statistics, Cat. No. 3235.0 – Population by Age and Sex, Regions of Australia, 2007 collated by Profile.id at http://profile.id.com.au/Default.aspx?id=334&pg=210&gid=10&type=enum

1 Victorian Commissioner for Environmental Sustainability 2008, State of the Environment Report – Victoria 2008, Part 2 Driving Forces.
2 Ibid.
3 Calculations based on the data series above.
4 Australian Bureau of Statistics, Cat. No. 3235.0 – Population by Age and Sex, Regions of Australia, 2007 collated by Profile.id at http://profile.id.com.au/Default.aspx?id=334&pg=210&gid=10&type=enum
5 Department of Planning and Community Development 2008, Victoria in Future 2008 – Mount Alexander http://www.dse.vic.gov.au/CA256F310024B628/0/26AA0400EB8B693CCA2576E700071D19/$File/Mount+Alexander.pdf .
6 Ibid.

ECONOMIC GROWTH

Economic growth — and the associated output of industry and spending power of the community — is another major driver of environmental change. Increased economic activity means a greater demand on energy, water, land and material resources, while greater affluence of the population also drives demand for goods and services and the associated natural resources involved.

Australia has enjoyed the benefits of a global resources boom and so the nation — and the state of Victoria — has experienced strong economic growth over recent years. In the decade to FY2005–2006, Victoria experienced an average annual Gross State Product growth rate of 3.6% and Victoria's economy has been growing at a faster rate than the population, suggesting an increasingly affluent society[7].

Mount Alexander Shire has enjoyed economic growth over the past decade; however, it remains a less affluent region when compared with the Australian average. The average taxable income is well below the national average, and the unemployment rate was higher than the national average during the period FY2002–2006. Average taxable income grew by 13.8% over 2002–2005 in the Shire, which was healthy growth, but still lower over that period than the national growth rate of 14.7%[8].

Table 1: Unemployment and Average Taxable Income Mount Alexander Shire

UNEMPLOYMENT AND AVERAGE TAXABLE INCOME – MOUNT ALEXANDER SHIRE VS NATIONAL AVERAGE						
		2002	2003	2004	2005	2006
Unemployment rate – Mount Alexander Shire	%	9.4	6.8	7.7	9.7	8.3
Unemployment rate – Australian average	%	6.7	6.2	5.8	5.3	5.1
Average taxable income – Mount Alexander Shire	$	32,239	32,861	35,380	36,695	NA
Average taxable income – Australia	$	40,771	42,307	44,591	46,769	NA

Source: Australian Bureau of Statistics 2008, National Regional Profile: Mount Alexander (S) (Local Government Area) and National Regional Profile: Australia

Economic growth in the Shire appears to have been based on an influx of new residents combined with growth in the tourism, personal services and retail industries. Manufacturing continues to be a steady employer. The largest producer in the Shire, the Don KRC processed meat producer, is in the process of consolidating its operations in Castlemaine, which means a doubling of capacity, building a larger factory and creating an additional 200 jobs at the site[9].

In 2006, the largest employing industries were:

- Manufacturing – 1087 persons or 16.5%
- Retail Trade – 951 or 14.4%
- Health & Community services – 912 or 13.5%[10]

Over the period 1996 to 2006, the Manufacturing and Agriculture industries declined slightly in employment while growth in jobs was experienced in the Retail, Construction, Property and Business Services, Government, Education and Health industries.

7 Victorian Commissioner for Environmental Sustainability 2008, State of the Environment Report – Victoria 2008, Part 2 Driving Forces.

8 Australian Bureau of Statistics 2008, National Regional Profile: Mount Alexander (S) (Local Government Area) and National Regional Profile: Australia

9 Personal Communication, Fiona McMahon, Manager Sustainable Development, 12th April 2010.

10 Australian Bureau of Statistics Census data compiled by Profile.id http://profile.id.com.au/Default.aspx?id=334&pg=139&gid=10&type=enum

PEAK OIL

Another major driver of change and environmental outcomes is peak oil. Peak oil is the point at which global oil extraction has peaked and will continue to decline, and is associated with a continued increase in the cost of extracting dwindling global oil reserves. It is generally agreed that this peak has either already occurred or will occur this decade, with the Chief Economist of the International Energy Agency predicting oil supply will peak in 2020[11]. This poses a real threat for Australia's car-dependent population because oil prices are projected to rise dramatically due to declining oil production, and in the long term we will need to find alternatives to petrol-based transport[12].

As a mostly non-urban shire, Mount Alexander is particularly exposed to rising oil prices because the population is largely car dependent. In addition, the food production and agriculture industry will be effected dramatically since operations and transport are dependent on oil as fuel. This is a key industry in the Shire but, of course, is a major social issue if the price of food rises or parts of the population cannot access food.

CLIMATE CHANGE

There is now overwhelming scientific agreement that the increased atmospheric greenhouse emissions resulting from human use of fossil fuels and land clearing are causing the temperature of the Earth to rise. A temperature rise of 0.74°C globally has been observed over the last century[13]. This temperature rise is affecting the climate in a range of complex ways, including changing rainfall patterns, increasing extreme weather events and bringing about sea level rise.

National average temperatures are known to have risen over the last century and Victoria has warmed by 0.6°C since the 1950s[14]. Rainfall patterns have been altered by this temperature rise alongside an increase in extreme weather such as storms and hail events. Rainfall in Victoria has declined in most regions. Reduced rainfall and increased temperatures impact many of the environmental themes discussed elsewhere in this report, and also increase the frequency and severity of wild fires.

There are a number of current and projected impacts of climate change upon Mount Alexander Shire. More detail is provided under the Climate section, but the key indicators include:

- The average annual temperature across the North Central Region, of which Mount Alexander Shire Council is a part, was 0.3°C warmer over the decade 1998–2007 than the 30 year average (1961–1990)
- The region's rainfall declined over the past decade: between 1998 and 2007 average rainfall was 15% below the 1961 to 1990 average
- Average annual temperatures are predicted to increase by about 0.9°C by 2030 (under a medium emissions scenario) and increase by 1.4°C to 2.7°C by 2070, and the number of hot days (days over 30°C) is also expected to increase
- Total average annual rainfall is expected to decrease by around 4% by 2030, with the greatest reductions occurring in spring (7%), and to decline by 6 to 11% by 2070[15]

These changes are likely to have significant impacts on the viability of agriculture in the region and food supplies could be threatened. Water supplies to the region are already restricted and the Victorian government continues to work to shore up water supplies amid declining rainfall patterns in much of the State. Biodiversity and waterways are already experiencing stress from lack of rain and hotter weather, as well as more extreme weather events such as bushfires.

11 Monbiot, G 2008, "When will the oil run out?", The Guardian, 15 December 2008, http://www.guardian.co.uk/business/2008/dec/15/oil-peak-energy-iea [accessed 23 February 2010]

12 Commissioner for Environmental Sustainability Victoria 2007, Creating a city that works: Opportunities and solutions for a more sustainable Melbourne, May 2007, p.10.

13 Intergovernmental Panel on Climate Change (IPCC), 2007a: Climate Change 2007: The Physical Science Basis. Contribution of Working Group 1 to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, ed. Susan Solomon, Dahe Qin, Martin Manning, Zhenlin Chen, Melinda Marquis, Kristen B Averyt, Melinda MB Tignor, and Henry L Miller (Cambridge, UK & New York, USA: Cambridge University Press, 2007), 727: http://www.ipcc.ch/ipccreports/ar4-wg1.htm.

14 Victorian Commissioner for Environmental Sustainability 2008, State of the Environment Report – Victoria 2008, p.188.

15 Victorian Government Department of Sustainability and Environment (DSE) 2008, Climate Change in the North Central Region, Melbourne, June 2008 http://www.climatechange.vic.gov.au/___data/assets/pdf_file/0013/73201/NorthCentral_WEB.pdf

THEME 1 – PROTECT THE NATURAL ENVIRONMENT

LAND AND WATERWAYS

Land, vegetation and water underpin most environmental assets and services. Sustainable land management maintains soil and water quality, and controls weeds and pests, for long-term productivity and 'ecosystem services'. Ecosystem services include the maintenance of soil structure and fertility, regulation of water flow and water tables, moderation of local climate and control of pests and diseases. Loss of native vegetation and unsustainable land management and farming practices are the major causes of land and waterway degradation, notably through reduced soil quality, increased water and soil run-off into waterways, salinity, weeds and carbon emissions. Mount Alexander Shire receives relatively low rainfall, which is declining further as a result of climate change. This is exacerbated by over-grazing by rabbits, kangaroos and other feral and pest species. The state of the Shire's land is relatively good, but sustainable management is difficult to measure, and is predicted to decline with climate change and reduced rainfall. The state of the Shire's waterways is generally poor and, although slowly improving, will remain poor during periods of low rainfall.

The land also supports an array of cultural heritage, from Indigenous middens, artefacts and scar-trees, through to gold-mining workings and historical buildings. Conservation of these cultural values needs to be integrated into management of the natural environment.

HEADLINE INDICATOR

Area of land managed for conservation

Figure 2 on the next page shows all public land managed for conservation and the number of hectares managed by each authority is listed in the table below.

Private reserves with secure tenure and management, such as those managed by non-government organisations are not included in this table and map. Other land, notably private land, also has high environmental values, but most are of unknown state and long-term security and are difficult to track and measure.

Another measure of the amount of land protected for conservation is measured by the Collaborative Australia Protected Area Database, which registers the areas protected as defined by the International Union for the Conservation of Nature (IUCN)[16]. In 2006, a total of 3,024 ha of Mount Alexander Shire was in an IUCN-defined protected area (including National Parks, Wilderness Areas, Nature Reserves, Habitat/Species Management Areas).

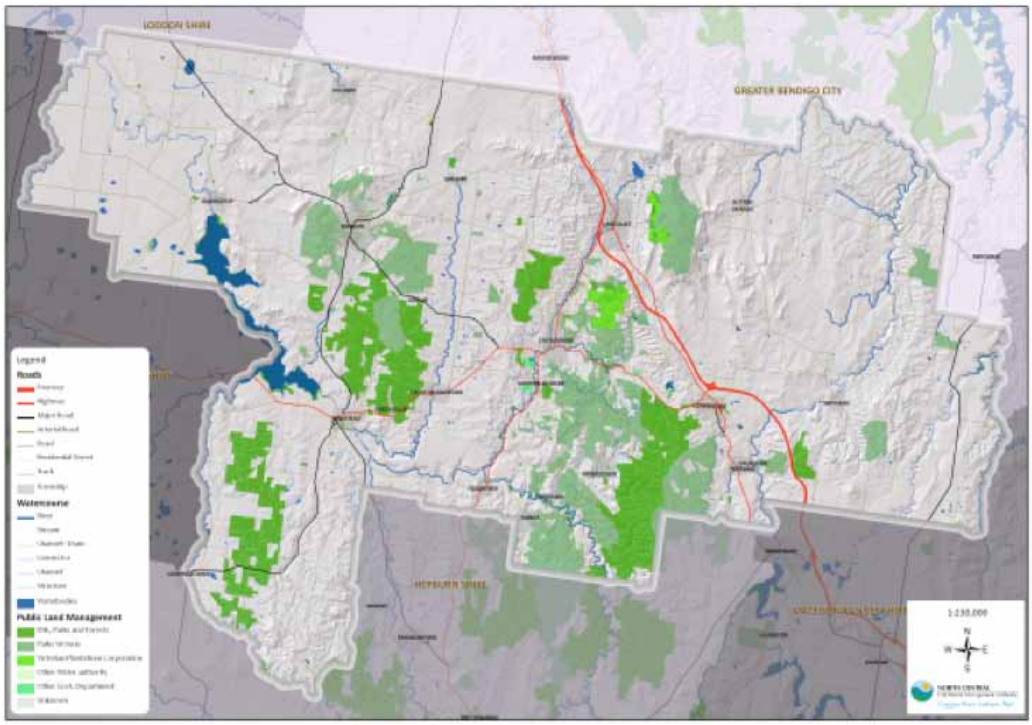
Table 2: Land Managed for Conservation in Mount Alexander Shire

PUBLIC LAND MANAGEMENT AUTHORITY	HECTARES
Department of Sustainability and Environment (Parks and Forests section)	12,141.84
Parks Victoria	12,575
Victorian Plantations Corporation	635
Other Govt. Dept. (Education; Public Transport; other)	91
Other Water Authority	3.5
Unknown	788
TOTAL	26,234

Source: North-Central Catchment Management Authority based on data from Land.vic.gov.au http://services.land.vic.gov.au/SpatialDatamart/dataSearchViewMetadata.html?anzlicId=ANZVI0803002437&extractionProviderId=1

16 Collaborative Australia Protected Area Database 2006

Figure 2: Land Managed for Conservation in Mount Alexander Shire



Source: North-Central Catchment Management Authority

Trend: Improving

After the 2001 Box-Ironbark Investigation, many State Forests were reclassified as protected areas or managed under conservation regulations. There is a general trend towards additional areas being protected or given improved protection status. These include increasing areas of small private reserves, which are of mixed tenure security.

Pressure

Even when protected, land needs adequately resourced management to maintain its values. Some areas may not be given adequate resources to ensure weed and pest problems or other impacts do not threaten their conservation values.

Responses

STATE GOVERNMENT

The Department of Sustainability and Environment (DSE) manages State Forests for multiple purposes, which increasingly includes conservation[17]. Parks Victoria manages other Crown Land. The Victorian Environmental Assessment Council (VEAC) advises on thematic land-use changes, with the next investigation into management of fragmented remnant vegetation on Crown Land[18].

PRIVATE LANDOWNERS

Mount Alexander Shire has a high concentration of private landowners committing land for conservation through covenants and other, less secure, agreements.

17 DSE (2008) Bendigo Forest Management Area Forest Management Plan

18 VEAC Remnant Native Vegetation Investigation. Downloaded from http://www.veac.vic.gov.au/investigation/remnant-native-vegetation-investigation April 2010.

Implications

Parks Victoria does not monitor environmental assets or pressures adequately to assess whether they are improving or declining[19] but there is a need for better resourcing in recognition of the multiple services provided[20]. There are no useful measures indicating the sustainability of private land management and ecosystem services need to be better recognised if landholders are to be supported in taking active stewardship[21]. There are opportunities to redesignate land managed by VicRoads along the Calder Highway as conservation land[22].

OTHER INDICATORS

Weeds

Weeds are invasive plants, spreading into new areas, especially where the ground or habitat is disturbed, and have a detrimental impact on economic, conservation or social values. Weeds compete with crops and may contaminate the harvested product. They smother and out-compete native species, especially waterside and ground flora. Weeds are scattered across Mount Alexander Shire, especially where land is disturbed and where seed is dispersed, for example, along waterways, roads, tracks and railway lines.

INDICATOR: NUMBER OF NEW WEED SPECIES AND NUMBER OF ERADICATED WEED SPECIES

Determining the exact date of arrival or establishment and whether a species has been completely eradicated are difficult; these data are the best assessments from local weed experts. Five species have appeared and been eradicated between 2000 and 2010:

Bidens pilosa Cobblers Pegs

Galenia pubescens Blanket Weed

Physalis viscosa Sticky Cape Gooseberry Weed (Sticky Ground-cherry)

Typha latifolia Reed Mace

Nassella hyalina Cane Needle-grass

Five species have appeared but not been eradicated between 2000 and 2010:

Calicome spinosa Spiny Broom

Chloris virgata Feathertop Rhodes Grass (Feather Windmill Grass)

Moraea fugacissima Galaxia

Onopordum acaulon Stemless Thistle

Sorghum halepense Johnson Grass

19 Parks Victoria (2007) State of the Parks Report.
20 Commissioner for Environmental Sustainability (2008) State of the Environment Victoria 2008
21 Commissioner for Environmental Sustainability (2008) State of the Environment Victoria 2008
22 D. Major, Regional Manager, Parks Victoria, Bendigo, pers. comm. April 2010

NUMBER OF WEED SPECIES IN THE SHIRE

Another indicator is the total number of weed species identified in the Shire. The following table lists the number of weed species in each category according to their level of risk to the environment and/or agricultural productivity.

Table 3: Number of Weeds in Categories of Conservation Significance in Mount Alexander Shire

Category	Explanation	Number of weed species in this category identified in Mount Alexander Shire *Note: Some species occur in more than one category*
Weed of National Significance	National category – Twenty priority species identified nationally for action based on their invasiveness, impacts, potential for spread and socioeconomic and environmental aspects	12
Declared Noxious (prohibited regionally)	Victorian category – North Central Catchment region. Regionally prohibited weeds are not widely distributed in a Region but are capable of spreading further. They can be eradicated and should be managed with that goal.	6
Declared Noxious (controlled regionally)	Victorian category – North Central Catchment region. These invasive plants are usually widespread and considered important in the Region. To prevent their spread, continuing control measures are required.	24
Declared Noxious (restricted)	Victorian category – North Central Catchment region. Plants that pose an unacceptable risk of spreading and a serious threat in Victoria or another State. Trade in these weeds is prohibited.	31
Environmental Invader of Significance	North Central region category – considered by North Central CMA staff to be invasive species notable for their impact, recent emergence or other factors within the Mount Alexander Shire.	181
Agricultural Weed of Note	North Central region category – considered by North Central CMA staff to be species notable for their impact on farmers within the Mount Alexander Shire.	88
Urban/disturbed areas nuisance weed	North Central region category – considered by North Central CMA staff to be species mainly of human disturbed areas including urban environments within the Mount Alexander Shire.	56
Uncategorised weed		272

Sources: Weed data collected by Ern Perkins; Ian Higgins, NCCMA; the Department of Sustainability and Environment's Victorian Biodiversity Atlas Flora Records.

Trend: Stable (or slight ongoing decrease)

Control and eradication is possibly reducing the rate of increase of some weed species but the number of new weed species is increasing overall. Some weeds are greatly increasing in area and density, while others are decreasing. There is anecdotal information, but no robust data, to suggest that management is also stabilising the numbers and distributions of many weeds and pests. This is, however, dependent on ongoing resourcing, and some species are expanding unchecked.

Pressure

Without ongoing control activities, weeds and pests will naturally reproduce and disperse to create increasing populations across increasing areas. Weeds are also aided in their spread across larger distances by transport of weedy soil, hay and other materials, and seeds attached to vehicles. Weeds may escape from nurseries, gardens, rubbish dumps and unmanaged land.

Responses

LANDOWNERS

Weed and pest management on private land is the responsibility of landowners but is facilitated and sometimes funded by DPI, DSE, NCCMA and small grants to organisations such as Landcare[23].

DSE AND PARKS VICTORIA

DSE manages weeds and pests in State Forests and Crown land, and Parks Victoria manages them on the parks it manages. Management is limited to controlling infestations, especially where neighbouring private properties, and funded by ongoing management funds, Good Neighbour Program, competitive funds and DPI grants for weeds[24].

Since 2000, Parks Victoria has coordinated about $250,000 of resources, including significant volunteer labour and private landowner resources, to control wheel pear cactus across 12,000 ha near Maldon and is successfully reducing the threat to a manageable level[25]. Generally, however, resourcing of weed control on public land falls well below what is desirable.

Weed and pest management needs to be focused on assets of highest significance across the Shire.

For the majority of exotic species (whether new invaders or old), their current distribution and extent is only a fraction of their future spread — they are still in the early phases of invasion and without human intervention it is inevitable that they will increase in the Shire.

Management efforts, nearly always led and implemented by community-based volunteers, are reducing the number of species becoming established. Supporting community education in weed awareness and providing resources to local community groups is probably the most cost-effective way to ensure that this continues as an effective strategy to minimise the numbers of new invader species.

Implications

Weed and pest prevention, eradication and control is under-resourced and sometimes poorly coordinated between agencies and funding sources[26]. Council lacks the resources for routine roadside weed control. Landcare's successes indicate that weeding is a suitable activity for community action. Community consultation has assessed weed management as one of the highest priorities[27]. A vocal community minority expects more effective control of feral and domestic cats by Council[28]. More powerful indicators of weed impacts include the area infested by weeds or the area from which weeds have been eradicated, but data are inadequate. There is no meaningful monitoring of pests or pest control.

To be strategic, investment in weed control should be focused on early detection and eradication of new/emerging species before they are 'out of control'.

23 NCCMA (2008) Draft Upper Loddon Catchment Action Plan; NCCMA (in prep.) Weed and pest management plan

24 DNRE (2002) Victorian pest management. A framework for action.

25 N. Muller, Parks Victoria Team Leader, pers. comm. April 2010.

26 Parks Victoria (2007) State of the Parks Report; Biosis (2008) An assessment of the weed management program in land managed by Parks Victoria. Report to VNPA; Note that Parks Victoria spent $16/ha on management in 2006-2007, much of which went on managing metropolitan reserves, compared to $29/ha in NSW and $27 by the Commonwealth, neither of which manage metropolitan reserves (WWF, Building Nature's Safety Net 2008. Progress on the Directions for the National Reserve System)

27 NCCMA (2008) ibid.

28 F. McMahon, Manager Sustainable Development, Mount Alexander Shire Council, pers. comm. April 2010.

Index of stream condition along Loddon and Campaspe Rivers

The index of stream condition can also be reported as each of its five sub-indices:

- Hydrology – flows, losses and HEP stations
- Streamside zone – width, continuity, structure, weeds, regeneration, billabongs
- Physical form – bank and bed stability, artificial barriers, instream physical habitat
- Water quality – phosphorus, turbidity, electrical conductivity, pH
- Aquatic life – diversity of macro-invertebrates

Figure 3: Index of Stream Condition of Rivers in Mount Alexander Shire in 1999

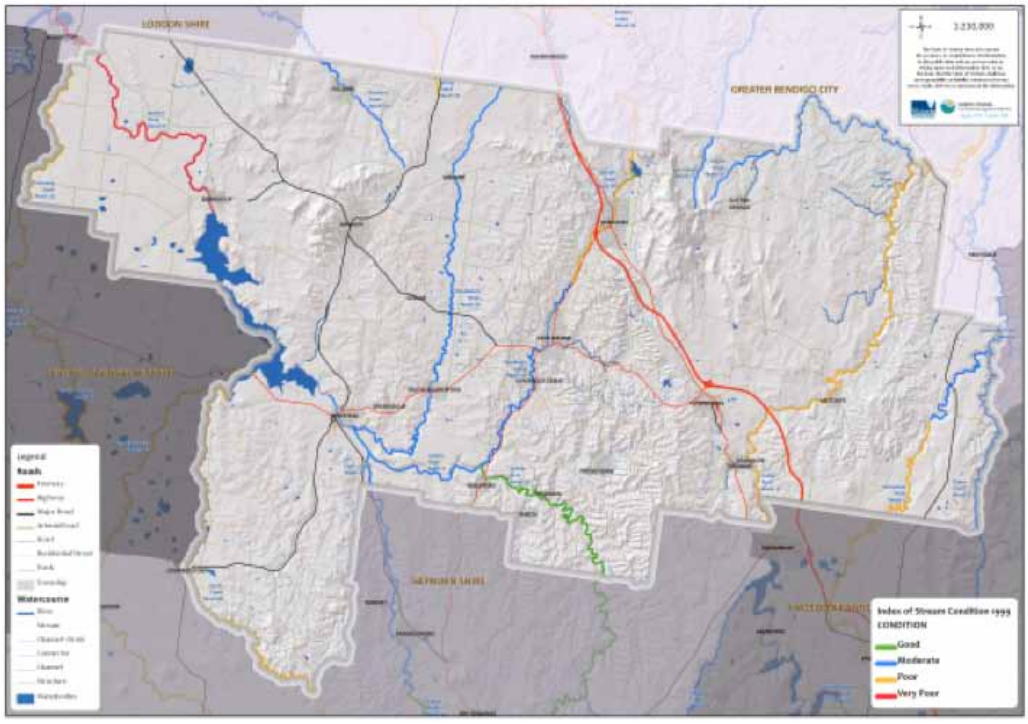
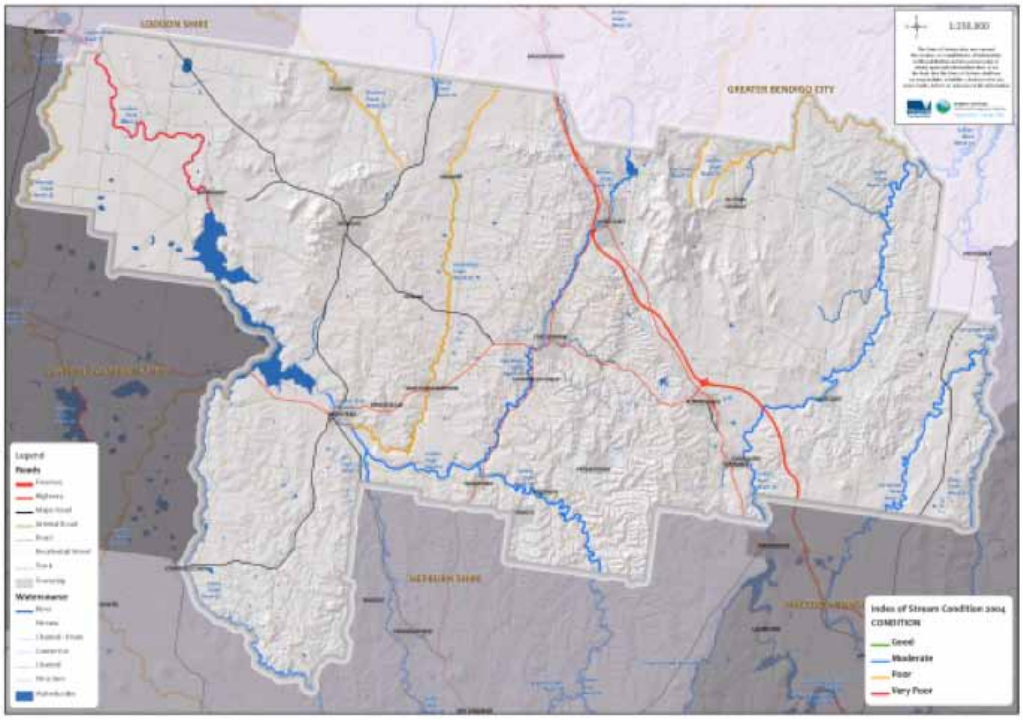


Figure 4: Index of Stream Condition of Rivers in Mount Alexander Shire in 2004



Trend: Stable (but poor)

Stream condition deteriorated massively during European colonisation and land clearance, and again in recent years of low rainfall. There were mixed trends between the two assessment years of 1999 and 2004; results from sampling in 2009–2010 are not yet available.

Pressure

Pollution comes from point sources such as industry and diffuse sources such as agriculture. Major sources include stormwater run-off, which picks up garbage, chemical and physical pollutants from impervious surfaces[29]. Agricultural run-off includes effluent, herbicides, pesticides, phosphorous, nitrogen and other fertilisers, and sediment caused by erosion of exposed soils. Run-off is higher from intensive use farming but moderated by the quality and quantity of waterside vegetation[30]. Recycled water is released by the Campbell's Creek sewerage treatment works. Overflows and seepages from sewerage works and rural septic tanks have high organic matter, nutrient loads and sometimes pathogens[31]. In 2009, 1895 properties in the Shire did not use piped sewerage services[32]. Accidental spillages such as chemicals from road accidents occur rarely but can have massive local impacts. It is predicted that climate change will decrease overall rainfall but increase the proportion that falls in heavy storms.

Responses

MOUNT ALEXANDER SHIRE COUNCIL

Council regulates stormwater and domestic waste water through its building regulations[33]. Waste water and sewerage is treated and recycled by Coliban Water.

There is much that Mount Alexander Shire Council can do in tandem with the NCCMA and State agencies to deal with the agricultural land impacts; for example, through the planning scheme.

NCCMA

The whole Shire is in Declared Water Supply Catchments, meaning that DSE and NCCMA assess proposed activities for their impacts on water. NCCMA provide financial incentives and advise farmers on sustainable land management and recommend fencing stock out of waterways.

Implications

Increased demand for rural living will increase the risk of water pollution. There is little short-term economic incentive for farmers to fence livestock out of waterways or developers to minimise storm-water run-off. Council stormwater regulations and policies may be inadequate[34]. The Federal government no longer funds the community-based Waterwatch monitoring system. Community consultation assessed restoration of connected riparian vegetation as one of the highest priorities[35]. The Coliban Catchment Water Plan recommends implementing a septic tank registration and inspection system, and an evaluation of sediment run-off from maintenance of unsealed roads[36].

29 PPK (2002) Mount Alexander Stormwater Management Plan
30 NCCMA (2006) A Catchment Action Plan for the Coliban Catchment.
31 DNRE (2000) Lake Eppalock Catchment: Land Capability Assessment and Planning Project; EPA (2000) The health of streams in the Campaspe, Loddon and Avoca Catchments.
32 I. Watson, Manager Industrial/Commercial, Coliban Water, pers. comm. April 2010.
33 PPK (2002) ibid; Mount Alexander Shire Domestic Wastewater Management Plan 2007
34 PPK (2002) ibid.
35 NCCMA (2008) ibid.
36 NCCMA (2006) A Catchment Action Plan for the Coliban Catchment.

Flow on the Coliban River below Malmsbury

River flows are determined by rainfall and other inflows minus abstractions and other losses. Flows are measured on the Coliban River below Malmsbury Reservoir. Flows include allocated environmental flows, which are designed to maintain the natural wetlands of waterways and downstream wetlands. These are a combination of minimum flow obligations plus any unregulated flows and spills.

Figure 5: Water Discharge below Malmsbury Reservoir; Mean Daily Discharge (ML)[37].

Trend: Declining

Since 2000, flows have been at levels inadequate to sustain downstream environmental assets. In very dry years, the Minister has qualified the environmental entitlements to meet the emergency needs of residential and agricultural users. A Ministerial Qualification from 2008 made only 30% of the environmental entitlement from Malmsbury Reservoir available for environmental releases. This allocation will increase to 50% in 2009–2010[38]. Malmsbury reservoir was 9.6% full in June 2006, declining to 4.1% in 2007 and 1.8% in 2008[39].

In the Loddon system, a continuation of recent low inflows would lead to about 17 GL of environmental flows, a 84% reduction on the long-term average of 109 GL; and on the Campaspe system, 23 GL, a 86% reduction from 139 GL[40].

Pressure

Inflows have greatly decreased, mostly because of reduced rainfall but also increased interception by small dams. Unregulated small dams in the Campaspe catchment intercept 29% of flows in recent dry years and locally up to 74% of flows[41]. Usage has declined but still exceeds water availability. Residential water needs are given priority over environmental needs and entitlements.

Responses

DSE, NCCMA and Coliban Water

DSE and NCCMA have imposed significant cuts to water usage allowances, especially to agricultural irrigation. Coliban Water constructed the Goldfields Superpipe and purchased water entitlements to deliver water from the Goulburn system to Bendigo and Castlemaine, and reduce pressure to extract water from natural waterways[42]. The Coliban Catchment Water Plan recommends researching a limit to farm dams[43].

Implications

Allocated environmental flows need to be delivered if downstream environmental assets are to be maintained[44]. Taking water from the Goulburn System impacts the waterway health of the Goulburn and Murray systems. Additional indicators could include reservoir levels, groundwater levels and the Index of Wetland Health in selected grassy and Red Gum swamps (these wetlands have had no significant water for many years and currently have very poor health, but could regain values given adequate rainfall and inflows).

37 Data supplied by Bruce Duncan, Manager Headworks, Coliban Water
38 Coliban Water (2009) Annual Report 2008/9.
39 Coliban Water Annual Reports
40 DSE (2009) Northern Region Sustainable Water Strategy
41 SKM (2008) Farm dam interception in the Campaspe basin under climate change. Report to DSE.
42 http://www.coliban.com.au/projects/goulburn_campaspe_link.asp
43 NCCMA (2006) A Catchment Action Plan for the Coliban Catchment.
44 DSE (2009) ibid.

Soil Quality

An indicator of soil quality would be very useful but data are unavailable. Soil quality is a key driver of agricultural productivity, vegetation quality and restoration, and sedimentation of waterways. Measures of soil quality include structure, organic content, fertility, salinity and erosion or loss. Historical loss of top soil has made most soils susceptible to further erosion. Erosion remains a localised problem especially in areas where livestock congregate, on poorly vegetated soils and steep slopes. In 1991, 30% of Victoria's agricultural land was considered to be severely degraded due to soil structure decline. In the Mount Alexander region, there were significant impacts on soils, waterways and landforms during the intensive gold mining of the mid 19th century Gold Rush. Alluvial mining involved significant alteration of creek flats, gullies and hilltops, while numerous holes, tunnels and open-cuts were dug[45]. Much of the forest was logged for firewood and construction, also resulting in soil erosion or changing landforms.

Land health across the NCCMA region is poor to moderate, as much has a very high susceptibility to soil structure decline with a high likelihood of occurrence under current land management practices[46]. Salinity costs Victoria $50 million annually in lost agricultural production and the cost of lost productivity due to soil acidification is estimated at $470 million per year[47]. There is considered to be a high risk of salinity in the Campaspe catchment, Castlemaine, Campbell's Creek and Chewton but this risk is not manifested during low-rainfall years[48].

DPI works with agricultural industry bodies to advise on best practices to minimise erosion, loss of soil structure and fertility, and salinity in varying climates[49]. The NCCMA develops strategies and synthesises information for sustainable land management. A high priority in the region is to prevent erosion, trampling and over-grazing by fencing stock out of riparian strips[50]. Small grants for on-ground works are available through a number of sources, including Mount Alexander Shire Council and Landcare groups.

45 Parks Victoria (2007), Castlemaine Diggings National Heritage Park management plan, http://www.parkweb.vic.gov.au/resources07/07_1927.pdf

46 NCCMA (2009) Annual Report.

47 Commissioner for Environmental Sustainability (2008) State of the Environment Victoria 2008

48 NCCMA (2007) North Central Dryland Region Management Plan

49 DPI (2008) Future Farming Strategy

50 NCCMA (2003) North Central Regional Catchment Strategy; NCCMA (2006) Caring for Country: a guide for sustainable land management in central Victoria; NCCMA (2007) Draft North Central Dryland Region Management Plan; NCCMA (2008) Draft Upper Loddon Catchment Action Plan

BIODIVERSITY

Biodiversity is the variety of all life, including the diversity of plants and animals, their genes and ecosystems, and the ecological processes they support. Plants and animals are essential for human life by providing ecosystem services such as air, water, soil and food. Nature is also essential for our cultural and spiritual life, as recognised by peoples' connections to land, trees and animals, and our ideal living environments. European settlement has caused extensive biodiversity changes, but government now recognises the fundamental importance of conserving natural ecosystems and species. Government policies aim to maintain functional ecosystems across the landscape, restore highly degraded habitats and conserve iconic species. However, biodiversity continues to decline as the quality of habitat deteriorates and is predicted to deteriorate faster as the climate changes.

HEADLINE INDICATOR

Percentage of Shire covered in native vegetation

Natural vegetation is an essential component of productive and sustainable farming by providing 'ecosystem services', such as the maintenance of soil structure and fertility, regulation of water flow and water tables, moderation of local climate and control of pests and diseases. Native vegetation is the designated land-use for 15% of the Shire[51] but actually covers 51% of the Shire, including large areas designated for forestry, farming and other land-uses[52].

Trend: Stable

From the time of European settlement until the late 1940s, much of the original native vegetation of the Shire was cleared, initially for mining and later for agriculture. Since the 1940s, there has been almost no net loss in total area of tree cover. Restoration and regeneration, as part of sustainable farming and land management as well as for biodiversity outcomes, is starting to lead to a net gain in the Shire[53]. Natural regeneration is the biggest driver of current and predicted vegetation gain[54]. However, native grass species have suffered as a result of oversowing with exotics and the phosphate bounty, therefore it is likely that there has been some net loss of native grasslands. However, no data are available for this[55].

Pressure

Clearance for farming, residential areas and services is now more regulated (although land clearing still sometimes occurs under the radar). The general benefits of native vegetation cover are well accepted.

Responses

MOUNT ALEXANDER SHIRE COUNCIL

Council regulates vegetation clearance as required under legislation (e.g. FFG Act and EPBC Act), with referral advice from DSE and DEWHA, and can demand offsets such as planting and improving the quality of vegetation in other areas.

COMMUNITY GROUPS

Groups such as Landcare restore and facilitate regeneration of native vegetation on public and private land. NCCMA and Connecting Country coordinate strategy and facilitate funding. Within Mount Alexander Shire there are numerous, high-quality community conservation and restoration groups.

Implications

Scattered native vegetation, notably mature paddock trees and riparian strips, also contribute greatly to ecosystem services and biodiversity, but may be overlooked and more difficult to manage than large patches of native vegetation. Better coordination, monitoring and reporting of conservation works funded by various bodies, including State government, Council, Landcare and Trust for Nature, would aid effective delivery and volunteer morale[56].

51 DPI (1996-2002) Land Use of the North Central Catchment Management Authority (GIS layer ref: LANDUSE100_NC/)

52 DSE (2005) Native Vegetation – Modelled 2005 Ecological Vegetation Classes (GIS layer ref: NV2005_EVCBCS/EVCBCS)

53 DEWHA (in prep.) Measuring change in native tree cover. Landscape Logic fact sheet no. 8; G. Park, NCCMA unpubl. data 2010

54 DEWHA (in prep.) ibid.

55 Commissioner for the Environment (1991) Agriculture and Victoria's Environment. Melbourne: Government of Victoria. Pg 229-232

56 NCCMA (2008) ibid.

OTHER INDICATORS

Area covered by key threatened habitats

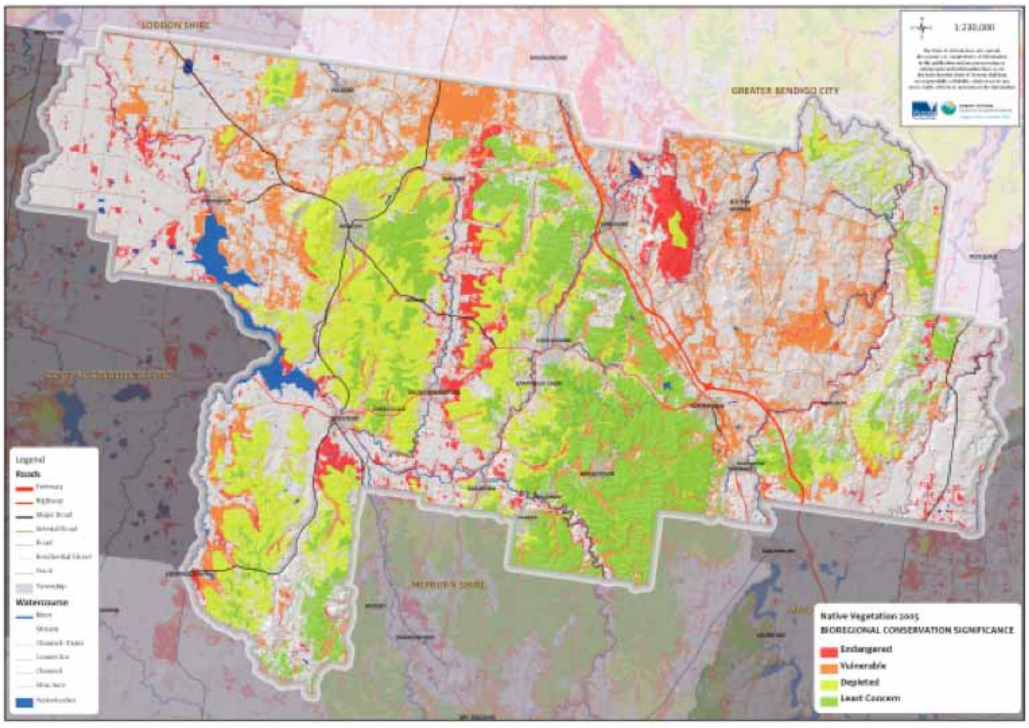
The map below shows the areas of the Shire covered by native vegetation and classifies them according to their Conservation Significance. It can be seen that 11% of the Shire's native vegetation is endangered, which represents a significant challenge to protecting and managing these areas.

Table 4: Areas of Bioregional Conservation Significance in Mount Alexander Shire 2005

Classification according to Conservation Significance	Hectares	Percentage of Native Vegetation
Endangered	8,936	11%
Rare	0	0
Vulnerable	21,390	27%
Depleted	24,590	32%
Least Concern	21,661	28%
Not Applicable	1,350	2%
TOTAL	77,927	100%

Source: North Central Catchment Management Authority

Figure 6: Areas of Bioregional Conservation Significance in Mount Alexander Shire 2005



Source: North Central Catchment Management Authority

Native habitats vary with soils, altitude, rainfall and other factors, and are divided into Ecological Vegetation Classes (EVCs). Each EVC supports its own unique biodiversity. The threat status of EVCs is based on historical and recent losses. Mount Alexander Shire shares responsibility for conserving threatened EVCs, which cover significant areas within the Shire.

Table 5: Ecological Vegetation Class areas in Mount Alexander Shire

EVC1[57]	1750 (HA)	2005 (HA)	BIOREGIONAL CONSERVATION STATUS (GOLDFIELDS BIOREGION)	PRIORITY FOR MOUNT ALEXANDER SHIRE*
Box Ironbark Forests or Dry Woodlands				
Box Ironbark Forest	28,523	20,788	Depleted	
Granitic Hills Woodland	2,834	1,743	Endangered	
Dry Forests				
Heathy Dry Forest	26,616	21,661	Least Concern	
Grassy Dry Forest	3,649	2,073	Depleted	
Herb-rich Foothill Forest	173	173	Depleted	
Valley Grassy Forest	7,077	3,455	Vulnerable	
Lower Slopes or Hill Woodlands				
Hillcrest Herb-rich Woodland	1,333	1,078	Depleted	
Hills Herb-rich Woodland	654	478	Depleted	
Grassy /Alluvial Terraces Woodland	6,139	2,562	Endangered	
Grassy Woodland	45,971	15,363	Vulnerable	
Scoria Cone Woodland	169	27	Endangered	
Herb-rich Woodlands				
Alluvial Terraces Herb-rich Woodland	288	149	Endangered	High
Alluvial Terraces / Creekline Grassy Woodland	6,419	2,831	Endangered	High
Creekline Herb-rich Woodland	35	9	Endangered	High
Plains Woodlands				
Plains Grassy Woodland	9,450	1,156	Endangered	High
Plains Woodland	8647	663	Endangered	High
Riverine Grassy Woodlands				
Floodplain Riparian Woodland	869	356	Endangered	High
Creekline Grassy Woodland	1,646	781	Endangered	High
Riparian Scrubs and Woodlands				
Swamp Scrub	149	12	Endangered	High
Swampy Riparian Woodland	35	29	Endangered	High
Stream Bank Shrubland	1,041	671	Endangered	High
Wetlands				
Wetland Formation	398	188	Endangered	
Red Gum Swamp	782	319	Endangered	
Water Body – man-made	0	1,361		
Total native vegetation	152,897	77,927		

[57] DSE (2005) ibid.

It would also be useful to measure habitat quality. High-quality vegetation offers improved ecosystem services and benefits for surrounding land management, and supports more biodiversity. Habitat quality is mapped as Conservation Significance based on the threat status of the EVC, a modelled condition value and landscape context score[58]. Factors include the abundance of mature trees, canopy cover, recruitment of new trees, dead wood, lack of weeds, size of habitat patch and connection to neighbouring patches[59]. Quality is assessed by DSE as habitat hectares and will be incorporated into Nature Print reporting. None of these measures have been repeated to indicate trends for Mount Alexander Shire.

Trend: Stable

Most native vegetation was lost by the 1940s and there is now almost no net loss in total area. EVCs on more fertile land have suffered disproportionate losses. Restoration and regeneration is increasingly targeted at the priority EVCs[60]. Habitat quality is declining in some areas and improving in other areas. Forests are recovering from historical over-harvesting and no commercial logging is planned in the near future. Demand for firewood has declined as more houses are connected to gas for heating.

Pressure

There is limited threat to the current extent of priority EVCs but their total area is inadequate to sustain many key species and ecosystem functions, especially if habitat quality continues to decline. A range of localised factors diminish habitat quality including fire, loss of mature trees, lack of recruitment, weeds and modification around rural dwellings. Over-grazing by pests and domestic stock, notably stock on native vegetation pastures and poorly fenced remnants, impacts many priority EVCs[61].

Responses

Mount Alexander Shire Council issues some permits for vegetation clearance on the condition of improving the quantity or quality of vegetation in other areas.

NCCMA, CONNECTING COUNTRY, LANDCARE AND OTHER COMMUNITY GROUPS

NCCMA and community-based groups advocate for and fund landscape-scale restoration and improved management of remnant and natural vegetation, aiming for large patches connected by corridors or biolinks, to improve ecosystem functionality and resilience[62]. NCCMA aids Council to use mapping layers of conservation significance to aid land-use decision-making.

Implications

Investment in habitat restoration needs to be targeted at priority EVCs. Threatened and priority EVCs need further research and investment[63]. Council and other planners may need more help to best use existing conservation prioritising maps. There is no monitoring of habitat quality within the Shire. Additional indicators could include native vegetation clearance permits issued by Council but the number of permits per se does not indicate the net impact, and the area of mature trees, but this is likely to change very slowly.

58 DSE (2005) Native Vegetation Importance (GIS layer ref = NV2005_LSIMP)
59 DSE Vegetation Quality Assessment Manual
60 Connecting Country (2008) ibid.
61 NCCMA (2006) A Catchment Action Plan for the Coliban Catchment.
62 Connecting Country (2008) Restoring landscapes across Mount Alexander. A biodiversity blueprint.
63 NCCMA (2008) ibid.

Number and status of threatened fauna in the Shire

The list of threatened species is a good overall indicator of the health of the natural environment, especially the rarest and most ecologically sensitive habitats. As many species are listed because of threats elsewhere in Victoria, or occur in insignificant numbers in the Shire, their threat status does not necessarily indicate their status within the Shire.

Table 6: Number of Threatened Fauna in Mount Alexander Shire

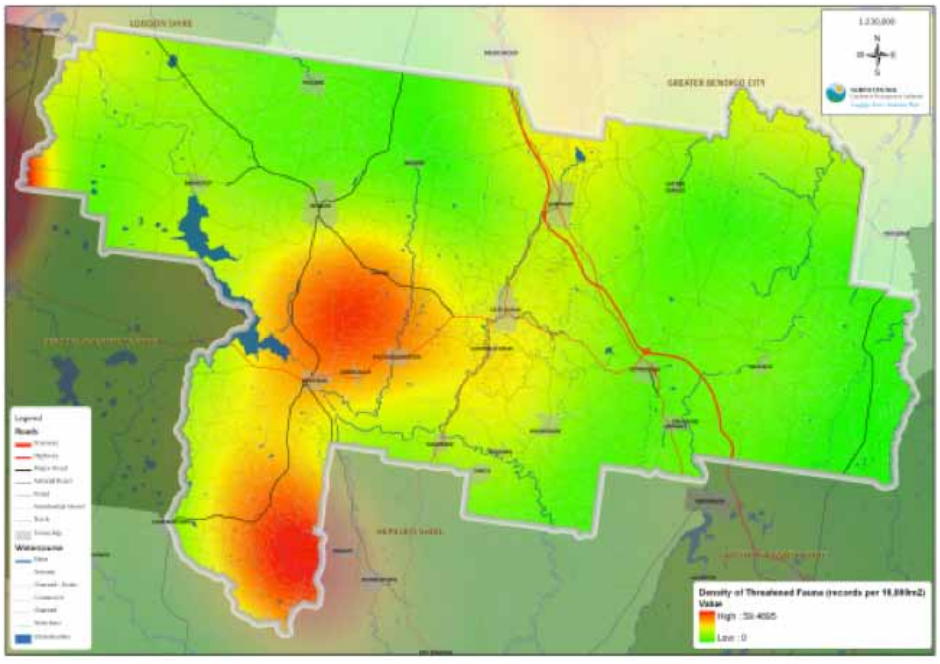
Threat category[64]	No. species threatened in Mount Alexander Shire	Species significant to Mount Alexander Shire
Critically Endangered	3	Regent Honeyeater
Endangered	17	Swift Parrot; Bibron's Toadlet; Golden Sun Moth
Vulnerable	21	Speckled Warbler; Diamond Firetail; Brush-tailed Phascogale; Eltham Copper
Near Threatened	19	Hooded Robin; Crested Bellbird; Brown Treecreeper; Black-chinned Honeyeater; Woodland Blind Snake

Source: North Central Catchment Management Authority

A handful of threatened species are monitored adequately to assess trends. The Eltham Copper butterfly is now restricted to small areas in the Wimmera, around Eltham, Big Hill in Bendigo and in Castlemaine Botanic Gardens and Kalimna Park in Castlemaine. The butterfly is symbiotic with dwarf Sweet Bursaria plants and a specific ant, which are susceptible to trampling, rabbits and weeds. The Southern Shepherds Purse flower now occurs nowhere else in the world away from moist moss on granite rocks Mount Alexander Regional Park, which are susceptible to drying, destruction by motorcycles and other human disturbance, weed invasion, grazing and fire[65].

The following map shows the distribution of threatened fauna species to identify where the "hotspots" are that need extra efforts for protection.

Figure 7: Distribution of Threatened Fauna within Mount Alexander Shire



Source: North Central Catchment Management Authority

64 DSE (2007) Advisory List of Threatened Vertebrate Fauna in Victoria – 2007.
65 DSE (2003) Eltham Copper butterfly. Flora and Fauna Guarantee Act Action Statement no. 39; DSE (2010) National Recovery Plan for Southern Shepherd's Purse Ballantinia antipoda.

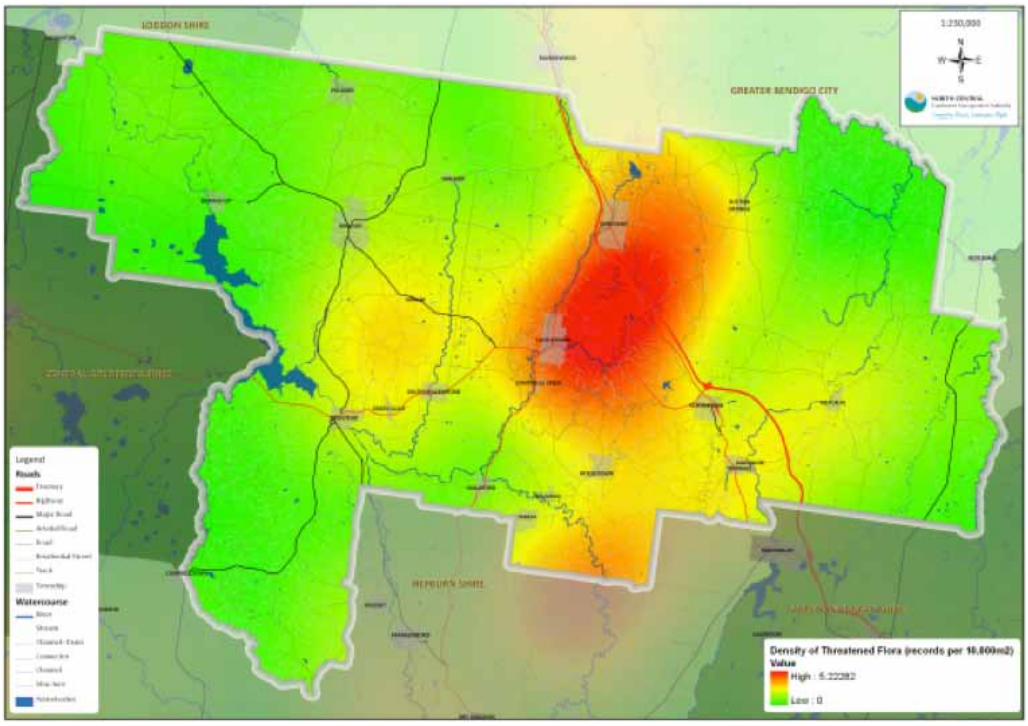
Table 7: Number of Threatened Flora in Mount Alexander Shire

Threat category (Victorian Register of Threatened Species)[66]	No. species threatened in Mount Alexander Shire	Species also listed on the Victorian Flora and Fauna Guarantee Act 1988 and federal Environment Protection and Biodiversity Act 1999
Endangered	11	Southern Shepherds Purse; Maroon Leek-orchid; Large Fruit Fireweed; Little Pink Spider Orchid; Purple Eyebright; Rough Eyebright (FFG & EPBC) Spiny RIceflower; Brittle Greenhood; Tough Scurf Pea (FFG)
Vulnerable	26	Clover glycine (EPBC & FFG) Striped Water Milfoil; Whorled Zieria; Scented bushpea; Swamp diurus; Purple diuris; Small milkwort; Bow-lip Spider-orchid (FFG) Spiny rice-flower subspecies; Trailing hop-bush (EPBC)
Rare	29	Australian Anchor plant (FFG) Ornate Pink-fingers (EPBC)
Poorly known but likely to be in one of the above categories	9	
Not listed on VROT		Robust Greenhood; Buloke; Hairy Tails (FFG) Riverswamp Wallaby Grass (EPBC)

Source: North Central Catchment Management Authority

The following map shows the distribution of threatened plant species in Mount Alexander Shire. It can be seen that the "hotspot' for threatened flora is in a zone around Castlemaine and Harcourt.

Figure 8: Distribution of Threatened Flora within Mount Alexander Shire



Source: North Central Catchment Management Authority

66 DSE (2005) Advisory List of Rare or Threatened Plants in Victoria

Trend: Declining

Many species became extinct at the time of European settlement. Most biodiversity follows the trends of the associated habitat (EVC or waterways). Local extinctions are still occurring as a long-term consequence of historical habitat losses. Most threatened species are still declining but several of those benefiting from pro-active conservation measures are stable or recovering. Threatened species are often difficult to monitor and most trends are inferred from patchy data and the state of the habitat.

Pressure

Many threatened species are still threatened because of historical habitat loss. Other species are threatened because of historical and ongoing habitat degradation. Many species are likely to decline as a result of a changing climate.

Responses

DSE

Many species require habitat conservation alone, but others have specific conservation needs. For those with specific needs, DSE has produced some Biodiversity Action Plans, Species Action Plans and Action Statements as strategic management planning tools, but their production and especially implementation is under-funded[67]. DSE implements the Eltham Copper Action Statement and manages and conserves the Southern Shepherds Purse within its resourcing capabilities.

CASTLEMAINE FIELD NATURALISTS

The Castlemaine Field Naturalists and other community groups provide support for managing and monitoring the Eltham Copper and other threatened species.

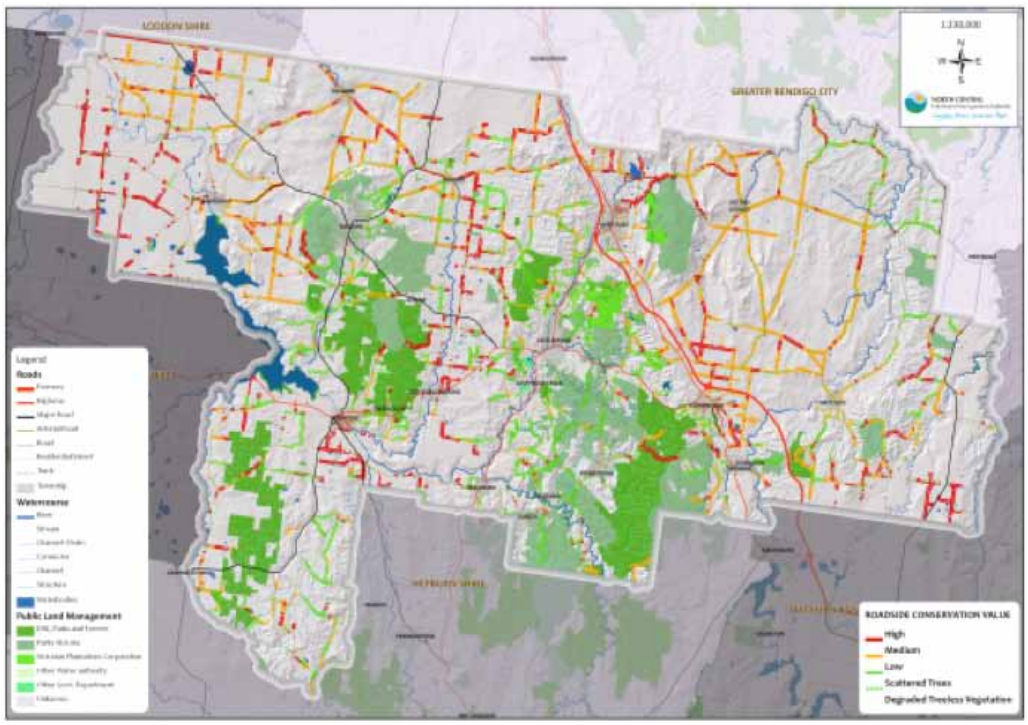
MOUNT ALEXANDER SHIRE COUNCIL

Council planning decisions are made with consideration to the distributions and conservation needs of threatened species. Council roadside management is informed by NCCMA maps of roadside conservation values[68]. The map below shows the distribution of conservation values in the roadsides that the Shire is responsible for.

67 e.g. DNRE (2002) Goldfields Biodiversity Action Plan; DSE (2002) Swift Parrot. Flora and Fauna Guarantee Act Action Statement no. 169.

68 DSE (2009) Managing native vegetation on roadsides: A guideline for implementing agreements under the local government public road exemption; Mount Alexander Shire Council (1998) Roadside Management Strategy.

Figure 9: Roadside Conservation Significance within Mount Alexander Shire



Source: North Central Catchment Management Authority

Table 8: Roadside Vegetation Condition in Mount Alexander Shire

ROADSIDE VEGETATION CONDITION	AREA IN MOUNT ALEXANDER SHIRE (KILOMETRES)
Degraded Treeless Vegetation	625
High	460
Low	515
Medium	641
Scattered Trees	153
TOTAL	2394

Source: North Central Catchment Management Authority

Implications

It is accepted that the overall legal structure, the Flora and Fauna Guarantee Act, has failed and should be reviewed, with adequate funding for a long-term improvement in the condition of Victoria's biodiversity[69]. NCCMA and Council need to ensure that all Council staff and contractors are kept aware of conservation planning and management information and best-practice guidelines. Mount Alexander Shire Council could generate positive publicity from iconic threatened species on Council-managed land. Future indicators could be based on Connecting Country's monitoring of nest boxes, or the Trust for Nature and Bird Observers and Conservation Australia's woodland birds index.

CLIMATE

As outlined in the Driving Forces section, there are a number of current and projected impacts of climate change upon Mount Alexander Shire. The most common indicators of climate change for any region are changes to average temperatures and rainfall. Global and national average temperatures are known to have risen over the last century and Victoria has warmed by 0.6°C since the 1950s[70]. Rainfall patterns have been altered by this temperature rise alongside an increase in extreme weather such as storms and hail events. Rainfall in Victoria has declined in most regions. Reduced rainfall and increased temperatures impact many of the environmental themes discussed elsewhere in this report, and also increase the frequency and severity of wild fires.

Mount Alexander Shire is already experiencing a reduction in rainfall and an ongoing drought and average temperatures have already increased. CSIRO research about the North Central Region of Victoria, of which Mount Alexander Shire is a part, shows that:

- The average annual temperature across the North Central Region was 0.3°C warmer over the decade 1998–2007 than the 30 year average (1961–1990);
- The average daily maximum temperature increased by 0.6°C and there were more hot days per year (eg 7 more days over 30°C);
- The region's rainfall declined over the past decade: between 1998 and 2007 average rainfall was 15% below the 1961 to 1990 average[71].

69 Commissioner for Environmental Sustainability (2008) State of the Environment Victoria 2008

70 Victorian Commissioner for Environmental Sustainability 2008, State of the Environment Report – Victoria 2008, p.188.

71 Victorian Government Department of Sustainability and Environment (DSE) 2008, Climate Change in the North Central Region, Melbourne, June 2008 http://www.climatechange.vic.gov.au/___data/assets/pdf_file/0013/73201/NorthCentral_WEB.pdf

Future projections by CSIRO of the impact of climate change on the North Central Region indicate that:

- Average annual temperatures are predicted to increase by about 0.9°C by 2030 (under a medium emissions scenario) and increase by 1.4°C to 2.7°C by 2070
- The number of hot days (days over 30°C) is also expected to increase.
- Total average annual rainfall is expected to decrease by around 4% by 2030, with the greatest reductions occurring in spring (7%), and to decline by 6 to 11% by 2070
- A 10 to 50% increase in the number of hot summer days (over 35°C) by 2030
- Extreme heavy rainfall events may become more intense
- Droughts are likely to become more frequent and longer
- Dry conditions that currently occur on average one in every four years may increase to up to one in three years by 2030
- Increased evaporation rates
- Drier soil likely, even if precipitation increases
- Decreased average run-off in streams
- Hotter, drier conditions likely to increase bushfire risk – for example, in Bendigo (not in Mount Alexander Shire Council but nearest available data) the number of 'extreme' fire danger days is expected to increase by between 23% and 65% by 2020, and by 35% to 230% by 2050[72].

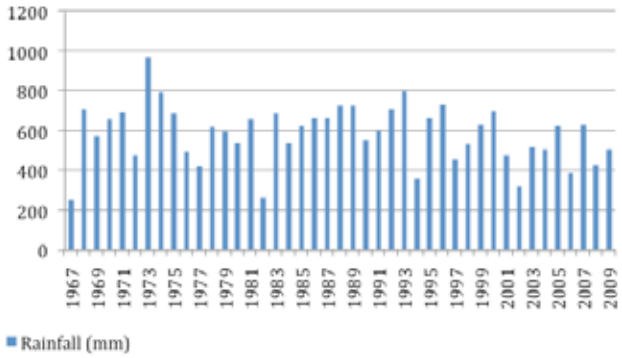
HEADLINE INDICATOR

Long-term Temperature and Rainfall in Mount Alexander Shire

Rainfall

Mount Alexander Shire has experienced a severe deficiency in rainfall, and in some areas the lowest rainfall on record, between 1997 and 2007[73]. The following graph shows annual rainfall at the weather station located at Castlemaine Prison. It is clear from this graph that there is a trend towards lower rainfall, particularly noticeable since 2000.

Figure 10: Annual Rainfall at Castlemaine Prison



Source: Bureau of Meteorology

Temperature

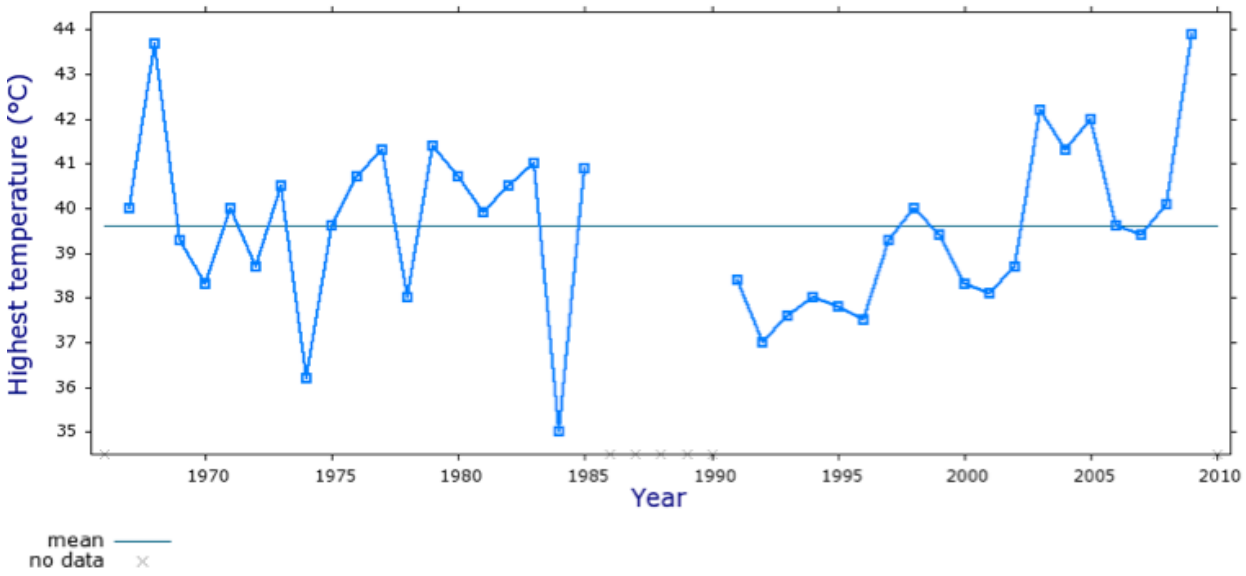
Temperature records fluctuate dramatically over time and a range of factors, including the El Nino and La Nina events, influence average maximum and minimum temperatures. Hence it is difficult to see exact trends by observing temperature data. However, long-term average temperatures in Victoria have shown an increase of 0.6 ºC in the last 50 years, which is very likely to be observed in Mount Alexander Shire. CSIRO research about the North Central Region of Victoria (includes Mount Alexander Shire) has shown that the average annual temperature across the region was 0.3ºC warmer over the decade 1998-2007 than the 30 year average (1961-1990) and the average daily maximum temperature increased by 0.6°C.

One outcome of climate change is the increase in extreme temperatures, therefore observing the annual highest temperatures can show the impacts of climate change. The graph below shows that annual highest temperatures have tended to increase, with the highest ever temperature having occurred in 2009.

72 DSE 2008, Op.cit

73 Victorian Commissioner for Environmental Sustainability 2008, State of the Environment Report – Victoria 2008, p.205.

Figure 11: Annual Highest Temperature at Castlemaine Prison Weather Station



Source: Bureau of Meteorology

Trend: Declining

Rainfall trends show declining rainfall and there is evidence that temperatures are also rising in the region. This is consistent with climate change projections and is predicted to continue into the future.

Pressures

The major pressure on climate change is the production of greenhouse gas emissions by human activity. Burning of fossil fuels for electricity, heat and transport is the largest component of this activity, while land clearing and agriculture also contribute significantly to greenhouse gas emissions. In Mount Alexander Shire Council the largest greenhouse gas emissions come from the use of brown coal for electricity generation (produced for the whole state of Victoria), fossil fuel used for transport, and to a lesser extent, methane emitted through farming (meat and dairy production and fertiliser use).

Responses

There are a range of responses that reduce greenhouse emissions in the State and the Shire — these are outlined under the Greenhouse section.

One major gap in responses is in Climate Adaptation — the effects of climate change are likely to be severe in the Shire and a plan to cope with these changes is urgently required. As at mid 2010, Council is beginning a process to develop a response on Climate Adaptation.

Fire

For general land health, particularly water and soil quality, minimal burning is needed to maintain ground vegetation and structure. Minimal burning also minimises carbon emissions and maximises carbon sequestration. Biodiversity conservation needs mosaic burns, leaving small patches of vegetation of variable periods since the previous fire. However, infrequent burning may lead to an increased risk of large and intense wildfires, which are a risk to lives, property and other assets.

OTHER INDICATORS

Risk of wildfire

There is no specific indicator of wildfire risk, number or area for Mount Alexander Shire.

Trend: Increasing risk

Indigenous fire management burned small patchy fires across a landscape of continuous native vegetation. Historical European management has largely suppressed fires, increasing the susceptibility to large wild fires. Although there is good data on wildfire numbers and extents, they are unpredictable and it is better to assess trends from the whole of Victoria rather than the Shire. More than 400,000 ha burned in Victoria in 1851, 1939, 1944, 2003, 2006–2007 and 2009, indicating a recent increase in large wildfires. The number of very high or extreme fire danger days in Victoria is predicted to increase by up to 25% by 2020 and up to 230% by 2050[74].

Pressure

The frequency and severity of wild fires is predicted to increase with climate change. Uncertainty exists over optimal levels of planned burns needed for ecological benefits and protection from wildfire[75]. Asset protection often requires more frequent fires than ecological management, leading to long-term changes towards more simplified fire-tolerant habitats.

Responses

DSE AND CFA

DSE is responsible for fire on all public land, and the CFA is responsible for fire on private and residential land. Actions are focused on prevention and mitigation of fires. Recent fire management has focused on fuel reduction and regular controlled fires around assets, mostly buildings, and controlled fires for ecological management. In 2009, the CFA developed a Township Protection Plan for Castlemaine.

MOUNT ALEXANDER SHIRE COUNCIL

In 2009, Council allocated an extra $100,000 for roadside works in preparation for the fire season and appointed a Bushfire Planning Officer[76].

74 Commissioner for Environmental Sustainability (2008) State of the Environment Victoria 2008.

75 Commissioner for Environmental Sustainability (2008) ibid.

76 Unconfirmed Minutes for the Ordinary Meeting of Mount Alexander Shire Council – 22 September 2009.

THEME 2 – USE RESOURCES SUSTAINABLY

GREENHOUSE

As outlined in the Driving Forces section, climate change is a key issue for the Shire. One of the major responses for the Shire is to reduce greenhouse emissions from both Council and community operations. Reducing dependence on fossil fuel will also reduce the vulnerability of the Shire due to peak oil – the rising cost of oil will make many activities like transport and food production more costly. Planning to reduce dependence on fossil fuels will reduce these risks as well as cutting greenhouse emissions. A major challenge for the Shire in reducing greenhouse emissions is that Victoria's electricity supply is largely derived from brown coal, a highly greenhouse intensive fuel, in the La Trobe Valley.

HEADLINE INDICATOR

Council Greenhouse Gas Emissions

Council greenhouse gas emissions were calculated as part of the now-ceased Cities for Climate Protection™ (CCP) program based on utility billing, fleet and waste data from Council.

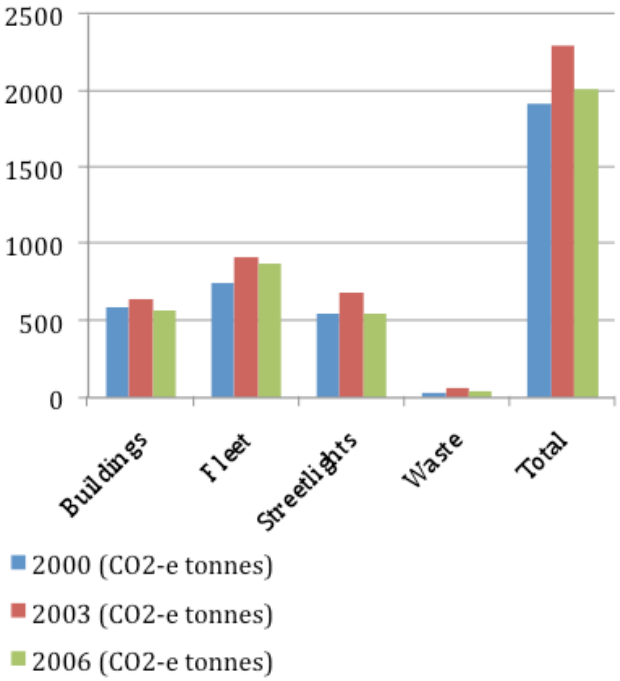
The following data is consistent with what appears in the Mount Alexander Shire Council Greenhouse Action Plan (2007 to 2010). Data is available for only some categories for the years since 2006 and so is not included here.

Table 9: Mount Alexander Shire Council Greenhouse Gas Emissions

	2000 (CO_2-e tonnes)	% of total (2000)	2003 (CO_2-e tonnes)	% of total (2003)	2006 (CO_2-e tonnes)	% of total (2006)
Buildings	592	31%	640	28%	570	28%
Fleet	742	39%	917	40%	871	43%
Streetlights	550	29%	683	30%	542	27%
Waste	30	2%	55	2%	35	2%
Total	1914	100%	2295	100%	2018	100%

Source: Mount Alexander Shire Council Greenhouse Action Plan

Figure 12: Mount Alexander Shire Council Greenhouse Gas Emissions



However, Council reports[77] that a number of actions have been implemented to reduce its own emissions through a combination of measures, including various building retrofits, more efficient vehicles and the purchase of a biodiesel blend for plant vehicles. As well, 100% green power has been purchased for emissions associated with street lighting electricity use, which saw Council's overall emissions reduce by 43%.

Trend

Although it is difficult to see a clear trend over three data sets, it appears that greenhouse emissions in all sectors of Council activity had declined from 2003 to 2006. A number of actions to reduce emissions have been put into place by Council since 2006, which are likely to have brought corporate emissions down even further. More data collection of Council energy use and the associated greenhouse emissions are required to measure the likely reductions.

77 Unconfirmed Minutes for the Ordinary Meeting of Council – Mount Alexander Shire Council – 8 December 2009.

OTHER INDICATORS

Community Greenhouse Gas Emissions

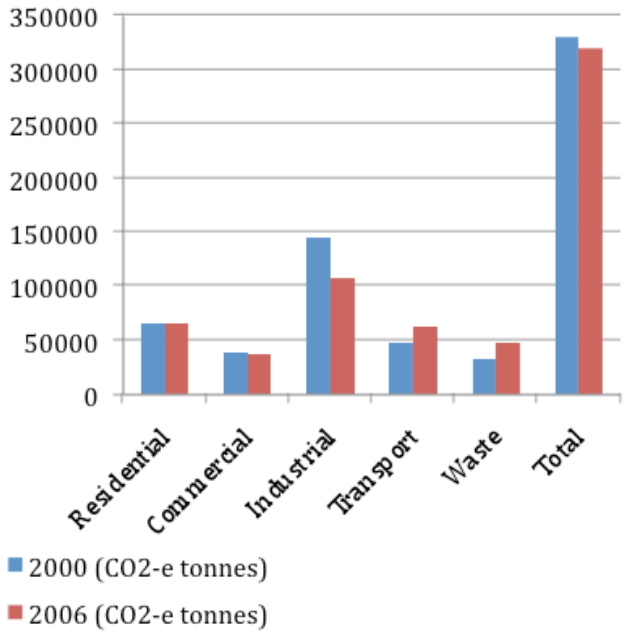
The Shire's community emissions from all sectors have been estimated by the CCP program for 2000 and 2006. It is acknowledged that the community data in CCP has major limitations as baseline information is determined through census data and uses averages across sectors and regions, and may not be entirely accurate for Mount Alexander Shire. Therefore it can only be seen as a rough estimate of actual emissions.

Table 10: Mount Alexander Shire Community Greenhouse Gas Emissions

	2000 (CO_2-e tonnes)	% of total in 2000	2006 (CO_2-e tonnes)	% of total in 2006
Residential	65,802	20%	65,996	21%
Commercial	38,742	12%	37,509	12%
Industrial	145,351	44%	107,378	34%
Transport	47,841	15%	62,017	19%
Waste	32,086	10%	47,086	15%
Total	329,822	100%	319,986	100%

Source: ICLEI Cities for Climate Protection Program

Figure 13: Mount Alexander Shire Community Greenhouse Gas Emissions



A range of initiatives have been undertaken by Council, Mount Alexander Sustainability Group (MASG) and State and Federal government authorities to assist the community to reduce emissions and these actions are likely to have reduced community emissions, or at least slowed their growth. These include:

- 200 solar photovoltaic panels brokered through MASG resulting in savings of 348 tonnes CO_2-e per annum (residential and commercial savings)
- 143 residents have installed solar hot water using the Federal government rebate resulting in savings of 300 tonnes CO_2-e per annum
- Around 450 residents installed insulation in 2009 as part of the Federal government rebate program resulting in estimated savings of 630 tonnes CO_2-e per annum.

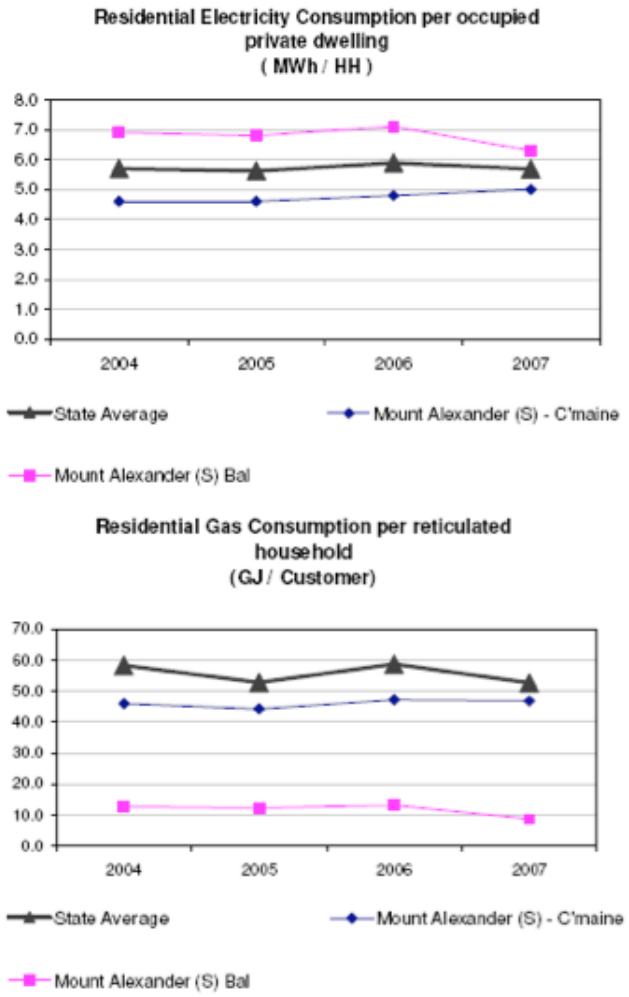
Trend:

The data from 2000 to 2006 suggests that community emissions had declined slightly, largely due to reduced emissions from the industrial sector. While there has been continued population growth in the Shire driving up residential, transport and waste emissions, some industrial sectors have declined such as agriculture, which has resulted in fewer greenhouse emissions from that sector.

Residential Energy Consumption

The Victorian Government Department of Sustainability and Environment (DSE) has compiled data from Victorian electricity and gas distributors to provide data on household energy use for each shire in the state. Trend data on residential electricity and gas consumption is provided from 2004 to 2007. It shows that Castlemaine households have a lower electricity consumption than the state average, while households in the rest of the Shire have a higher electricity consumption. This could be because there is more extensive reticulation of gas in Castlemaine than in other parts of the Shire, where households must rely on electricity for cooking, hot water and heating.

Figure 14: Residential Electricity and Gas Consumption in Mount Alexander Shire



Source: Victorian Government Department of Sustainability and Environment 2009, Household Energy Use – Mount Alexander Shire, July 2009 http://www.climatechange.vic.gov.au/CA256F310024B628/0/93B19A44DA46D8ECCA25764F0013D218/$File/54+-+Mount+Alexander+_S_.pdf

Trend

For the average household in Mount Alexander Shire both electricity and gas energy use are generally going down, although only slightly. The reasons for this trend are not clear but could be the result of increased energy prices and/or greater awareness of climate change and education programs to reduce household emissions.

Pressure

A big barrier for the Shire in reducing greenhouse emissions is that Victoria's electricity supply is largely derived from brown coal, a highly greenhouse intensive fuel, in the La Trobe Valley. Transport is also largely based on fossil fuel, and alternative fuels are very limited. The size of the Shire, being rural, means that travel distances are great and are difficult to service with public transport or cycling. Increasing population, wealth and consumption in the Shire is also increasing the demand on electricity, gas, petrol and generally on goods and services, which all leads to higher greenhouse emissions.

Responses

MOUNT ALEXANDER SHIRE COUNCIL GREENHOUSE ACTION PLAN

The Greenhouse Action Plan (GAP) identifies 15 corporate initiatives and 16 opportunities for reducing community emissions for the reduction of CO_2-e emissions by 30% from the year 2000 baseline to 2010. The Plan's goal is "to contribute to the stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous interference with the climate system through:

- reducing net greenhouse emissions attributable to the Council's activities by 30% from 2000 levels;
- reducing community emissions by 30%;
- being actively involved in local and regional partnerships and programs to reduce the impact of climate change;
- providing advocacy and leadership in the community;
- fostering knowledge and understanding within the community of greenhouse issues; and,
- assessing potential impacts of climate change on the Shire and the surrounding region and preparing strategies to minimise or adapt to them."[78]

78 Mount Alexander Shire Greenhouse Action Plan 2007-2010 page 2.

A major challenge for the Shire is lack of accurate greenhouse emissions data from Council operations as well as of the community. Council is looking to set up a system to accurately monitor its corporate emissions in the near future and will look to do so in a manner consistent with the National Greenhouse and Energy Reporting Scheme (NGERS).

MAINE POWER PROJECT – MOUNT ALEXANDER SUSTAINABILITY GROUP (MASG) & CSIRO

One of the major greenhouse emissions reductions projects in the Shire is the Maine's Power project being run by MASG with the CSIRO and other partners. The project was initiated in 2006 to work with the four largest energy users in the Shire to cut their greenhouse emissions by 30%. The four businesses are Don KRC (incorporating Castle Bacon), Mount Alexander Hospital, Kelly Thompson Lewis Foundry, and Victoria Carpets wool mill. The project has identified that transmission losses are a major cause of greenhouse emissions and that local renewable energy and combined heat and power options could reduce these losses.

In particular, Don KRC will be installing a cogeneration plant in their expanded factory to deal with peak energy demand. The local distribution network is nearing peak capacity and this business puts a major strain on peak demand.

MOUNT ALEXANDER SUSTAINABILITY GROUP (MASG) RENEWABLE ENERGY AND ENERGY EFFICIENCY PROJECTS

MASG has been working with the community for a number of years to motivate actions for energy efficiency, sustainable transport and installation of renewable energy. For example, MASG has brokered a bulk purchase of 270 solar photovoltaic panels, which have been installed in homes and workplaces in the Shire.

CENTRAL VICTORIAN GREENHOUSE ALLIANCE (CVGA) INCLUDING CASTLEMAINE 500

The CVGA is an alliance funded by the Victorian government aimed at supporting the 14 councils in the central Victorian region, including Mount Alexander Shire Council, to reduce their greenhouse emissions at the corporate and community level. The Alliance allows co-operation between the councils, a more strategic approach, sharing of knowledge and solutions and some specific greenhouse projects. One such project was the Castlemaine 500, which engaged 500 households in Castlemaine to cut their energy consumption and greenhouse emissions through behaviour change and some efficiency fittings. The project was delivered in 2004-2006 with funding from the Victorian Government and resulted in savings of at least 320 tonnes of greenhouse emissions. Participants report that they are using less energy and emitting less greenhouse emissions two years after the project.[79]

VICTORIAN GOVERNMENT GREENHOUSE STRATEGY

The Victorian government has a number of climate change initiatives in place and is in the process of developing a White Paper on climate change to guide the State's actions to reduce its emissions. In addition there is also work underway to produce a Climate Adaptation response for the state.

79 C500 Steering Committee 2008, Telling the Performance Story of the Castlemaine 500, http://www.cvga.org.au/main/documents/C500eBook_Mar09.pdf

TRANSPORT

Transport in Mount Alexander Shire is largely car- and truck-based and is therefore heavily reliant on fossil fuels. The improvement of the rail line between Melbourne and Bendigo has increased the use of the train to travel between urban centres and there is some take up of cycling and walking within towns like Castlemaine. Yet the vast majority of trips made within the Shire are by car and truck

HEADLINE INDICATOR

Mode of Travel to Work

This data is collected in the ABS Census every five years; however, the data provided only captures about a third of the population hence it is only a guide to behaviour. Nevertheless, this data shows that there is a major reliance on cars as transport modes.

Table 11: Mode of Travel to Work, 2006 in Mount Alexander Shire

Mode of Travel to Work (Census Day 2006)	Number of People	Percentage
Public Transport (Train/Bus/Tram/Ferry)	141	2%
Car	4470	69%
Truck	88	1%
Motorcycle	20	0%
Bicycle	64	1%
Walked	328	5%
Worked from home or did not travel	1395	21%
Total	6506	100%

Source: Australian Bureau of Statistics, Census of Population and Housing, 2006

Trend: Stable

Data from the Census in 2001 shows very similar patterns to the above travel behaviours, which suggests that car travel continues to be the major form of transport in the Shire. The improvements to the train service between Melbourne and Bendigo may result in some shift towards more train travel and less car travel, especially for those commuting to Bendigo, Melbourne or other key centres. However this will not be seen until further research is done — for example in the 2011 Census.

OTHER INDICATORS

Motor Vehicle Ownership and Purchase

The data below shows that new vehicle purchases continue to increase each year. Concomitantly the total number of vehicles in the Shire grew annually from 2002 to 2006 almost entirely as a result of passenger vehicle purchases, with some light commercial vehicles as well. The growth in passenger vehicles over that period was 6.7% which is higher than the rate of population growth.

Table 12: New Motor Vehicle Sales and Registered Motor Vehicles, Mount Alexander Shire

	2002	2003	2004	2005	2006
NEW MOTOR VEHICLE SALES – MOUNT ALEXANDER SHIRE					
Passenger vehicles	271	287	270	314	313
Other vehicles	178	199	238	252	236
Total new motor vehicle sales	448	486	508	566	549
REGISTERED MOTOR VEHICLES – MOUNT ALEXANDER SHIRE					
Passenger vehicles	10,143	10,366	10,592	10,708	10,820
Campervans	81	97	89	97	95
Light commercial vehicles	3,009	3,095	3,156	3,209	3,296
Light rigid trucks	71	74	81	79	82
Heavy rigid trucks	464	467	466	459	450
Articulated trucks	123	126	157	90	94
Non-freight carrying trucks	28	27	27	30	32
Buses	83	78	80	78	76
Motorcycles	552	535	533	542	576
Total registered motor vehicles	14,553	14,864	15,182	15,294	15,521

Source: Australian Bureau of Statistics, National Regional Profile – Mount Alexander Shire, 2008

Trend: Worsening

Motor vehicle purchase continues to grow, which means that more vehicles are using the roads in the Shire. Associated with this is an increase of the land impacts of roadways (loss of habitat, pollution from run-off etc) as well as the greenhouse emissions from petrol and diesel use.

Pressure

Increased affluence is a key pressure on transport because more people are able and willing to buy motor vehicles and to pay for the rising cost of petrol. The availability of public transport is also a key factor — if there are more alternatives to driving this may allow more people to shift from car use to buses or trains. The improved train line from Melbourne to Castlemaine may have had an impact already but more research is needed to determine this.

Responses

MOUNT ALEXANDER SHIRE COUNCIL WALKING AND CYCLING STRATEGY

The Shire recently developed a Walking and Cycling Strategy and it was passed by Council in April 2010. The Strategy aims to support increased walking and cycling in the Shire and includes a range of actions to make it easier and safer for active transport use.

WATER USE

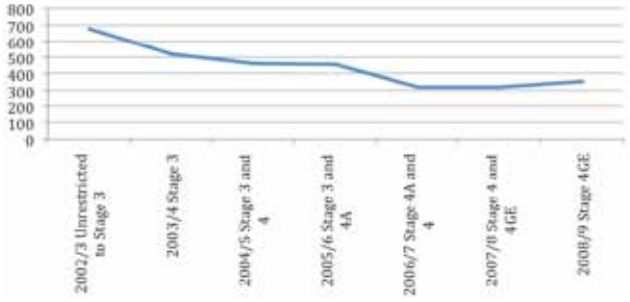
Water consumption has a large environmental impact where water resources are limited, as they are in Mount Alexander Shire. The health of natural waterways is dependent on receiving adequate inflows and losing restricted amounts for down-stream use. Inflows have been significantly reduced in recent low-rainfall years. Water use has grown as a growing population, with increased standards of living, consumes more water at home and in the industries that support modern life, especially intensive agriculture. The largest water user is agriculture, especially irrigated crops. Unmeasured amounts of water are also abstracted by dams and bores for use in all types of agriculture. Large losses occur from evaporation and seepage from dams and waterways. Domestic usage can be reduced by constructing rainwater and grey-water systems.

HEADLINE INDICATOR

Residential water consumption

Residential water consumption per household has been calculated from Coliban Water's annual reports, adding figures for towns across the Shire.

Figure 15: Annual Residential Water Consumption per Residential Household (in kilolitres) supplied by Coliban Water within Mount Alexander Shire



Source: Coliban Water

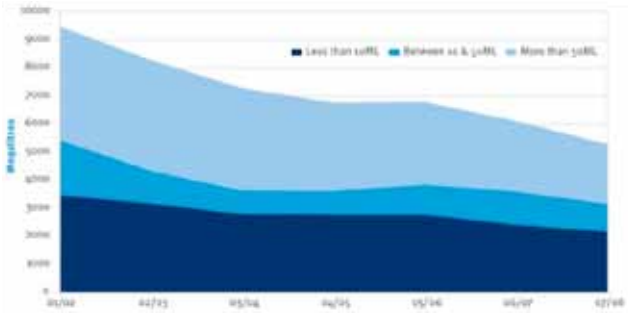
Trend: Stable but declining over time in response to water restrictions.

There has been a slight increase in the amount of water used by residential customers from 2006-2009, after significant decreases between 2002 and 2006.

OTHER INDICATORS

Industrial water usage

Figure 16: Annual Industrial Water Consumption supplied by Coliban Water across all Shires



Source: Coliban Water

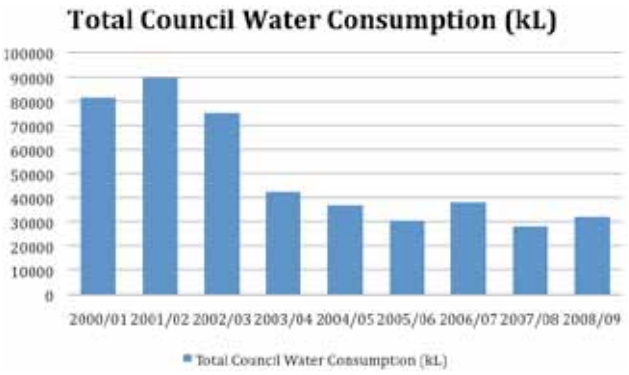
Trend

Water consumption by non-residential customers, especially those consuming more than 50 ML annually, has declined steadily across the area serviced by Coliban Water[80].

Council Corporate Water Consumption

Council water consumption rates in all facilities, parks, standpipes and as part of providing its services have been collected from Coliban Water as part of the Shire's Sustainable Water Use Plan.

Figure 17: Mount Alexander Shire Council Water Consumption



Source: Mount Alexander Shire Council Sustainable Water Use Plan (draft 2010)

Taking sets of three year averages from the base year of 2000/01 to smooth the rainfall and water restrictions variations in the data, it can be seen that last three year average shows an annual figure that is only 40% of the first three years of the decade.

Table 13: Mount Alexander Shire Council water consumption

PERIOD	3 YR (ANNUAL) AVERAGE	CHANGE	COMMENT
July 2000 – June 2003	82,145 kL		Stage 3 restrictions were not imposed by Coliban Water until July 2003
July 2003 – June 2006	36,723 kL	-45,422 kL	Consumption more than halved during this period
July 2006 – June 2009	32,924 kL	-3,799 kL	Stage 3 restrictions have been in force since late 2007

Source: Mount Alexander Shire Council Sustainable Water Use Plan (draft 2010)

Trend

This data shows that Council water consumption has declined significantly over the last decade.

Pressure

Residential water use has declined over the past decade as a result of water restrictions and high awareness of the ongoing drought. Recent slight increases in residential water usage may reflect the recent easing of water restrictions.

Industrial water use has decreased despite increases in manufacturing outputs due to companies' water conservation and efficiency measures.

In wet years, most water is used by agriculture, but reduced water entitlements have restricted usage in recent years. An increase in agricultural intensification, partly driven by the lifestyle change towards small businesses on parcels of land previously used for extensive grazing, has driven increased water usage. Increases in commercially irrigated agricultural businesses during years of high water capacity have slowed in recent years of restricted water entitlements. A large proportion of water stored in reservoirs and distributed in open channels is lost through evaporation, and much smaller amounts from leaks, bursts and treatment processing.

Council corporate water use has declined as a result of concerted actions by Council to increase water efficiency and use recycled water, and also as a result of water restrictions imposed in the last decade, which greatly reduced the water available for use on public parks and gardens.

80 Coliban Water (2008) Annual Report 2007/8.

Responses

DEWHA AND DSE

DEWHA and DSE have various awareness programs and incentive schemes to reduce domestic water usage. DSE's Water Smart Gardens and Homes Rebate Scheme has helped to save more than 2.24 billion litres of water across Victoria each year[81] and is supported by Coliban Water.

DSE AND NCCMA

DSE and NCCMA work with farmers to improve their water use efficiency in the Declared Water Supply Catchments, which cover Mount Alexander Shire. This includes restricting groundwater users to 70% of their licensed volume[82]. DSE works with Council to produce a Sustainable Water Use Plan.

COLIBAN WATER

Agricultural water allocations were restricted from 50% in 2005/6 to 35% in 2007/8 and 0% in 2006/7 and 2008/9, but with a Ministerial qualification allowing an emergency allocation of 30% of entitlements during the zero-allocation years. Residential customers had water restrictions too. Coliban Water and DSE work with all customers consuming 10 ML water per year to produce a Water Management Action Plan (WaterMAP). The Castlemaine Sewage Works, which also treats sewerage from Harcourt, Maldon and Newstead, treated 957 ML of sewerage in 2008/9, and reused 132 ML, up from 94 ML in 2007/8; the remainder of the treated water being discharged into waterways. There are opportunities for this discharged water to be used by irrigators such as around Harcourt. Residential customers are encouraged to use less than 155 litres per person per day, in line with Melbourne water usage targets. Significant resources are being invested to control leakage and reconfigure channel systems.

GOULBURN-MURRAY WATER

Goulburn-Murray Water has a similar role to Coliban Water but supplies rural water usage for the Loddon system.

MOUNT ALEXANDER SHIRE COUNCIL

The Council's Sustainable Water Use Plan identifies where council uses water, how much water is used and identifies actions for council to reduce their water consumption. This Plan is being implemented during 2010 and beyond.

IMPLICATIONS

There are no good measures of groundwater levels or extraction by bores. Residential water usage is available only per household, not per person. Levels of water usage are too high to be met by water inflows without buying additional water from the Goulburn system.

81 DSE (2009) Water Smart Gardens and Homes Rebate Scheme. 1 July 2009 to 30 June 2011. Downloaded from http://www.ourwater.vic.gov.au/__data/assets/pdf_file/0013/2461/Rebates_Brochure.pdf April 2010.

82 DSE (2008) Basin Water Accounts 2007/8.

LAND USE PLANNING

Before European settlement, Mount Alexander Shire was entirely covered with native vegetation, mostly forest and woodland. Over half of the Shire is now used for farming, with an increasing area allocated to housing, industry and services.

HEADLINE INDICATOR

Residential Building approvals

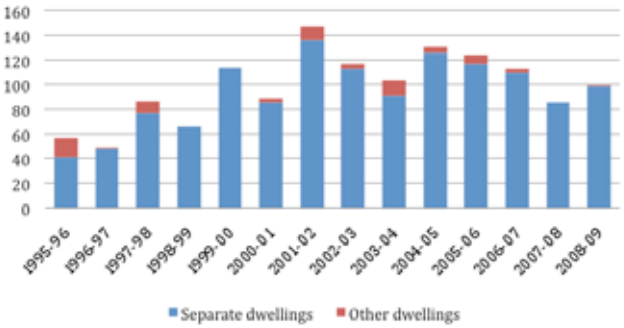
Planning approvals by Mount Alexander Shire Council for residential building developments is one indicator of the growth in the built environment. However, this is a limited indicator since it does not take into account new commercial and industrial developments. It also does not assess the land area used by the new developments nor whether they are replacing existing buildings or built forms compared to vegetation or agricultural land.

Table 14: Residential Building Approvals Mount Alexander Shire

Residential Building approvals, Mount Alexander Shire[83]				Annual change*		
Year (ending June 30)	Separate dwellings	Other dwellings	Total dwellings	Separate dwellings	Other dwellings	Total dwellings
1995–96	41	16	57	–	–	–
1996–97	48	1	49	7	-15	-8
1997–98	77	10	87	29	9	38
1998–99	66	0	66	-11	-10	-21
1999–00	114	0	114	48	0	48
2000–01	86	3	89	-28	3	-25
2001–02	137	11	148	51	8	59
2002–03	113	4	117	-24	-7	-31
2003–04	92	12	104	-21	8	-13
2004–05	126	5	131	34	-7	27
2005–06	117	8	125	-9	3	-6
2006–07	110	3	113	-7	-5	-12
2007–08	86	0	86	-24	-3	-27
2008–09	99	1	100	13	1	14

Source: Australian Bureau of Statistics

Figure 18: Residential Building Approvals Mount Alexander Shire



Source: Australian Bureau of Statistics

Trend

Residential building approvals appear to be increasing over time. This is consistent with the population growth within the Shire. More information is needed to determine whether all these buildings are additional or whether some are replacing existing ones. However, an increase in building stock is likely to result in loss of some vegetation, open space or agricultural land, and is also likely to be associated with increased energy and water consumption and waste generation.

OTHER INDICATORS

Percentage of land used for conservation, native vegetation, grazing, cropping and residential and services

Native vegetation provides the best environmental sustainability and ecosystem services, followed by grazing, especially on perennial native pastures, then cropping, although this varies considerably between crop types, then residential and services. Increased residential areas, particularly rural residential dwellings not connected to services, industry and roads, lead to increased water run-off, water pollution and reduced vegetation.

83 Australian Bureau of Statistics, Building Activity, Australia, (catalogue number: 8752.0 to 8752.7) – data collated at http://profile.id.com.au/Default.aspx?id=334&pg=220&gid=10&type=enum

Table 15: Area of Land Uses in Mount Alexander Shire

Land Use	Total ha in 1996-2002[84]	% of Shire	No. establishments in 200[85]
Native vegetation*	34,984	23%	na
• Includes: forestry	11,554	8%	
• Includes: conservation	4,274	3%	
• Includes: recreation	6,636	4%	
Grazing	90,955	59%	246
Cropping	8,089	5%	135
Residential and services	18,942	12%	na
• Includes: Rural residential	9,208	6%	
•Includes: Roads	6,185	4%	

**Note that this is land use, and native vegetation also extends over other land uses*[84]

Trend: Slightly Improving

Before European colonisation, the Shire was 100% covered by native vegetation, managed through fire by the Traditional Owners. Land was cleared for mining in the late 1800s, with further clearing due to plague proportions of rabbits in the 1930s and 1940s. Most cleared land has been used for grazing, with some cropping especially in irrigated areas. There are small areas of private forestry, estimated in 2006 to cover 885 ha[86], but no biomass or biofuel plantations[87].

Pressure

Population growth and an increased desire to live on the land are the main drivers of increased use of land for dwellings and services along with industrial and commercial uses in the Shire. Growth in the economy is also resulting in more businesses in the Shire, which need more land; however, some industries such as agriculture have declined in recent years. Reduced rainfall is causing agriculture to shift towards more extensive grazing, but with increased risks of over-grazing.

A greater demand for road-based transport also results in land being used for freeways and other roads, and a potential loss of vegetation or agricultural land. For example, the Calder Freeway expansion resulted in some land being used for this major road project.

Responses

MOUNT ALEXANDER SHIRE COUNCIL PLANNING POLICIES (including Municipal Strategic Statement & Rural Living Strategy)

Council regulates land-use changes through the planning system. Mount Alexander Shire Council permits new residential and industrial development to infilling and limited peri-urban expansion around towns, especially Castlemaine. Council is limiting new rural residential development.

There is community concern that the Shire is threatened by poorly planned development[88] while rural developments need ongoing regulation to minimise environmental impacts[89].

VICTORIAN GOVERNMENT PLANNING POLICIES – Melbourne 2030 and Bendigo Corridor Sustainable Growth Strategy

Melbourne 2030 is the strategic planning blueprint for Melbourne and the surrounding regions. A priority of that strategy was to focus urban development in the key towns that have benefited from the redevelopment of train lines in regional Victoria. The corridor between Melbourne and Bendigo is one of the main corridors and Castlemaine is one key town on that rail line. As such, the Bendigo Corridor Sustainable Growth Strategy was devised to ensure development is focussed on key towns rather than in rural zones or smaller hamlets where local character should be protected.

IMPLICATIONS

Better indicators are needed to assess the impact of planning decisions on environmental sustainability.

84 DPI (1996-2002) Land Use of the North Central Catchment Management Authority (GIS layer ref: LANDUSE100_NC/)

85 ABS (2006) Value of Agricultural Commodities Produced http://www.abs.gov.au/ausstats/abs@.nsf/Products/7125.0~2005-06+%28Reissue%29~Main+Features~Victoria?OpenDocument Downloaded April 2010

86 ABS 2006 data: Downloaded from http://www.abs.gov.au/ausstats/abs@.nsf/Products/7125.0~2005-06+%28Reissue%29~Main+Features~Victoria?OpenDocument April 2010

87 B. Keogh, Australian Carbon Traders, pers. comm. April 2010

88 Connecting Country (2008) Restoring landscapes across Mount Alexander. A biodiversity blueprint.

89 RPD Group (2006) Mount Alexander Shire Rural Living Strategy

WASTE AND RESOURCE CONSUMPTION

The consumption of materials is one of the major environmental impacts of any community. All goods consumed constitute embodied energy, water, materials and land use in their extraction, manufacture, transport, use and disposal, and may also release toxic emissions into the air and water. Population growth and an increased standard of living (income and expenditure) are resulting in increased consumption of goods, which means a greater impact on the environment.

Recycling of post-consumer waste continues to increase but total waste generated is also growing, meaning that landfill waste is still a major environmental issue. While better than disposal, recycling also consumes energy and water therefore overall consumption needs to decline if the related environmental impacts are to be reduced.

Waste disposal has a number of negative environmental impacts in addition to the resources used in the production of the waste goods. These include:

- Energy and associated greenhouse gas emissions of collecting, transporting, sorting and recycling or disposing of waste
- Land used for landfill and waste management facilities
- Ground and surface water can be polluted by leaching toxins in landfill areas
- Greenhouse gas emissions from decomposing waste in landfills, especially methane
- Litter from landfill sites, bins and waste collection areas
- Odour, noise and dust from landfills and transfer stations

HEADLINE INDICATOR

Municipal Waste Generation

Waste generation is a proxy indicator for consumption because most of what we buy ends up in landfill.

Table 16: Kerbside Collection Landfill Waste and Recycling in Mount Alexander Shire – data collected by Waste Contractors for Mount Alexander Shire Council

Year	Waste to Landfill (tonnes per year)[90]	Recycled Waste (tonnes per year)^[1]	Percentage of Total Kerbside Waste Recycled	State Average[91]
2006/07	3230	1370	30%	41%
2007/08	3101	1404	31%	42%
2008/09	3390	1979	37%	-
2009/10*	2335	1159	33%	-

**2009/10 data is July-March only — final financial year data to come*

^Recycled material figures do not take into account contamination, which is estimated by the Waste Contractors to be approx. 5%.

90 Waste Collection data provided by Mount Alexander Shire (Russell Ogier, Manager Healthy Environments)

91 State average data from Sustainability Victoria, Victorian Local Government Annual Survey 2006-07 and Victorian Local Government Annual Survey 2007-08, http://www.sustainability.vic.gov.au/resources/documents/Victorian_Local_Government_Annual_Survey_2007-08.pdf .

Figure 19: Kerbside Collection Landfill Waste and Recycling in Mount Alexander Shire – data collected by Waste contractors for Mount Alexander Shire Council

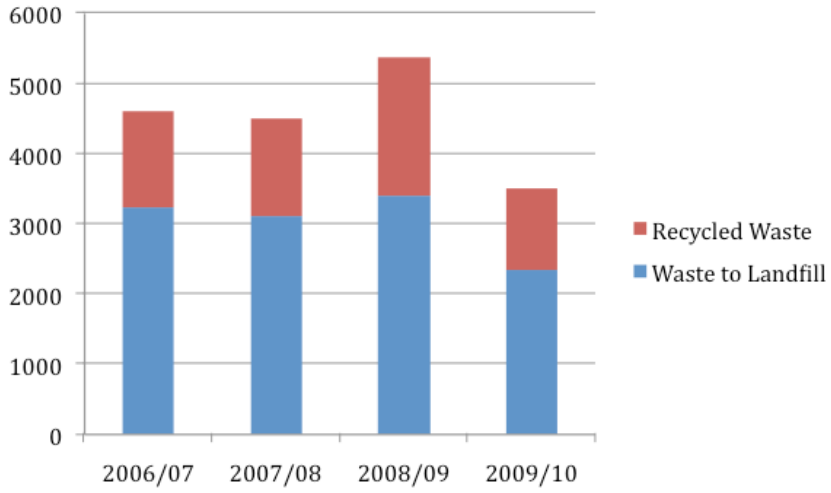


Table 17: Waste to Landfill and Recycled in Mount Alexander Shire and State Average – Sustainability Victoria Victorian Local Government Survey 2006-07 and 2007-08

Year	Total Household Waste to landfill per year (kg)	State Average (kg)	Total Household Recyclables per year (kg)[92]	State Average (kg)[3]	Percentage of Total Kerbside Waste Recycled*	State Average[3]
2006/07	460	474	202	271	28%	41%
2007/08	438	476	198	291	30%	42%

**Recycling percentage differs between the Sustainability Victoria (SV) data to the Mount Alexander Shire Council data above due to contamination estimates being included in the SV data, thus reducing the recycling amount.*

92 Data from Sustainability Victoria, Victorian Local Government Annual Survey 2006-07 and Victorian Local Government Annual Survey 2007-08, http://www.sustainability.vic.gov.au/resources/documents/Victorian_Local_Government_Annual_Survey_2007-08.pdf.

Trend: Stable

While the lack of long-term data makes it difficult to draw strong conclusions, it appears that waste to landfill has remained steady over the last four financial years, while material collected for recycling has increased. This means that the overall waste generated by households is increasing. However, the average annual waste generation of households in Mount Alexander Shire is below the state average, as is the amount of recyclables collected.

This is consistent with the Victorian trend of increased total waste, but with the growth taken up by recycling collection. The growth in waste generation in Mount Alexander Shire is attributable to population growth, more households being serviced by kerbside collection and increased affluence.

As a result of kerbside collection servicing more residences as well as increased awareness and ease of recycling, the proportion of waste being recycled has increased slightly over the last four years. However, the percentages in Mount Alexander Shire Council are well below the state averages.

OTHER INDICATORS

Waste to Castlemaine Landfill

Castlemaine Landfill is the only landfill site in the Shire, and waste is also transported from Maldon Transfer Station to this tip. Municipal waste disposed of at Castlemaine Landfill includes kerbside collection waste, waste dropped off by the community and Council waste (including from public place bins). Building waste and Industrial waste is also disposed of at the tip as well as Category C waste (prescribed industrial waste with a low hazard level).

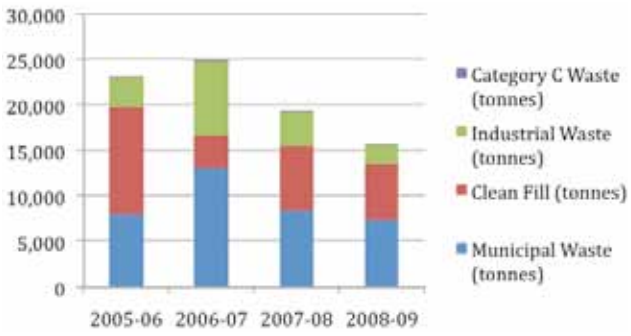
Table 18: Waste collected at Castlemaine Landfill
Source: Mount Alexander Shire

Year[93]	Municipal Waste (tonnes)	Clean Fill & Building Waste (tonnes)*	Industrial Waste (tonnes)	Category C Waste (tonnes)	Total Tonnes
2005-06	7,959	11908	3328	10.5	23,206
2006-07	13,153	3563	8233.28	3.06	24,952
2007-08	8,318	7205	3932	2.75	19,458
2008-09	7,335	6235	2175	6.37	15,751

**Some building waste is recycled so this figure overestimates the amount of waste landfilled in this category (however figures are not available for how much building waste is recycled).*

93 Data provided by Mount Alexander Shire, Russell Ogier, Manager Healthy Environments

Figure 20: Waste Collected at Castlemaine Landfill



Trend

Waste to landfill appears to be decreasing in all categories and overall, although four years is limited data to see a clear trend. Large volumes of material are now being diverted from the Castlemaine Landfill, including building rubble and timber products, mattresses, electronic equipment, and are now being reprocessed. The volume of material to landfill has been reduced by approximately 25% over the year 2009[94].

This may also be as a result of an increase in landfill charges resulting from the state government waste levy rising.

Percentage of households with a waste collection service (response indicator)

About 7000 households, or 73 per cent of the residences in in the Shire are serviced with a kerbside waste and recycling collection[95]. The remaining 1900 households either take their waste to a tip or dispose of it on their property (through dumping or burning it). No data is available about the destination of waste from this 27 per cent of households. About 230 commercial premises are also serviced with a kerbside collection. Although commercial operations are required to pay for waste disposal, recycling is at their discretion and many businesses do not choose this additional collection service.

Trend

Information from the Council suggests that the number of households serviced by Council kerbside collection continues to grow as new residents move to the Shire and request waste collection (since they were used to such a service in their previous homes).

Ecofootprint of Community Consumption

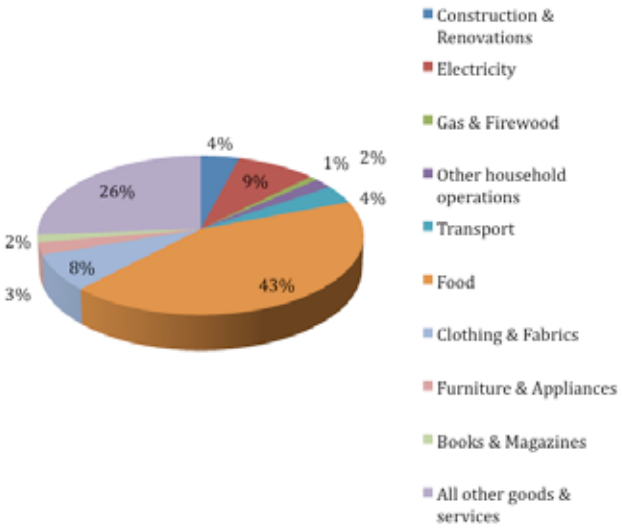
Research undertaken by the Australian Conservation Foundation and the University of Sydney in 2007 shows the average ecofootprint of a resident of the Mount Alexander Shire. This is a measure of the total land required to provide the resources demanded by a person's lifestyle. In Castlemaine (postcode 3450) the average ecofootprint is 5.82 hectares, while the average for the rest of the Shire is 5.71 hectares[96].

Table 19: Ecofootprint of Mount Alexander Shire Community

Region (postcode)	Average Ecofootprint in 2007 (hectares)
Castlemaine (3450)	5.82
Rest of Mount Alexander Shire (3447, 3448, 3451, 3453, 3462, 3463)	5.71
Victorian average	6.03
Australian average	6.4

The average ecofootprint of a Mount Alexander resident is made up of the following components:

Figure 21: Components of Average Mount Alexander Resident's Ecofootprint



94 Unconfirmed Minutes for the Ordinary Meeting of Council – Mount Alexander Shire Council – 8 December 2009

95 Data provided by Mount Alexander Shire, Russell Ogier, Manager Healthy Environments

96 Australian Conservation Foundation 2007, Consumption Atlas, www.acfonline.org.au/consumption

Pressure

The main driver or pressure on consumption and hence the generation of waste in the Shire is increasing affluence as well as population growth (outlined in Section 1). Other drivers include general Australian trends towards more disposable or single-use products such as take-away food packaging, as well as less durable products – for example electronic goods. An influx of low cost goods may also be driving a greater culture of disposability.

Major issues for the effectiveness of recycling in the Shire include:

- Contamination of recycling – there is a lack of data about contamination of recyclables collected in Mount Alexander Shire, but the Waste Contractor suggests it is about 5 per cent. Council staff believe it is likely to be higher[97].
- The cost of recycling (and waste collection generally), which is higher per capita for Mount Alexander Shire than more populous municipalities.

Responses

The Shire is predominantly responsible for waste collection and disposal, and has engaged consultants to assist in the development of a Waste Management Strategy. Prior to developing this strategy there has been a lack of strategic direction for waste management. The Shire is also soon to tender for new contracts for waste collection and recycling with private contractors – this can be an opportunity to change and improve waste management practices.

The Regional Waste Management Group is the next level of responsibility, which brings a number of shires together to work on municipal waste issues and waste education. Mount Alexander Shire Council is a member of the Calder Regional Waste Management Group.

The Victorian Government's *Towards Zero Waste* Strategy also affects the Shire's waste management approach. The Strategy sets statewide targets for waste reduction, resource recovery and littering, and specific targets and actions for Victoria's municipal and business sectors to deliver more sustainable use of resources by 2014.

97 Personal Communication, Russell Ogier, Manager Healthy Environments 12/4/10

APPENDIX 1 – LIST OF CLASSIFIED WEEDS OF NATIONAL SIGNIFICANCE IN MOUNT ALEXANDER SHIRE

WEED OF NATIONAL SIGNIFICANCE

Twenty priority species for national action based on their invasiveness, impacts, potential for spread and socioeconomic and environmental aspects.

The following Weeds of National Significance are present in Mount Alexander Shire:

Asparagus asparagoides (L.) Druce Bridal Creeper

Chrysanthemoides monilifera (L.) Norl. Boneseed

Chrysanthemoides monilifera subsp. monilifera (L.) African Boneseed

Rubus anglocandicans A. Newton Blackberry

Rubus fruticosus spp. agg. sensu Jeanes & Jobson Blackberry

Rubus laciniatus Willd. Cut-leaf Bramble

Rubus polyanthemus Lindeb. Blackberry

Rubus ulmifolius Schott Blackberry

Salix alba L. White Willow

Salix cinerea L. Grey Sallow

Salix fragilis L. Crack Willow

Salix X rubens Schrank Basket Willow

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