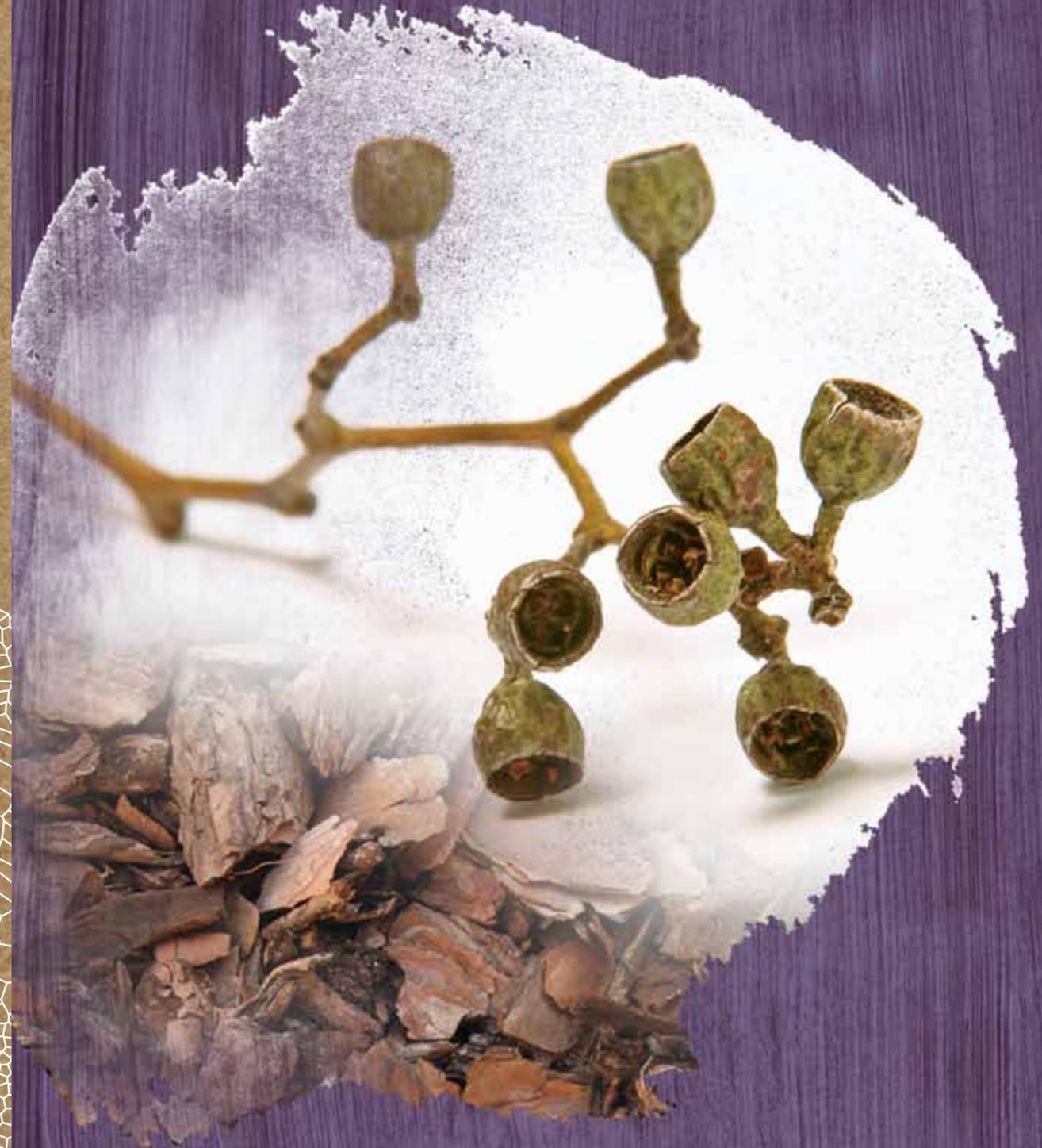


community environmental recovery action plan

CERAP



Christmas Hills

CERAP

Christmas Hills • November 2012

## What is a cerap?

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Community Recovery Committees:

St Andrews Community Recovery Committee  
 Strathewen Community Renewal Association  
 Christmas Hills community

Nillumbik Shire Council  
 Environmental Planning Unit  
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 Infrastructure Maintenance Unit  
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All community members who attended CERAP workshops, hosted site visits and provided feedback on draft plans.

Once Around the Sugarloaf, Mick Woiod

Photographs - Nev Ragg, Doug Evans and EnPlan Partners

Skyline Road North and Wallace Road Bushfire Zone Alliance (SWABZA)

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Every effort made to ensure referencing of this document.

The Christmas Hills Community Environmental Recovery Action Plan is a package of documents developed with the Christmas Hills community that identifies actions to care for and manage the environmental and agricultural values of Christmas Hills.

The Christmas Hills CERAP has drawn upon many different sources of information (Nillumbik CERAP Literature Review 2011). The findings were then presented to the Christmas Hills community over two workshops in May 2011 to determine the community's vision for land management in Christmas Hills and their priorities.

#### The CERAP consists of:

- **The Nillumbik CERAP Literature Review 2011** – this provides details on the wide range of information sources that were used to prepare this CERAP (and the two other CERAPs for St Andrews and Strathewen).
- **The Community Environmental Recovery Action Plan (CERAP) – Christmas Hills – July 2012** – this is the main CERAP document and contains the detailed descriptions of:
  - the Christmas Hills area (for example climate, geology, topography, land use history, waterways and biodiversity)
  - the environmental and agricultural values of Christmas Hills and the key threats
  - the actions needed to protect and enhance these values
  - examples of community-based projects that could be undertaken.
- The **Christmas Hills Community Environmental Recovery Action Plan Map** – this map depicts the three main land management zones in Christmas Hills and identifies the types of actions landholders in each zone can do to help care for and manage the environmental and agricultural values of Christmas Hills.

The three zones are:

- Zone A – Conservation focus – land that is predominantly steep, hilly forested country. Northern part of zone is recovering from 2009 bushfires
  - Zone B - Agricultural focus – land that is predominantly undulating, largely cleared country used for grazing
  - Zone C - Restoration focus – land that is a mix of forested and cleared land on steep, hilly country.
- **The CERAP Fact Sheets** – this is a series of updateable information sheets that provide more detail on various specific aspects of land management. Fact sheets in the series at the time of printing include:
    - Managing bush blocks
    - Dams and waterways
    - Weed mapping and monitoring
    - Erosion
    - Native fauna in Nillumbik
    - Land classes - Christmas Hills
    - Land classes - St Andrews
    - Land classes - Strathewen
    - Landcare
    - Legal responsibilities for weeds and pest animals
    - Controlling pest animals
    - Property management planning
    - Revegetation
    - Weed control.

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Photo by Doug Evans

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Photo by Nev Ragg

# 1. Executive Summary

This Community Environmental Recovery Action Plan (CERAP) for Christmas Hills provides the vision, goals and actions to guide sustainable management of Christmas Hills over the next five years. It is intended to be a document for use by the community and covers important issues for catchment management in Christmas Hills. It includes appropriate activities to undertake individually and in conjunction with other land managers; for instance, your neighbours, Nillumbik Shire Council and Melbourne Water. A careful read will reveal just how precious our local landscape is and how and why we need to protect it for the future.

The vision for the CERAP, developed in consultation with the community, is:

“In 2040, Christmas Hills will have preserved its unique character and will provide a place where conservation, agriculture and rural lifestyles have struck a sustainable balance.”

The goals which have been identified by the community to fulfil this vision are:

SUBJECT	GOALS
Agriculture	To encourage adoption of sustainable practices in all agricultural landscapes. To identify sustainable agricultural enterprises for the future.
Waterway health	To manage the catchment for protection and improvement of water quality.
Biodiversity	To protect and enhance native vegetation, fauna and ecosystems. To secure important biolinks by protecting and enhancing remnant native vegetation and linking core areas.
Rural living	To encourage adoption of sustainable land management practices. To encourage protection and enhancement of biodiversity values.
Community engagement and capacity-building	To build informed and cohesive communities with strong leadership, where people implement sustainable land management practices in a cooperative way that supports effective individual action.

A number of key challenges to catchment management in Christmas Hills have been identified. These include continuing changes to rural development, the need to maintain ecological values, erosion, pest plants and animals, climate change and fire. In particular, the February 2009 bushfires adversely affected parts of the Christmas Hills catchment, causing substantial damage to houses and other private property, as well as burning a large area of native vegetation. The CERAP contains a range of specific actions for landholders under the categories mentioned above, namely: Agriculture, Waterway health, Biodiversity and Rural living. It also contains outlines of five potential projects designed to fulfil the goals.

Community-building and capacity-building activities primarily fall under the responsibility of community groups and Nillumbik Shire Council. These are key to the

successful implementation of the Plan. Such activities are aimed at involving and engaging subsets of landholders; for instance, farmers, immediate neighbours or owners of bush blocks who all have similar land management goals.

The CERAP contains two case studies – of a farm and a bush block – to illustrate some of the issues involved in these different land uses and their potential solutions.

In addition to this Plan, the following resources have been developed to assist you in taking positive action to protect and enhance your property. These resources include:

- a series of best practice factsheets providing detailed information of weeds, pest animals, native fauna, waterways, erosion and agriculture
- a catchment map summarising the environmental values, agricultural values, significant threats and what can be done to help.

## 2. Introduction

This Community Environmental Recovery Action Plan (CERAP) identifies long term goals and actions for the Christmas Hills community to undertake for the protection and recovery of the Christmas Hills environment over the next five years. The goals and actions relate to natural resource assets including agricultural areas, bushland and waterways. Some of the bushland areas were adversely affected by the February 2009 bushfires.

The CERAP was developed in consultation with the Christmas Hills Landcare Group, Skyline Road North and Wallace Road Bushfire Zone Alliance (SWBZA) and interested members of the community through community workshops and other stakeholder consultations. The boundary of the Christmas Hills catchment for the purpose of the CERAP has been determined by the Christmas Hills community and is identified in the maps contained in the CERAP. It is a living document, intended for easy revision and updating to provide ongoing direction for achieving its vision and goals.

The implementation of actions by individuals is voluntary. The CERAP is meant to be used as a guide for prioritising actions both for you to take on **your property** and for you to contribute to within **your community**.

The CERAP is informed by the [Nillumbik CERAP Literature Review 2011](#), which identifies and reviews existing documentation including legislation, federal, state and regional policy, municipal strategies and plans and local information. For those implementing the CERAP, and for other owners and occupiers of rural land in the Christmas Hills catchment, easy access to information is also provided by best practice factsheets and the Christmas Hills CERAP summary map. These have been prepared in conjunction with the CERAP and are available on the [Nillumbik Shire website](#) or as a hardcopy through the Christmas Hills Landcare Group.



### 2.1 Vision, principles and goals

The vision that underpins the CERAP is:

**'In 2040, Christmas Hills will have preserved its unique character and will provide a place where conservation, agriculture and rural lifestyles have struck a sustainable balance.'**

Implementation of the actions and projects included in the CERAP will ensure that the vision is realised.

Management of the Christmas Hills catchment will be shaped by six guiding principles, now and into the future:



#### **Principle 1: Community awareness**

Members of the Christmas Hills community understand and value good land management. They understand its importance and are willing to invest and actively participate in actions that result in good land management.

#### **Principle 2: Extension and technical support**

The Christmas Hills community has access to technical support through a variety of local, regional and state resources and expertise.

#### **Principle 3: Incentives**

Incentives are provided and promoted to encourage cost-sharing arrangements that support research and on-ground works that have a public and private benefit.

#### **Principle 4: On-ground works**

The implementation of the CERAP will provide coordinated and effective on-ground projects that demonstrate sustainable land management and conservation.

#### **Principle 5: Coordination**

The Christmas Hills community works in partnership with Nillumbik Shire Council and other stakeholders towards a healthy, resilient, productive community and landscape.

#### **Principle 6: Research and investigation**

Essential and locally relevant land management knowledge is compiled, accessible and used to make good decisions in programs, investment, standards and planning.

The following goals were established by the community.

Table 1: Community-identified goals for environmental recovery

SUBJECT	GOALS
Agriculture	To encourage adoption of sustainable practices in all agricultural landscapes. To identify sustainable agricultural enterprises for the future.
Waterway health	To manage the catchment for protection and improvement of water quality.
Biodiversity	To protect and enhance native vegetation, fauna and ecosystems. To secure important biolinks by protecting and enhancing remnant native vegetation and linking core areas.
Rural living	To encourage adoption of sustainable land management practices. To encourage protection and enhancement of biodiversity values.
Community engagement and capacity-building	To build informed and cohesive communities with strong leadership, where people implement sustainable land management practices in a cooperative way that supports effective individual action.

Source: Christmas Hills community workshops May 2011

This CERAP aims to inspire and assist the community to undertake both individual and collaborative action. It also provides documentation and justification to support requests to external organisations for funding and other resources. Projects will require commitment from a lead organisation, a project management team and people from the community, as well as agencies. This will provide a combination of local knowledge, experience, technical knowledge and skills.

## 2.2 History of land use in Christmas Hills

"It is over 150 years now since the first European herdsmen led their sheep and cattle through the part of the Stringy Bark Ranges we now know as Christmas Hills. They were not of course the first to have set out to develop ways of deriving sustenance from this old Australian landscape. The people they were to dislodge from their landscape, the Eaglehawk and Crow people of the old domain had already been in occupation of their world for some 2,000 generations. Over that incredibly long expanse of time, the Wurundjeri people had learnt to come to terms with their landscape and the importance of modifying it only to the extent that it met their needs.

The Christmas Hills lie some forty kilometres east of Melbourne, abutting the northern slopes of the Yarra River. Despite having the suburban outliers of Australia's second largest city virtually on its borders, the district today still retains essentially the same mosaic of farmland and bushland resulting from its exposure to a century or so of farming activity. Early maps described the region as the Stringy Bark Ranges or the Stringy Bark Forest. There is no actual town of Christmas Hills, nor has there ever been such, as we generally understand the term. Even so, over much of the past 150 years, a succession of pastoralists, miners, selectors and latter-day small-holders have sought to create for themselves some nucleus around which to consolidate along traditional lines.

European settlement opened in the Christmas Hills in 1840 with the opening of the Watsons Creek Station, followed by the opening up of the Christmas Hill Station in 1842 which together encompassed the whole of today's Christmas Hills. Small-hold farmers began to move in, in 1865, taking up bush blocks averaging around 80 acres. By 1890 all of Christmas Hills was being worked by these small-holders. Ninety percent of them were 'selectors' paying off their farms to government at one shilling per acre per half year whilst improving their land to the same value, that is: clearing it of trees, building fences, sowing crops and building a family home upon it.



Photo by Nev Ragg

During most of that period, they have struggled also to impose some measure of European farming practice on the Australian bush. Here again they can be seen to have been less than successful. They did succeed in leaving their mark on the more amenable patches of good land, but elsewhere the tenacious Stringybark-box woodland had generally succeeded in holding its own. Today, only a handful of small farms remain testimony to past struggles: elsewhere the bush slowly reclaims ground previously yielded to axe and plough.

The history of any community is largely determined by the nature and location of its physical landscape. As the landscape changes, so also does the history of the community which lived out its span upon it. Of course there

will always be other variables, no two histories are ever the same. Each is unique in its own way. However, it would seem that for a century or more the destiny of the people who settled the Christmas Hills was determined primarily by the nature of their landscape. Always we have seen ourselves as masters of our destiny, able in the long term to impose our will upon the land. For two centuries we have measured our achievements by our capacity to transform our landscape, seldom stopping to ponder how much that landscape has in fact transformed us. It is only by looking back into the past that we can prepare for the future."

Source: Once Around the Sugarloaf, Mick Woiwod

*The history of any community is largely determined by the nature and location of its physical landscape. As the landscape changes, so also does the history of the community which lived out its span upon it.*

## 2.3 Existing land use

Our Christmas Hills catchment contains both agricultural and bushland landscapes. Small farms and bush properties predominate, with probably only one traditional broad-acre farming property large enough to fully support the financial needs of a farm family. The many small-to-medium-sized farms are mainly beef cattle or horse-raising enterprises.

The small farm operators typically are part-time farmers and rely on non-farm income. The combining of farming with non-farm income as a permanent change is crucial to the future sustainability of Christmas Hills, which is largely driven by personal preference for a rural lifestyle. Its proximity to the Melbourne metropolitan area offers a scenario for small producers to focus on value-adding and produce sales to tourists and customers of farmers' markets. The use and enjoyment of 'bush blocks' for

their conservation values is also a strong motivation and 'absentee' owners often live in the city and visit their land to enjoy the bush.

Melbourne Water has freehold ownership over 53 property titles in the Christmas Hills catchment. Half of its properties (typically cleared land suitable for grazing) are leased out and these cover a total area of 478 Ha, while the other half (typically bush blocks) are directly managed for their conservation values and these cover a total area of 228 Ha.

### Property statistics

The data in **Table 2** shows the spatial distribution of the separate properties in the Christmas Hills catchment. In some cases, more than one property may belong to a single owner.

Table 2: Property size profile for the Christmas Hills catchment

	Up to 0.4 ha	> 0.4 ha to 1 ha	>1 to 4 ha	>4 to 10 ha	>10 to 40 ha	>40 to 100 ha	>100 to 400 ha	Total
No. properties (%)	99 (30%)	27 (8%)	38 (13%)	113 (34%)	33 (10%)	15 (5%)	-	325
AREA (%)	(0.9%)	(0.7%)	(3.6%)	(36.7%)	(25.9%)	(32.5%)	-	2,286.0

Source: Nillumbik Shire Council, 2010

The majority of these properties (approximately 76%) are bush blocks covering 58% of the Christmas Hills catchment (properties in Zone A on the Christmas Hills CERAP summary map). Another 17% of the properties are in Zone B, covering 28% of the catchment. The remaining 7% of properties are in Zone C covering 14% of the catchment.



Photo by Nev Ragg  
Example of a property in Zone C

## 3. Catchment Description

A catchment is an area of land that collects water, which drains to the lowest point in that area. Rain falling on the land will make its way to the lowest point, via groundwater, aquifers, creeks, dams, lakes, rivers, wetlands or stormwater systems.

Together with rivers, creeks, lakes and dams, a catchment includes groundwater, stormwater, wastewater and water-related infrastructure. Catchments are connected from top to bottom, so what happens upstream in a catchment has a great influence further down the catchment.

Human activities across a whole catchment, such as pollution, soil erosion and the spread of weeds, can adversely affect the quality of water and the environment at the bottom of the catchment.

This is why it is important to manage a catchment as a whole rather than in parts.

## 3.1 Christmas Hills catchment area

The catchment of the Watsons Creek and its tributaries (including Reedy, Five Mile, Sugarloaf and Happy Valley Creeks) includes a mix of public conservation reserves and privately owned land. This CERAP is focused on much of the privately owned land in the catchment.

Our catchment includes the three narrow valleys of Watsons, Reedy and Five Mile Creeks. These are within a landscape of predominantly low hills through the central catchment that merge with long ridges of steep hills and rugged terrain on the northern, eastern and western boundaries. Much of the steep land remains forested, while most of the low hills – in the centre and to the south-west of the catchment – have been cleared for agriculture and contain scattered native trees.

## 3.2 Climate

Between December and February, maximum daily temperatures in Christmas Hills average between 25° C and 28° C, but they can soar above 40° C especially when hot conditions prevail across the state. Between June and August, maximum daily temperatures average between 13° C and 15° C, but they can occasionally drop below 0° C, causing frost. The average annual rainfall is 775 mm. Low temperatures tend to limit growth in winter and drought limits growth in the summer months.

## 3.3 Geology and soils

The geology of the Christmas Hills area is primarily dominated by sedimentary rocks such as siltstones and mudstones which were deposited during the Silurian period approximately 440 million years ago. There are also unconsolidated gravels, sands, silts and clays which mainly occur along local waterways in the area.

The soils on the hills are light-textured yellow, brown or red duplex (meaning there is a sharp distinction between A (top) and B (second) soil horizons in the top 10 centimetres of the soil). Shallow light-textured gradational soils (displaying a gradual change between soil horizons) occur on the crests and steeper slopes. Grey clay with a uniform profile (little change with increasing depth) occurs along drainage lines and floodplain areas. This landscape displays a high erosion hazard due to the hard-setting soil surfaces, which tend to increase run-off and the dispersible clay subsoils. Sheet, gully and tunnel erosion occur on sloping land. Erosion of stream beds and banks is also common where drainage lines have little or no protective vegetation.

## 3.4 Topography

The aerial photo in **Figure 1** illustrates the hilly terrain and the cleared and uncleared areas of the catchment. Ridgelines and valleys are visible. The brownish grey areas are bushland and the light green areas are generally cleared land with northerly and westerly slope aspects. The dark green areas are cleared land predominantly with southerly and easterly slope aspects. Managing for slope aspect is particularly important for pastures on grazing properties, some horticultural crops and in planning to manage the risk of bushfires.

## 3.5 Waterways

Watsons Creek is a tributary of the Yarra River that originates in the Kinglake Ranges and flows through the Christmas Hills catchment from north-east to south-west. Five Mile Creek is also in the catchment and originates in the Rifle Range Reserve in the north. Native vegetation generally occurs along the length of both waterways in the catchment but some areas are devoid of vegetation in the centre of the catchment. A Catchment Management Plan for the Watsons Creek Catchment was prepared for the Nillumbik Shire Council in 2000.

Sugarloaf Reservoir is directly south of the Christmas Hills catchment and is not included in this CERAP.

## 3.6 Native vegetation cover

Christmas Hills supports large areas of relatively intact native vegetation providing habitat for an abundance of significant and unique flora and fauna both on private property and public land. The Kinglake National Park, Warrandyte State Park, Sugarloaf Reservoir and Kinglake to Warrandyte habitat link all contribute to the significance of the catchment. Areas of cleared land used for agricultural purposes support scattered native trees. Watsons, Reedy and Five Mile Creeks provide ecological values.

Indigenous vegetation is tightly linked to land type.

- The well-drained, exposed areas such as crests and slopes contain woodland with Long-leaf Box (*E. goniocalyx*), Red Box (*E. polyanthemos*), Messmate (*E. obliqua*), Red Stringybark (*E. macrorhyncha*) and Narrow-leaf Peppermint (*E. radiata*).
- The lower slopes primarily contain Yellow Box (*E. melliodora*).
- The dominant trees along drainage lines are Candlebark Gum (*E. rubida*), Red Gum (*E. camaldulensis*) and Manna Gum (*E. viminalis*).
- Red Ironbark (*E. tricarpa*) may occur in small patches of open forest, usually on older soils.



Photo by Nev Ragg



Photo by Nev Ragg

Christmas Hills supports large areas of relatively intact native vegetation providing habitat for an abundance of significant and unique flora and fauna both on private property and public land.



**Figure 1:** Aerial image of the Christmas Hills Landcare boundary

## 4. Agricultural Land Capability

Assessing land capability or ‘land class’ allows us to gauge the inherent risks and opportunities for our land to provide for and sustain our current and/or proposed land uses. Land capability varies according to the geology, soil type, topography, aspect and climate.

In general terms, land with a high capability rating (e.g. land class 1), will be more suitable to being modified for agricultural use.

### 4.1 Land management units

Four discrete Land Management Units (LMUs) have been identified in the Christmas Hills catchment. The aggregation of lands with common characteristics into LMUs provides a general picture of the capability of our land to sustain various land uses.

The four LMUs in Christmas Hills catchment are as follows:

- Gently undulating LMU: Gradient 3% – 15%
- Moderately undulating LMU: Gradient 15% – 25%
- Steep LMU: Gradient 25% – 35%
- Rugged terrain LMU: Gradient 35% – >40%.

The location of each LMU is identified in **Figure 2**.

The hilly landscape and soil type of the Christmas Hills catchment facilitates a significant erosion hazard. Specifically:

- all sloping land has high to moderate hazard for sheet, gully and tunnel erosion
- the steeper slopes display a moderate to high hazard for mass movement (land slips)
- all streamlines display a high hazard for streambed and bank erosion and sedimentation.

## 4.2 Agricultural land quality

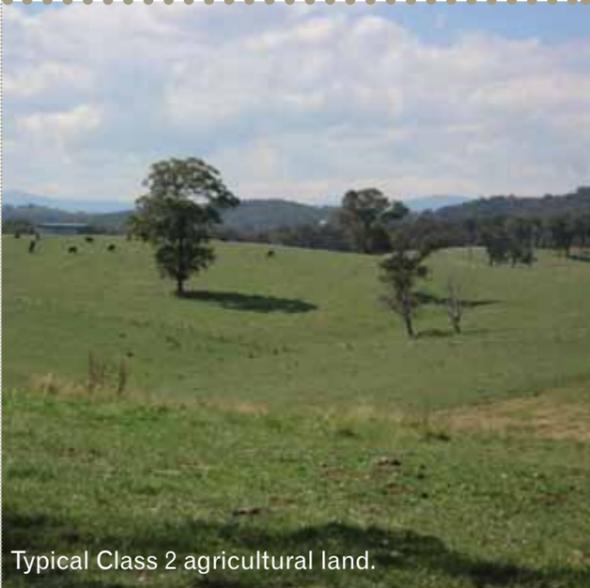
This section expresses the degree of agricultural versatility and production potential across the Christmas Hills catchment in terms of five classes of agricultural land quality. It is important to note that this only provides a broad guide and should not be used to justify significant changes in land use.

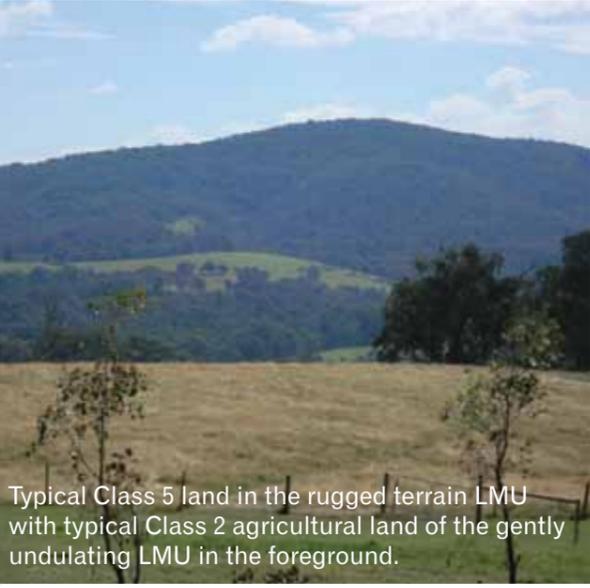
Prior to undertaking any significant change to land use, or if you have only recently purchased your land, it is strongly recommended that you prepare a detailed land capability assessment of your land. This is best achieved

as a component of a detailed 'Property Management Plan' (sometimes referred to as a 'Whole Farm Plan'). Nillumbik Shire Council can assist landholders with the preparation of such plans.

**Table 3** presents a five-class description of agricultural land quality across the Christmas Hills catchment and the map at **Figure 3** depicts a broad spatial interpretation of this information. This mapping is largely based on slope classes and hence does not incorporate important components of land capability such as local hazards (e.g. known tunnel erosion), variation in remnant vegetation cover, aspect, soil type, soil moisture and the presence of minor drainage lines.

**Table 3:** Agricultural land quality assessment for Christmas Hills catchment

LAND CLASS	EXPLANATION	PHOTO REPRESENTATION OF LAND CLASS
<b>Class 1</b> <b>Very high agricultural land quality</b>	Agriculturally versatile land, with high inherent productive potential through possessing deep permeable, friable, structurally resilient and fertile soils, a flat to gently undulating land form, and a growing season of up to 11–12 months under either natural rainfall or irrigation. Suitable for intensive irrigated cropping and grazing.	This land class does not exist in the Christmas Hills catchment.
<b>Class 2</b> <b>High agricultural land quality</b>	Agriculturally versatile, but requiring a higher level of inputs to achieve the same productivity as Class 1. Slope is greater, soils are more variable, and the growing season is limited: up to 9–10 months, or extended to 12 months if irrigation water is available. Suitable for high production, extensive cropping and grazing, and vines or orchards with irrigation.	 <p>Typical Class 2 agricultural land.</p>

LAND CLASS	EXPLANATION	PHOTO REPRESENTATION OF LAND CLASS
<b>Class 3</b> <b>Moderate agricultural land quality</b>	Sound grazing land but limited in versatility. Generally unsuited to cropping either due to limitations of slope or drainage, lack of topsoil depth, weaker structure, low water-holding capacity, or presence of rock. Fertility levels are moderate to low; growing season can be limited to approximately 7–8 months due to dryness or wetness. With high inputs, moderate to high animal production may be achieved.	 <p>Typical Class 3 agricultural land in the moderately undulating LMU.</p>
<b>Class 4</b> <b>Low agricultural land quality</b>	Capable of supporting grazing under moderate to low stocking rates, but only in situations where legally cleared paddocks exist. Slopes are moderate to steep, with shallow infertile soils that need care in their management. Fertility levels are generally low. High inputs may not be economical. Erosion hazard is high. Forest is often the best and most stable form of land use. Removal of remnant indigenous vegetation must be avoided.	 <p>Typical Class 4 agricultural land in the steep LMU.</p>
<b>Class 5</b> <b>Very low agricultural land quality</b>	Land unsuited to agriculture. Constraints may be steepness of slope, existing indigenous vegetation, shallow, sandy or rocky soils, and high susceptibility to erosion. Environmental stability may be best achieved by isolating areas and strictly controlling or eliminating agricultural land uses. Removal of remnant indigenous vegetation must be avoided.	 <p>Typical Class 5 land in the rugged terrain LMU with typical Class 2 agricultural land of the gently undulating LMU in the foreground.</p>

Land Management Units and Agricultural Quality will vary across a property. When planning for your property, use this information as a guide to mapping and prioritising land use in more detail.

## 4.3 An agricultural case study

### An organic approach to farming

A case study with Peter and Jane Russ, Christmas Hills

Seventeen years ago, Peter and Jane Russ moved to an eight-hectare property at Panton Hill. Soon afterwards, they purchased a 70-hectare grazing property on the Eltham-Yarra Glen Road at Christmas Hills where they now live.

This property is located in undulating farmland that contains the confluence of Watsons and Five Mile Creeks. About 17 hectares of the property is fenced native bushland, and nearly all creek lines have been fenced to keep out stock in recent years. The balance of the land (53 hectares) is pastured.

When they took over the property, Peter and Jane faced an enormous challenge. It was a rundown dairy farm, full of metal rubbish and infested with Blackberry (*Rubus fruticosus*). The sheds and stockyards were derelict and the boundary fences were in very poor condition, allowing stock to range at will.

Peter and Jane's first priority was to clean up rubbish in the paddocks. By the time this task was completed, 17 truckloads of wire and other metal rubbish had been removed to the tip. The second priority was to construct stockyards, re-fence the property boundary and clean up the blackberries along the creeks and on the creek flats.

The blackberry infestation was extensive and much of it occurred in inaccessible positions, especially along the creeks, in tree lines and on the steeper hills. Peter and Jane brought in goats to help clean up the blackberries, but goats proved very difficult to manage and contain. The Russ's tried not to use chemicals but found that spraying herbicide to kill blackberries was the only practical solution. Now that blackberries are under control, Peter and Jane will spot-spray only when necessary.

The property had many other weeds. Honeysuckle, bridal creeper, ragwort and plum trees were established with blackberries along the creeks. These were controlled with the herbicide primarily used for blackberries. Pasture weeds included Bent Grass, Sweet Vernal Grass, Fog Grass and Capeweed.

The Russ's prefer to use organic farming principles and aspire to biodynamic accredited certification for their farm products. Soil testing has been done and following recommendations, the property has received applications of lime and dolomite. The Russ's do not intend to use manufactured fertilisers and are testing the effectiveness of poultry manure on pasture.

The most productive soils are on the creek flats and lower hill slopes and pastures in these areas were improved before the hills. Jane said they recently hosted a field day with Peter Andrews, who advocated 'natural sequence farming'. Peter Andrews advised a form of contour farming using 'Yeomans Keyline' techniques to improve the productivity of their hill country, which they propose to trial.

The property is now subdivided along Land Management Unit boundaries, with the steeper land fenced from the creek flats and lower slopes, while creek lines which remain in native bush are fenced from grazing. Creek lines were fenced with the assistance of a 1:1 grant from Melbourne Water's Stream Frontage Management Program. A remaining length of watercourse in the south-east of the property is proposed for fencing in the near future.

Subdivision along Land Management Unit boundaries allows rotational grazing management of paddocks to maximise pasture productivity according to the land

capability. Peter said they use an intensive form of rotational grazing called 'cell grazing' on the flats and lower hills. With this technique they are able to control the intensive grazing of cattle mobs in small paddocks around a central trough using electric fencing. This technique will be progressively expanded as more water troughs are installed and electric fencing expanded. Cell grazing complements broader rotational grazing of the hill paddocks. To achieve optimum management, Peter said they still need to improve internal tracks for better farm access and movement of stock.

There is plenty of water on the farm, sourced from 12 farm dams. Water is pumped to tanks on a hill and reticulated by gravity to paddock troughs. Currently a petrol pump is used on the two house dams but it is proposed to replace this with windmill pumps.

Peter said that after surviving the drought, in future they would always have two years' supply of fodder available. Hay is cut from the creek flats and lower slopes. This will be stored as round bales in two hay sheds.

He said the use of cell grazing allows the development of a well-balanced mixed pasture. This method has removed weeds such as Bent Grass, Sweet Vernal Grass and Fog Grass from the pasture and retained and rejuvenated the existing quality pasture species of Perennial Ryegrass, Cocksfoot, Paspalum, Plantain, Subterranean Clover and native Trefoil. It is also proposed to trial some Lucerne on the dryer flats.

The Russ's run about 30 beef Angus cows, from which they aim to produce 30 saleable weaners each year. Weaners are sold to other farmers for growing out. The aim is to minimise costs by selling all stock directly off the farm rather than through saleyards.

Jane said they also plan to raise poddy calves and develop a small organic market garden to supply vendors at farmers markets.

With regard to fire preparedness, Peter and Jane agree that their strategy is to 'stay and defend'. They irrigate the house paddock and have sprays around the house, a portable fire-fighting unit and pumps on all water supplies near the house.

Peter and Jane consider their two greatest successes to be the control of the huge infestation of blackberries facing them when they purchased the property and surviving the drought. They now feel able to get on with the 'fine tuning' of cell and rotational grazing, water supply development and construction of internal access tracks.

When asked about important lessons from their experience Peter and Jane made several points: the farming life style is important to them, and they would do more research, prepare a better farm plan, and work with nature by managing to suit the climate without pushing the limits of the land.

Peter and Jane consider their two greatest successes to be the control of the huge infestation of blackberries facing them when they purchased the property and surviving the drought.

When they took over the property, Peter and Jane faced an enormous challenge. It was a rundown dairy farm, full of metal rubbish and infested with Blackberry (*Rubus fruticosus*)



Peter Russ checks the quality of his hay

# 5. Ecological Values

Ecological values are generally defined as the benefits that space, water, minerals, flora and fauna and other aspects of natural ecosystems provide for native life forms.

The Christmas Hills catchment is within the Highlands Southern Fall Bioregion. Bioregions are relatively large land areas characterised by broad, landscape-scale natural features – geology, hills, valleys, creeks and vegetation – and environmental processes that influence the functions of entire ecosystems. They are used as the broad scale mapping units for biodiversity planning in Victoria, adopted under Victoria's 1997 Biodiversity Strategy.

The ecological values of Christmas Hills are recognised in several different information sources including the North East Region of Councils (NEROC) report, DSE's Ecological Vegetation Class (EVC) and Biological Conservation Significance (BCS) mapping and BioSites, and Nillumbik's Environmental Significance Overlays, ESO review mapping, and roadside conservation value mapping. This bioregion is the southerly aspect of the Great Dividing Range and is predominantly hilly. The geology that underpins the bioregion is largely sedimentary and granitic rock with shallow stony soils and yellow duplex soils.

The Christmas Hills catchment is regarded as an area of particular note for fauna and habitat rarity and abundance. Lists of significant flora and fauna recorded in the catchment are detailed in **Appendix 1**. Plants and animals may be listed as being of state or national significance. This may mean that the population of the species is poorly known or rare or threatened with extinction. The following rare or threatened species have been recorded in Christmas Hills:

- the nationally significant Little Pink Spider Orchid (*Caladenia rosella*) and 15 state-significant flora species
- the nationally significant Growling Grass Frog, (*Litoria raniformis*) and 13 state-significant fauna species, including Powerful Owl (*Ninox strenua*), Brush-tailed Phascogale (*Phascogale tapoatafa*), Barking Owl (*Ninox connivens*), Masked Owl (*Tyto novaehollandiae*) and Common Dunnart (*Sminthopsis murina*). **Appendix 2** gives details of a project that identified locations of the Common Dunnart in the Christmas Hills catchment.

It is worth noting that significant species records must be treated with caution as survey efforts across the area are not known and it is highly likely that additional survey efforts would reveal additional significant species.

## **The North East Regional Organisation of Councils (NEROC) Report**

In 1997, the former North East Regional Organisation of Councils (NEROC) published a report on significant fauna sites and habitats for north-east Melbourne. The 'NEROC Report', written by local field ecologist Cam Beardsell, provides a comprehensive description of sites of faunal significance and the species of native animals that require conservation management. The report also maps important fauna conservation sites (NEROC sites) and provides recommendations to conserve fauna habitat across the region. Copies of this report can be obtained by contacting Nillumbik Shire Council.

Six NEROC sites of significance cover parts of the Christmas Hills catchment. Three of the sites are considered part of the Nillumbik Upland Hills (NUH) and three are in the Yarra Lowland Hills (YLH). A section of significant site NUH A 80 within One Tree Hill Park is considered an ecological reference area and sections of YLH D 64 along Watsons Creek are considered to be critical conservation areas. **Figure 4** shows the habitat and faunal significance of each NEROC site.



Photo by Nev Ragg

## 5.1 Ecological vegetation classes

In Victoria, native vegetation in an area or catchment can be categorised into Ecological Vegetation Classes (EVCs). These represent different vegetation communities identified and mapped across Victoria by DSE. They are a valuable tool in biodiversity planning and conservation assessment. EVCs help to give us a better understanding of our landscape and why it looks the way it does, and why certain plants grow in certain areas. DSE provides two sets of EVC mapping: Pre-1750 EVC mapping and 2005 EVC mapping.

- Pre-1750 EVC mapping depicts the predicted distribution of EVCs that existed in Victoria prior to European settlement. It is a modelled dataset based on field data, soils, rainfall, topography and historical records.
- 2005 mapping is also a modelled dataset based on satellite imagery interpretation and indicates the current extent of native vegetation (EVCs) and their decline since 1750.

The pre-1750 mapping identifies ten EVCs that would have existed in the Christmas Hills catchment (see **Figure 5**). The 2005 DSE mapping identifies that while all these EVCs remain, their distribution is reduced (see **Figure 6**).

Remnant vegetation within Christmas Hills is dominated by three EVCs, Grassy Dry Forest, Herb-rich Foothill Forest and Valley Grassy Forest.

Grassy Dry Forest occupies drier sites on exposed aspects and crests of ridges or on the drier areas of sheltered slopes. It is dominated by a low-to-medium height open forest of eucalypts including Red Stringybark, Long-leaf Box and Red Box to 20 metres tall. The understorey consists of a sparse shrub layer, including Spreading Wattle and Common Cassinia and is dominated by a high diversity of grasses and herbs including Honey-pots, Grey Parrot-pea, Ivy-leaf Violet, Red-anther Wallaby-grass, Wattle Mat-rush, Grey Tussock-grass and Weeping Grass.

Herb-rich Foothill Forest occupies the eastern and southerly aspects on lower slopes and in gullies. It is a medium-to-tall open forest to 25 metres, dominated by a range of eucalypts including Narrow-leaf Peppermint, Messmate Stringybark and Mountain Grey-gum. It contains a large shrub/understorey tree layer, dominated by Blackwood, over a sparse to dense medium shrub layer dominated by

Common Cassinia, Prickly Currant-bush and Dusty Daisy-bush. It is characterised by a high diversity of herbs and grasses in the ground layer including Common Raspwort, Ivy-leaf Violet, Hairy Speedwell, Red-fruit Saw-sedge, Tasman Flax-lily, Grass Trigger-plant, Weeping Grass and Common Apple-berry.

Valley Grassy Forest occupies fertile, well drained colluvial or alluvial soils on gently undulating lower slopes and valley floors. It is dominated by an open forest of various eucalypts that prefer moist or fertile conditions including Candlebark, Yellow Box, Long-leaf Box, Red Stringybark and Narrow-leaf Peppermint to 20m tall. It contains a sparse shrub layer of Black Wattle, Burgan, Common Cassinia and Cherry Ballart. The ground layer is seasonally dominated by a diverse array of moisture loving herbs, lilies, grasses and sedges including Kidneyweed, Tall Sundew, Thatch Saw-sedge, Small Poranthera, Grey Parrot-pea, Love Creeper and Weeping Grass. At the drier end of the spectrum, the ground layer may be sparse and slightly less diverse but with the moisture-loving species still remaining.

There are slightly smaller remnants of Creekline Herb-rich Woodland along creeklines and shallow drainage lines including Five Mile Creek, Heathy Dry Forest on shallow, skeletal soils on undulating hills on exposed aspects of ridge tops and steep slopes adjacent to Kinglake National Park, Riparian Forest along the lower reaches of Watsons Cree, and Gully Woodland on the upper reaches of Watsons Creek. Christmas Hills also contains minor remnants of Box Ironbark Woodland, Grassy Woodland and Swampy Riparian Woodland.

Care is needed when using EVC-modelled maps as they provide a guide only. Vegetation should be verified on the ground before undertaking any management actions relevant to identified EVCs.

Each EVC has been assigned a Bioregional Conservation Significance (BCS), indicating its conservation status within the Highlands Southern Fall Bioregion. How commonly the EVC occurred in 1750, how much is left and how degraded it is all contribute to this status. BCS categories include: Least Concern, Rare, Depleted, Vulnerable, Endangered and Presumed Extinct. A map of Bioregional Conservation Significance of native vegetation in our area of Christmas Hills is shown in **Figure 7**.



Photo by Doug Evans



Photo by Doug Evans

Remnant vegetation within Christmas Hills is dominated by three EVCs, Grassy Dry Forest, Herb-rich Foothill Forest and Valley Grassy Forest



Photo by Doug Evans

## 5.2 Biolinks

The NEROC Report also identified strategically important habitat linkages, sometimes known as 'biolinks'.

The resilience of our ecosystems and their biodiversity can be improved by protecting, strengthening, creating and maintaining biolinks. Initially targeted at fauna, their key objective was to identify areas where connectivity could be improved to assist animals to move through the landscape. Biolinks can be understood in part as wildlife corridors which help species move across the landscape rather than being restricted to small isolated patches.

However, biolinks benefit not only flora and fauna but also whole ecological communities. In areas dominated by agriculture or fragmented by development, biolinks help to provide connections between habitats. They effectively increase the size and connectivity of existing reserves, parks and privately owned areas of habitats. They allow species of plants and animals to remain living in areas as well as adapt and evolve, thus maximising their opportunities to respond positively to challenges such as climate change. Without biolinks, many species and populations will become isolated and gradually disappear.

Our Christmas Hills catchment provides several biolinks that connect the Kinglake National Park with One Tree Hill Reserve, Sugarloaf Reservoir Park, the Yarra River Reserve, and Warrandyte State Park through Watsons Creek, One Tree Hill and NEROC Area NUH A81.



Regional links also occur along Five Mile Creek and between the Sugarloaf Reservoir and adjacent native vegetation. The Shire of Nillumbik is coordinating the Urban Fringe Weed Management Initiative that focuses on the Warrandyte-Kinglake Nature Conservation Reserve (see **Figure 8**), and other parcels of public land that contribute to habitat connectivity. The purpose of this initiative is to protect key values on public land in Melbourne's outer suburbs from the threat of weeds.

Within the catchment, most habitat links are intact and in good condition. However, the NEROC Report identified some habitat links that could be strengthened. Works may be proposed to increase the quality of these links: through fencing off linkages and allowing for natural regeneration or, if natural regeneration is inadequate, revegetation using locally indigenous species. The potential impact of predation from domestic cats and dogs must also be minimal in habitat link areas if they are to serve their purpose.

Restoring and creating biolinks typically requires cooperation between land managers.

Creeks and associated vegetation provide important biolinks.



Photo by Nev Ragg

...biolinks benefit not only flora and fauna but also whole ecological communities.

## 5.3 BioSites

Biosites are areas of land or water identified by Department of Sustainability and Environment (DSE) that contain significant biological assets with particular attributes. These might be the presence of rare or threatened plants or animals or the conditions required for their survival. We have nine identified BioSites that overlap or abut our catchment (see the map in **Figure 9**). **Table 4** identifies their attributes and significance. These BioSites are detailed below.

**Table 4 :** BioSites within the Christmas Hills catchment and their significance

BIOSITE (with identification number)	SIGNIFICANCE
One Tree Hill (5271)	National
Kinglake/Warrandyte Habitat Link (8641)	State
Christmas Hills (1625)	State
Watsons Creek – Yarra Ridge (4881)	State
Rifle Range Reserve (4880)	State
Watsons Creek – Clintons Road to Christmas Hills Primary School (5253)	State
Sugarloaf Reservoir Reserve (5248) (small portion only in catchment)	Regional
Watsons Creek – Gills Road to Clintons Road (5258)	Regional
Watsons Creek – Gawa Nillumbik Bushland Reserve and Surrounds (5257)	Regional

**8641 - Kinglake/Warrandyte Habitat Link (State significant):** This habitat link includes One Tree Hill Reserve, Rifle Range Reserve and Kinglake National Park and includes significant habitat for Brush-tailed Phascogale.

**4880 – Rifle Range Reserve (State significant):** Bushland stretching north of One Tree Hill, crossing Buttermans Track at Marshalls Road and linking Kinglake National Park. It includes the Rifle Range Reserve at Smiths Gully and adjoining private properties proposed to be included in the Warrandyte Kinglake Nature Conservation Link. It contains approximately 400 hectares of foothills comprising of Herb-rich Foothill Forests, Grassy Dry Forests, Gilgai Wetlands and Creekline Grassy Woodlands. The site meets the significance criteria for ecological integrity and viability, richness and diversity, and rarity and conservation at a state level for flora and a regional level for fauna. It contains habitat for Crested Sun Orchid *Thelymitra X irregularis*, Tussock Sedge *Carex iynx*, Lace Monitor *Varanus varius*, Brush-tailed Phascogale *Phascogale tapoatafa* and Barking Owl *Ninox connivens*.

**4881 – Watsons Creek – Yarra Ridge (State significant):** The catchments of Watsons Creek along a southern spur (Yarra Ridge) of the Great Dividing Range downstream of Kinglake National Park. It contains approximately 1,300 hectares of mountain and foothills comprising of Sedge Wetlands, Grassy Dry Forests and Gilgai Wetlands. The site meets the significance criteria for ecological integrity and viability, richness and diversity, and rarity and conservation at a State level for flora and fauna. It contains habitat for Growling Grass Frog *Litoria raniformis*, Brush-tailed Phascogale, Common Dunnart *Sminthopsis murina* and Barking Owl. Current identified threats to this BioSite include habitat loss, intensification of agriculture, land use changes, introduced and native herbivores, invasion by environmental weeds, development and domestic stock.

**5271 – One Tree Hill (Nationally significant):** This BioSite forms part of the Warrandyte-Kinglake Nature Conservation Reserve and is approximately 450 hectares. It has been identified as containing a high richness and diversity of species at this site and meets the significance criteria for ecological integrity and viability, richness and diversity, rarity and conservation and scientific and educational value. It contains habitat for a large number of significant species including Barking Owl, Powerful Owl *Ninox strenua*, Swift Parrot *Lathamus discolor*, Velvet Apple-berry *Billardiera scandens*, Common Bent-wing Bat *Miniopterus schreibersii*, Common Dunnart, Brush-tailed Phascogale, Pale Swamp Everlasting *Helichrysum aff. rutidolepis* (Lowland Swamps), Dandenong Range Cinnamon Wattle *Acacia leprosa* (Dandenong Range variant), Slender Tick-trefoil *Desmodium varians*, Austral Crane's-bill *Geranium solanderi var. solanderi*, Sharp Greenhood *Pterostylis X ingens* and Little Pink Spider Orchid *Caladenia rosella*. Current identified threats include invasion by environmental weeds, removal by humans, recreational activities including horse riding and motorised vehicles (4WDs, trail bikes), introduced and native herbivores, inappropriate fire regimes, physical soil disturbance and soil erosion.

**5253 – Watsons Creek – Clintons Road to Christmas Hills Primary School (State significant):** Watsons Creek and surrounding bushland has been identified as the most intact foothills streamway landscape in north-east Melbourne. Electrofishing sites and instream reference points are located in Watsons Creek upstream and downstream of Happy Valley Ford. It has been identified as containing a high richness and diversity of species at this site and meets the significance criteria for ecological integrity and viability, richness and diversity, rarity and conservation for flora and fauna. It contains habitat for significant species including Bent-wing Bat, Mountain Galaxias *Galaxias olidus*, Yellow-spot Jewel *Hypochrysops byzos hecalis*, Masked Owl *Tyto novaehollandiae*, Wine-lipped Spider Orchid *Caladenia oenochila* and Velvet Apple-berry. Current identified threats include sedimentation or siltation of the waterway, domestic stock, saline intrusion, water level and flow changes, nutrients and chemicals, invasion by environmental weeds, pollution and toxins, introduction of species to areas outside of their range, recreations activities and instream barriers including dams.

**5258 – Watsons Creek – Gills Road to Clintons Road (Regionally significant):** This section of Watsons Creek has been identified as regionally significant as it meets the significance criteria for ecological integrity and viability and rarity and conservation. It contains significant creekline vegetation including Floodplain Riparian Woodland, Creekline Grassy Woodland and Gilgai Wetland. However, as survey data is incomplete for this section of the creek the actual significance is anticipated to be appreciably higher. Identified threats include soil disturbance and erosion, domestic stock, invasion by environmental weeds, sedimentation and siltation.

**1625 – Christmas Hills (State significant):** This BioSite has been delineated for its high ecological integrity and viability and as a wildlife corridor. The major Vegetation Communities identified are: Box-Stringybark Woodland (Lower Yarra), Riparian Forest (Sherbrooke - Lilydale) and Damp Sclerophyll Forest (SL) which include a range of canopy species including Bundy *Eucalyptus goniocalyx*, Red Stringybark *E. macrorhyncha*, Swamp Gum *E. ovata*, Manna Gum *E. viminalis*, Messmate Stringybark *E. obliqua*, Narrow-leaf Peppermint *E. radiata*, Yellow Box *E. melliodora* and Red Ironbark *E. tricarpa*.

### Shire of Nillumbik Overlays

- Two Environmental Significance Overlays from the Nillumbik Planning Scheme, ESO 1 – Sites of Fauna and Habitat Significance, and ESO 4 – Waterways, occur in the Christmas Hills catchment (see **Figure 10**).
- The overlays state environmental objectives, permit requirements and decision guidelines to ensure that any planning decisions take into account the environmental values within these areas.

### ABZECO Ecological mapping

ABZECO Consultants have been engaged by the Shire of Nillumbik to update the mapping of areas of ecological significance. Their work to date has led to distinguishing between two categories of ecological significance (see **Figure 11**).

- Areas mapped as Core are considered likely to be relied upon by rare or threatened plants and animal species.
- Areas mapped as Buffer include vegetated areas of lower quality than the Core areas, but also include some unvegetated land that could be revegetated to provide buffer protection for Core areas and increase ecological connectivity.

This study is yet to be formally considered by Council (as of July 2012).

## 5.4 Roadsides

Christmas Hills roadsides generally support native vegetation, which varies in quality from low to high conservation value. Council's Roadside Management Plan is the strategic document which guides the implementation of roadside maintenance activities. This Plan focuses on balancing the sometimes competing interests on roadsides between human safety, fire risk, management of remnant native vegetation located on roadsides and ensuring a safe and efficient transport network and utility corridor. **Figure 12** details the

conservation values of roadside vegetation in the Christmas Hills catchment.

This Plan contains updated information regarding the environmental values of roadsides in Nillumbik based on revised conservation value mapping work undertaken in winter/spring 2010. This provides guidance to Council about where resources should be allocated to protect the more valuable of these roadside reserves. The Plan has a strong emphasis on operational management of roads so that works activities do not adversely impact flora and fauna values of roadsides.

A number of threats to river health are evident in the catchment since the 2009 bushfires.



Photo by Doug Evans

## 5.5 Waterway health

The Christmas Hills catchment falls within the Middle Yarra system. The waterways within this system are highly valued, especially the Yarra main stem and tributaries, and have areas of natural beauty, support many recreational activities and important animal species such as platypus. These waterways incorporate significant indigenous and European heritage values. Community feedback has also outlined a broad spectrum of values across the Middle Yarra system, reflecting its size and diversity.

Watsons Creek is identified in the Port Phillip and Westernport Regional River Health Strategy (Melbourne Water 2007) as being of very high regional significance, due to its ability to support important riparian plants, provide habitat for fish and other aquatic creatures and its water quality. The management objective for river health is to maintain ecologically healthy rivers and Watsons Creek's current condition is rated as excellent to good.

Future targets in the Strategy, summarised in **Table 5** below, are meant to maintain that condition.

**Table 5:** Melbourne Water's management targets for Watsons Creek

ASPECT	CURRENT RATING	TARGET
Water quality	Good	Excellent
Aquatic life	Good	Excellent
Habitat and stability	Excellent	Excellent (maintain)
Vegetation	Moderate	Excellent
Flow	Excellent	Excellent (maintain)

Melbourne Water has identified the following as priority for the Christmas Hills catchment:

- improving habitat in waterways for fish, frogs and platypus through revegetation and weed control.

A number of threats to river health are evident in the catchment since the 2009 bushfires. The direct effects include the burning of vegetation and ground cover, which generates ash and increases soil water repellence. These can in turn affect faunal survival, catchment hydrology and sediment transport. The key indirect post-bushfire effects are changes in stream flow, erosion and sedimentation.

These are triggered, exacerbated or accelerated by rainfall events and have an impact on the following:

- aquatic fauna and flora
- flooding
- channel erosion and sedimentation
- waterways' health targets in the catchment and downstream
- stability of bridges, rock chutes, dams and other waterways infrastructure
- risk to private property.

## 5.6 An ecological case study

### A forested bush block

A case study with Mark Gardner and Kylie Moppert in Christmas Hills

Mark Gardner and Kylie Moppert have owned a property of approximately 8.5 hectares at 109 Reeves Road, Christmas Hills since 2002. The property supports intact Valley Grassy Forest (EVC 47) and Grassy Dry Forest (EVC 22) vegetation. It is also within a belt of native vegetation forming a habitat link from the Kinglake Ranges to the Yarra Lowland Hills. The fires of February 2009 passed through Christmas Hills approximately one kilometre to the north of the property.

The native vegetation on the property is diverse and while no significant flora and fauna species have been recorded

#### Threats:

##### Weeds

As with all bush blocks, weed infestation is one of the main threats to the biodiversity values at Reeves Road. The main weed species recorded on the property are Early Black Wattle (*Acacia decurrens*), Sweet Pittosporum (*Pittosporum undulatum*), Arum Lily (*Zantedeschia aethiopica*) and some ornamental shrubs that were planted historically. Ground cover species, such as Sweet Vernal Grass (*Anthoxanthum odoratum*), and Blackberry (*Rubus fruticosus* spp. Agg) seedlings are also an issue. The aquatic plant Parrots Feather (*Myriophyllum aquaticum*), has also been a problem in one dam.

##### Pest animals

Feral animals are a problem in the area, and feral cats and foxes are periodically noted passing through the block. Rabbit populations have recently increased, placing pressure on native understorey plants.

##### Conservation program integration

The property has seven adjoining neighbours. This leads to challenges with trying to integrate conservation programs, as well as some inappropriate plantings and lack of effective cat control on neighbouring properties.

there are nearby records of the state-significant Round-leaf Pomaderris (*Pomaderris vacciniifolia*). The state-significant Powerful Owl (*Ninox connivens*) and Brush-tailed Phascogale (*Phascogale tapoatafa*) have also been recorded nearby, and the property supports potential habitat for these and other significant fauna species. The property also has three dams and is protected by a 'Trust For Nature' Conservation Covenant.

#### Actions:

##### Weeds

Mark was surprised at the low level of weed cover when they purchased the block and he has been continuing to reduce this over time. He and Kylie have had great success with controlling woody weeds and are now looking at more effective ways of controlling the grassy weeds. They have also removed the Parrots Feather infestation from the dam by hand and are monitoring for any regrowth.

##### Pest animals

Mark has been trapping foxes and cats over time to prevent predation on native fauna. An adjacent neighbour has installed a cat cage after their cat was trapped and returned.

The couple has also been involved with the Christmas Hills Landcare Group's rabbit baiting program, which is integrated across the catchment. They have achieved mixed results with bait uptake, probably due to the large amount of feed currently available, but are continuing with the next round in December.

##### Conservation program integration

Mark and Kylie's relationships with their adjacent landholders assist with their education on local conservation issues, and they continually look for ways to work together.

#### Lessons learned and the future:

*"We have found that a low-profile approach to managing our bush has worked really well,"* Mark said. *"The key is to regularly walk over the whole block to see what's happening, and to keep on top of any emerging weed infestations or other issues. Educating ourselves and getting in touch with our neighbours to get them interested in the precious biodiversity on their block has also been really important. There is a lot of information and support out there from the Christmas Hills Landcare Group, Nillumbik Shire Council, Trust for Nature and the Catchment Management Authority that people should take advantage of. For the future, I would like to get some flora and fauna surveys done here. We are currently taking part in getting some nesting boxes for the Common Dunnart, as there is potential habitat for them here. It will be interesting to see what happens."*



Common Dunnart at One Tree Hill Reserve  
Photo by Nev Ragg.

"We have found that a low-profile approach to managing our bush has worked really well"



Common Dunnart nesting box on the property of Mark Gardiner and Kylie Moppert

# 6. Community Engagement and Capacity-Building

To achieve the actions identified in this CERAP, we need to see ourselves as land managers, not just landholders and residents. We need to be aware of the problems and acknowledge them as important issues. We need to be prepared to act, know what measures to take, at what scale and with whom to cooperate.

Catchment management involves:

- protecting remnant indigenous vegetation
- reconnecting fragmented native habitat
- protecting rare or endangered species
- managing invasive plants and animals
- improving pastures and soils
- protecting and enhancing waterway quality.

These are all complex tasks and interconnected issues. They require cooperation between neighbours and ultimately people across the wider catchment. Major community engagement and capacity-building programs will be needed to support us in this work.

Capacity-building programs generally fall into the categories of awareness raising, information and knowledge, skills and training, and facilitation and support. By building peoples' ability and motivation to act, the capacity-building activities can contribute to greater and more effective community engagement and action in developing and implementing this CERAP.

Potential participants in capacity-building could include the following:

- subsets of landholders with specific land use interests (e.g. farmers, owners of bush blocks, and various land managers) or those located within specific neighbourhoods
- community groups (e.g. Landcare, CFA, Fireguard groups)
- regional organisations (e.g. Port Phillip and Westernport Catchment Management Authority, Melbourne Water, industry groups and learning institutions)
- government agencies (local, state and federal)
- private technical and financial advisers/facilitators.



Photo by Doug Evans

When planning for capacity-building, a range of approaches for engaging various participants should be considered. It is important to avoid the 'one size fits all' approach, as most on-ground action is in the hands of individual landholders and local groups and we have differing interests and needs.

In particular, the targeting process should consider those people who are not currently engaged but whose participation is critical for achieving CERAP outcomes.

Detailed consideration is needed to the following questions to maximise the success of engagement and capacity-building actions.

- What specific behaviour and practice changes are required to achieve the priority outcomes?
- What are the specific, critical capacity-building activities that will most effectively support the achievement of these changes?
- What prerequisite and corequisite activities are required to successfully undertake these capacity-building activities?
- What has already been done and is the proposed activity building on this?
- Where geographically within the catchment should capacity-building activities be targeted in order to best achieve priority outcomes?
- Who within the target areas should be specifically identified for involvement in capacity-building?
- When should specific capacity-building activities be undertaken and in what order? Which are time critical and which cannot be undertaken until others have been completed?
- Which are the most appropriate delivery mechanisms in terms of who delivers the services (e.g. local government, catchment management authority, community support network, educational institution or other organisation/group)? What should be their approach?
- Who will supply the resources?



Photo by Doug Evans



Photo by Doug Evans

# 7. Challenges for Management of the Christmas Hills Catchment

This section gives a brief overview of areas of the catchment and some of the challenges we face. Actions to address challenges are to be found in Section 8.

## Agriculture

European settlement opened in the Christmas Hills in 1840 with the opening of the Watson's Creek Station followed by the opening up of the Christmas Hill Station in 1842 which together encompassed the whole of today's Christmas Hills. In 1865, small-hold farmers began to move in taking up bush blocks averaging around 80 acres. By 1890, all of Christmas Hills was being worked by these small-holders. Ninety percent of them were 'selectors' paying off their farms to government at one shilling per acre per half year whilst improving their land to the same value, that is: clearing it of trees, building fences, sowing crops and building a family home upon it.

During most of that period, they have struggled also to impose some measure of European farming practice on the Australian bush. Here again they can be seen to have been less than successful. They did succeed in leaving their mark on the more amenable patches of good land, but elsewhere the tenacious Stringybark-box woodland had generally succeeded in holding its own. Today, only a handful of small farms remain testimony to past struggles: elsewhere the bush slowly reclaims ground previously yielded to axe and plough.

Some agricultural areas of higher quality in Christmas Hills have also attracted 'tree change' migration – the growth of small, lifestyle-oriented farm businesses. While individual agricultural enterprises may be run on a commercial basis, their small scale provides insufficient income for the farm family, whose livelihood relies on off-farm income and capital growth. This trend is likely to continue for the foreseeable future.

Challenges for the farming sector in our catchment include drought, water scarcity, increased running costs and reduced viability of traditional commercial agricultural enterprises. Climate change, growing urbanisation and new patterns of land use, threats from the introduction and spread of weeds and pests and changing community and consumer expectations are further threats.

## Pasture quality

The quality of pasture is, of course, an important issue for our farmers.

Pasture deterioration leads directly to interrelated components and drivers of soil degradation including topsoil depletion, compaction, increased water run-off, erosion, loss of soil fertility, acidification and a crash in soil biota. This in turn causes degradation of local waterways and water-bodies as a result of an increase in sediment and nutrient load.

Pasture deterioration also exposes areas to weed invasion, creating new weed hot-spots which then become threats to nearby agriculture and biodiversity. Sustainable pasture management is a topic of farm planning in itself. Pasture mismanagement, such as over-grazing, is a consequence of poor knowledge. It is a drain on the ecological, productive and economic resources of a property and hence would never be knowingly practiced. This highlights the fact that good community education is the precursor to sustainable property management.

While the Christmas Hills area supports large areas of relatively intact native vegetation, there are also scattered mature native trees in agricultural paddocks.



Photo by Nev Ragg

## Ecological values and native vegetation

There is strong appreciation for the bush in the Christmas Hills community and awareness of the catchment's ecological values. The bush landscapes of Christmas Hills have always attracted many residents and visitors to the area and justly continue to do so. A significant amount of remnant bushland in Christmas Hills is privately owned.

The protection and enhancement of our existing remnant bush with its animal and plant populations is the best way to conserve biodiversity across these landscapes. Native animals struggle to replenish their population numbers when they have to move between small areas of habitat in a fragmented landscape with little connectivity. Fragmentation is worsened after disturbance events such as bushfire. Therefore, large natural areas of remnant vegetation are of fundamental importance for nature conservation and are irreplaceable. All other things being equal, large remnants are inherently more valuable than groups of small, fragmented patches that add up to the same size.

If areas of bushland have become degraded, natural regeneration of native plant species is best, as we have seen post-fire that the bush is uniquely adapted to fire. Research shows that restoration of bushland through revegetation or reintroduction is unlikely to return an area to its original condition with all of its inherent ecological processes and resilience. These ecological processes are vital in the services they provide to the human community – carbon sinks, for example. Restoration should be targeted firstly to areas of high quality, moving on to those of lower quality when time permits. Threats to biodiversity such as weed incursion should be treated at their source.

While the Christmas Hills area supports large areas of relatively intact native vegetation, there are also scattered mature native trees in agricultural paddocks. These

provide various benefits for productivity such as shelter for stock, reduction of wind and water erosion and seeds for regeneration (in the paddocks and elsewhere). They can be important habitat for native fauna, providing conduits or stopping-off points for animal movement between patches of intact vegetation and they may also be a source of food. These trees are threatened by ringbarking and uncontrolled grazing in agricultural areas with biodiversity values. As a result, they are prone to dieback.

## Waterways

Our waterways and their unique riparian plants (riparian forests) need protection too. Melbourne Water rates Watsons Creek as of very high regional importance. The current condition is rated as good, and the management objective is to improve the condition of the creek. It is described as having:

".... excellent channel form, good streamside vegetation and its headwater reaches have been defined as ecologically healthy. Weeds pose a risk to both headwater and rural sections."

When creeks and significant gullies are left unfenced, stock may have access to graze and trample riparian vegetation. Creek banks become trampled and begin to erode and water quality is reduced. This practice often goes hand in hand with overgrazing of pastures, particularly in times of low rainfall or overstocking.

Private landholders with remnant bush on their properties need to be aware of their responsibilities regarding noxious weed control and of legislation that protects native vegetation, such as the Planning and Environment Act 1987, which requires landholders to have a permit to remove, destroy or lop native vegetation (see DSE Practice Note: *New Vegetation Provisions in Planning Schemes*).

## Erosion

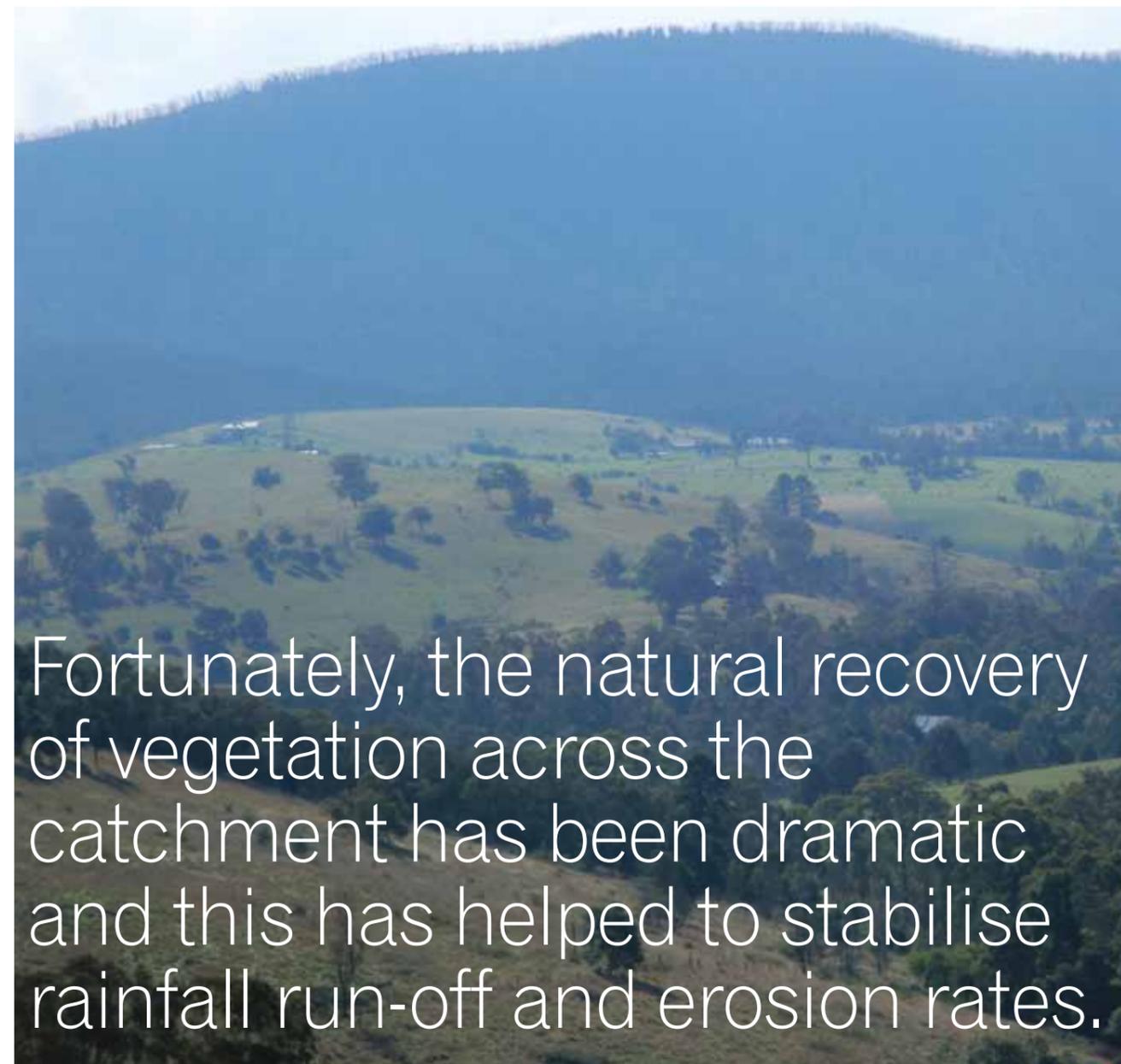
The Christmas Hills catchment generally has highly erodible soils on account of its thin topsoil and highly dispersive subsoils (easily dissolved). The likelihood of erosion is greater in areas that have:

- steep slopes
- disturbed topsoil
- concentrated flows of water
- vertical drops in the bed of drainage lines
- poor coverage of vegetation
- high rabbit populations.

Note: A combination of these factors increases the risk.

Much of the steep land of the Christmas Hills catchment was bared of vegetation by the 2009 fires. This resulted in higher volumes of faster flowing rainfall run-off. This caused a significant spike in erosion. Fortunately, the natural recovery of vegetation across the catchment has been dramatic and this has helped to stabilise rainfall run-off and erosion rates. Engineered solutions to stabilising active erosion sites have been required in situations where the activity of the erosion has been a serious threat to infrastructure or the natural/productive environment.

The sediment load that is generated via an accelerated rate of erosion has serious consequences for downstream waterways and water-bodies. This includes siltation of in-stream pools and other water-bodies which alters the aquatic ecological conditions and degrades the in-stream biota.



Fortunately, the natural recovery of vegetation across the catchment has been dramatic and this has helped to stabilise rainfall run-off and erosion rates.

## Pest plants

Pest plants – weeds – are considered by many Christmas Hills landholders to be one of our highest priorities for land management. They reduce the integrity of both bush and agricultural land and some may eliminate native species or replace a whole plant community or EVC. Weeds also reduce the productivity of grazing and cropping systems by reducing yield, contaminating produce and providing harbour for pests and disease. The invasion of noxious weeds into pasture land has potential for adverse animal health issues; for instance, the impact of poisonous or spiny weeds on stock.

In some locations the 2009 bushfires have enabled some weed species to invade native vegetation. Weeds can be spread from roadsides, through lack of hygiene with trucks, earth moving and other machinery and inadequate land management practices. A particular problem is the invasion of garden escapees from the interface with rural living areas.

Significant factors in the spread of weeds are a lack of knowledge about their impact on native ecosystems and an inability – particularly of new landholders – to identify weed species. Properties with absentee landholders and new and emerging pest plants also present challenges. This is exacerbated by lack of time, financial resources or equipment to carry out control works.

The Christmas Hills catchment contains a wide range of weeds. While most have been introduced from overseas (often for agriculture, forestry or gardens), some have spread from other parts of Australia. They include widespread, long-established agricultural weeds, environmental weeds of bushland. Weeds of greatest concern are the aggressively invasive established environmental weeds and new incursions of environmental weeds. Invasive weed species challenge all land managers.



The Shire of Nillumbik lists 126 species as local environmental weeds and some of these (e.g. Blackberry and Paterson's Curse) also cause problems for agriculture. In addition to the Shire list, other weeds are declared pest plants under the provisions of the Catchment and Land Protection Act 1994. While these primarily threaten agriculture, many have severe impacts on native plant communities. New and emerging weeds for Christmas Hills are becoming of great concern, particularly Chilean Needle Grass, Serrated Tussock and Bridal Creeper (*Asparagus asparagoides*).

Many of the pest plants in the catchment were originally garden escapees such as English Ivy (*Hedera helix*) and Agapanthus (*Agapanthus praecox*). Other environmental weeds include Blackberry (*Rubus fruticosus*), Thistles (*Cirsium spp.*) and Panic Veldt grass (*Ehrharta erecta*).

The Christmas Hills Landcare Group completed a project mapping of infestations of ten high priority weed species. Over 60 properties participated covering about 20% of the group's area. (see **Figure 13**). The weed species that were mapped are:

- Blackberry (*Rubus spp.*)
- Bridal Creeper (*Asparagus asparagoides*)
- Boneseed (*Chrysanthemoides monilifera*)
- Brooms (*Cytisus spp. and Genista spp.*)
- Cootamundra Wattle (*Acacia baileyana*)
- English Ivy (*Hedera helix*)
- Radiata Pine (*Pinus radiata*)
- Spanish Heath (*Erica lusitanica*)
- Sweet Pittosporum (*Pittosporum undulatum*)
- Wild Watsonia (*Watsonia meriana var. bulbifera*).

As the list above shows, many of the pest plants noted within the Christmas Hills catchment were originally garden escapees such as English Ivy (*Hedera helix*) and Agapanthus (*Agapanthus praecox*). Other significant environmental weeds include Blackberry (*Rubus fruticosus*), Thistles (*Cirsium spp.*) and Panic Veldt Grass (*Ehrharta erecta*).

## Pest animals

The pattern of settlement and fragmentation of the landscape in Christmas Hills has allowed the spread of feral animals, which are predators of native flora and fauna. Roaming cats and dogs are predators too – a problem linked to increased urbanisation.

Pest animals of particular concern in the catchment are as follows:

### Rabbits

Rabbits have recovered and increased in numbers post-fire due to a number of factors: higher rainfall, green pick and additional harbour in regenerating bush.

Rabbits threaten the values of our public and private lands. The Department of Primary Industries is able to use the provisions of the *Catchment and Land Protection (CaLP) Act 1994* to enforce rabbit control on private land.

The most appropriate method for rabbit control will depend on your situation, available resources and preferences. All methods must comply with relevant agricultural chemical, animal welfare and firearms legislation. Baiting for rabbits with 1080 poison is not usually undertaken in closely settled areas because of the unacceptable risk to domestic pets. The Council offers subsidies to landholders for rabbit control works if you are working with your neighbours in a Rabbit Action Group. These generally cover approximately one third of works' costs.

The Christmas Hills Landcare Group has a rabbit control program in a 500 hectare target area of the catchment. This area was chosen using information from the group's weed and warren mapping project and grant funds have been secured to engage contractors to spray blackberries to remove harbour and deliver a ferretting program. Landholders have also been supported for a baiting program using pindone-treated oats laid under specially constructed bait stations (to minimise the risk of non-target species taking the bait). The project will be completed with warren destruction using a mini-excavator, followed by a spotlight count of rabbits to assess success.

### Foxes

Foxes are identified in the NEROC Report as a threat to regional biodiversity. They penetrate deep into residential areas and cause serious environmental damage through predation, particularly for ground-dwelling fauna, the spread of fruiting weed species such as blackberry and pittosporum, and the spread of disease to native animals. They may also attack newborn livestock, raid chicken coops and disturb domestic pets.

As for rabbits, the most appropriate method of fox control will depend on your situation, available resources and preferences. Coordinated action by a group of landholders will provide a higher level of control.

### Wild Deer

Wild deer are one of Australia's worst emerging pest problems, causing damage to the natural environment and agricultural businesses. Populations are expanding and deer are invading new areas and integrated control is needed where the population is emerging. Shooting is generally regarded as the best control option for deer.

### Unrestrained domestic animals

Direct predation by cats and dogs can be devastating to many indigenous animals, most particularly ground-dwelling and foraging species such as quail, bush-rats, frogs and even possums. Cats will readily climb and take birds, gliders and bats. Dogs that are regularly allowed to roam free from their property can form packs and will attack larger native mammals.

Feral cats, formerly domesticated, occur in Christmas Hills.

Landholders should contain domestic animals within restricted areas on their property, not only protect biodiversity but to safeguard their pets.

### Burgan

Burgan (*Kunzea ericoides*) is a native shrub species and occurs naturally in the Christmas Hills catchment but it commonly colonises disturbed areas and can alter the structure of native vegetation by out-competing other shrub and understorey species to reduce biodiversity. Burgan can also colonise areas near infrastructure such as dwellings and sheds and become a fire hazard. Planned removal of Burgan from these areas may be an appropriate strategy. It is important to note that Burgan removal may require a permit, so check with Council prior to commencing works.

## Fire

Bushfires have always occurred in Australia. Our native plants and animals have evolved with it and most Australian ecosystems have developed specialised relationships with fire. For most native vegetation and wildlife, fires do not destroy, decimate or devastate, and are not catastrophic. In fact, fires can initiate important ecological processes necessary for ecosystem survival.

Post-fire ecosystem recovery normally starts within weeks and occurs over many years. Plants survive through buds protected under soil or bark, woody capsules, soil-stored seed and underground tubers. In the short and medium-term, the shrub layer can develop dense regrowth that offers more protection for ground-dwelling animals, such as Antechinus and Echidna, and can reduce predation. As plants mature and demand more light, nutrients and water, some plants are out-competed, and plant density reduces.

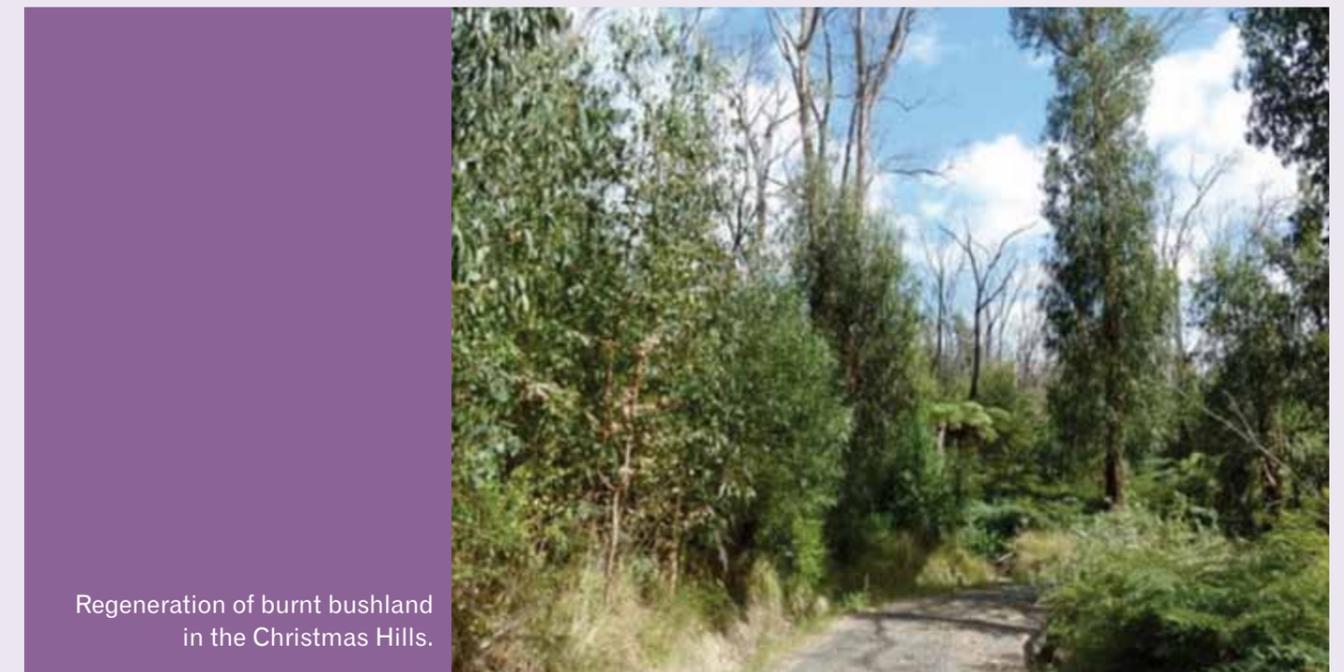
Christmas Hills' bushfire history includes the fires of 1893, 1939, 1962 and 2009. The area has a fire-prone environment and projections for future temperature and rainfall indicate increased drought and bushfire events. Slope, aspect and vegetation type are landscape characteristics that influence the degree of fire hazard.

In 2009, more than 390 hectares of the Christmas Hills catchment was burnt. Eighteen homes were lost and fire-affected 38 properties along Skyline Road and Wallace Road. A significant amount of flora and fauna was burnt, and local waterways suffered substantial damage. Subsequent rain also led to soil erosion and flood damage in burnt areas and unburnt areas downstream.

Most native vegetation burnt in the 2009 bushfires is regenerating by natural processes.



Plants survive through buds protected under soil or bark, woody capsules, soil-stored seed and underground tubers.



Regeneration of burnt bushland in the Christmas Hills.

## Climate change

The report published by Land and Water Australia in 2008, *Glimpsing Victoria's Future Climate*, projects that Victoria's future climate will differ from that of the past.

Temperature projections are for continued warming. Rainfall projections are more mixed than for temperature but mainly indicate a drying trend, particularly during winter and spring. The combination of projected warming and less rainfall has significant implications for communities, agriculture and stream flow.

By 2030, annual rainfall in Victoria is projected to decrease by up to 5 per cent relative to around 1990. By 2070, a decrease of 5 to 10 per cent is most likely under a low greenhouse gas emission scenario, or a 10 to 20 per cent decrease under a high emission scenario. Winter and spring rainfall is likely to decrease, while changes in summer and autumn rainfall are less certain. Projections show an increase in rainfall intensity and an increase in the number of dry days, which means we are likely to experience longer dry spells interrupted by heavier rainfall events.

By 2030, Victoria's annual average temperatures may increase by at least 0.6° C relative to around 1990. By 2070, this may increase by 1.0° C under a low emission scenario, and at least 2.5° C under a high emission scenario. These increases could be accompanied by an increase in the frequency of very hot days and nights, so that by 2030 there are likely to be more days per year above 35° C. By 2070 and under a high emission scenario, the number of days over 35° C may have doubled. Conversely, the frequency of frosts and very cold days and nights is likely to decline.

The combination of projected warming and less rainfall has serious implications for run-off and water storage. By 2030, stream flow into Victorian dams is projected to decline by 7 to 35 per cent relative to historical average flows.

In summary, the projected changes would induce a range of threats to agriculture, including:

- declining productivity due to increased drought and bushfires
- crop and pasture yields benefitting from warmer conditions and higher carbon dioxide levels, but vulnerable to reduced rainfall
- reduced availability of water
- greater exposure of stock and crops to heat-related stress and disease
- earlier ripening and reduced grape quality
- less winter chilling for fruit and nuts
- southern migration of some pests
- a potential increase in the distribution and abundance of some exotic weeds.

These climate change-induced threats to agriculture could create a greater demand for agricultural land and agricultural production in cooler, higher rainfall regions in the state. This could include the Christmas Hills catchment.

Climate change is also predicted to have a marked impact on biodiversity through many factors such as changes in vegetation structure including a decrease in foliage quality, and reduction in range for the majority of vertebrate species. Increased temperatures are expected to result in changes to vegetation composition. It is likely that changes in structure, productivity and foliage quality will have flow-on effects to other aspects of biodiversity. Climatologists suggest that climate change will result in a drying climate and more intense and frequent fires, with the following impact on biodiversity:

- smaller areas of refugia as a result of larger scale fires, slowing the re-colonisation of burnt areas and the recovery of populations, possibly resulting in local extinctions
- increased fire mortality of drought-stressed plants, notably eucalypts
- reduced post-fire recruitment of flora
- loss of core areas of biodiversity.

By 2030, annual rainfall in Victoria is projected to decrease by up to 5 per cent relative to the climate of around 1990.



Photo by Nev Ragg

# 8. Actions

Sustainable catchment management is complex, especially in Christmas Hills with its mix of private and public land in key environmentally sensitive areas.

Actions have to be planned at the catchment level and require collaboration between land managers and coordination of works across private and public land property boundaries. For instance, an action initiated by an individual property owner may fall under the responsibility of, say, Parks Victoria, Melbourne Water or Nillumbik Shire. In such cases, collaborative work between landholders, Landcare and other agencies can achieve greater, longer term sustainable outcomes.

Such a context, however, may be challenging for some landholders (both public and private) and this is where community education in caring for our catchment and capacity-building to work together effectively become crucial (see Section 6).

The following table outlines potential land management actions, together with the relevant responsible agencies. They are grouped into themes of agriculture, waterway health, biodiversity and rural living.

## 8.1 Agriculture

### Goals

- To encourage adoption of sustainable practices in all agricultural landscapes.
- To identify sustainable agricultural enterprises for the future.

ACTIONS	RESPONSIBILITY
<p><b>Prepare a property management plan.</b> To cover:</p> <ul style="list-style-type: none"> <li>• Integrating agriculture and environmental protection.</li> <li>• Fitting together personal aspirations and community benefit.</li> <li>• Matching land use to land capability.</li> <li>• Biodiversity protection and enhancement.</li> <li>• Weed and pest animal control.</li> <li>• Soil and pasture management.</li> <li>• Farm water management.</li> <li>• Bushfire safety planning.</li> </ul>	<p><b>Landholders</b></p>
<p><b>Improve and maintain soil and pasture health.</b></p> <ul style="list-style-type: none"> <li>• Soil testing.</li> <li>• Nutrient management (e.g. adding organic material.)</li> <li>• Grazing management (e.g. cell/rotational grazing).</li> <li>• Pasture weed management (learn to recognise and develop skills to control).</li> <li>• Rabbit control (engage contractors and/or develop own skills).</li> </ul>	<p><b>Landholders</b></p>
<p><b>Protect biodiversity and waterway assets.</b></p> <ul style="list-style-type: none"> <li>• Fencing to exclude stock from remnant vegetation and waterways.</li> <li>• Fencing to protect paddock trees.</li> <li>• Retain fallen trees and branches as habitat (or relocate to designated habitat areas).</li> <li>• Environmental weed management (learn to recognise and develop skills to control).</li> <li>• Fox and rabbit control (engage contractors and/or develop own skills).</li> <li>• Create vegetation corridors to improve links between vegetation remnants through revegetation with indigenous species.</li> <li>• Collaborate with neighbours where assets or threats extend beyond the property.</li> </ul>	<p><b>Landholders</b></p>
<p><b>Monitor and record observations of rare or unusual native plants and animals.</b></p>	<p><b>Landholders</b></p>
<p><b>Create opportunities for landholders to undertake property management planning.</b></p>	<p><b>Council, Landcare, Melbourne Water and DPI</b></p>
<p><b>Create opportunities for landholders to undertake environmentally-sensitive bushfire safety planning.</b></p> <ul style="list-style-type: none"> <li>• Help landholders understand fire behavior and fire risk management.</li> <li>• Sensitive management of fuel loads, including Burgan.</li> </ul>	<p><b>Council, Landcare and CFA</b></p>

## 8.1 Agriculture (continued)

ACTIONS	RESPONSIBILITY
<p><b>Build landholder capacity to recognise and control pest plants and animals.</b></p> <ul style="list-style-type: none"> <li>• Provide weed identification information.</li> <li>• Provide events to explain and demonstrate pest plant and animal control methods.</li> <li>• Provide training for qualifications in pest plant and animal control for landholders (e.g. Farm Chemical Users course, ACUP accreditation, 1080 pest animal baiting accreditation).</li> <li>• Help landholders overcome initial obstacles (e.g. develop projects that engage pest plant and animal control contractors to knock down major infestations, community “Help a Neighbour” events).</li> <li>• Provide access to tools, and equipment for pest plant and animal control.</li> </ul>	<b>Council and Landcare</b>
<p><b>Build landholder capacity to manage soil and pasture health.</b></p> <ul style="list-style-type: none"> <li>• Provide soil and pasture management information and expertise.</li> <li>• Provide events to explain and demonstrate soil, pasture and grazing management methods.</li> <li>• Provide training in soil testing.</li> <li>• Provide soil erosion, and dam and drainage design information.</li> </ul>	<b>Council and Landcare</b>
<p><b>Establish one or more local sustainable agriculture demonstration properties</b></p>	<b>Council, Landcare and key landholders</b>
<p><b>Coordinate pest plant and animal control across multiple properties.</b></p> <ul style="list-style-type: none"> <li>• Develop projects that engage multiple landholders in targeted areas for pest plant and animal control works.</li> <li>• Coordinate timing of any pest animal baiting across private and public land.</li> </ul>	<b>Landcare</b>
<p><b>Promote relevant grants and programs available to landholders.</b></p> <ul style="list-style-type: none"> <li>• Melbourne Water’s Stream Frontage Management program.</li> <li>• Nillumbik’s Land Management Incentive program.</li> <li>• Multi-landholder projects developed by Landcare.</li> </ul>	<b>Landcare, Council and Melbourne Water</b>
<p><b>Protect high quality agricultural land from further development.</b></p>	<b>Council</b>

## 8.2 Waterway health

### Goal

- To manage the catchment for protection and improvement of water quality.

ACTIONS	RESPONSIBILITY
Exclude stock from waterways by fencing with wildlife friendly fencing.	<b>Landholders and Melbourne Water</b>
Improve riparian habitat quality through weed control and revegetation.	<b>Landholders and Melbourne Water</b>
Work with neighbours to create native vegetation corridors along waterways.	<b>Landholders and Melbourne Water</b>
Provide guidelines for the design of private roads and drains.	<b>Council</b>
Provide workshops about the potential impacts of local land uses on waterway quality.	<b>Landholders and Melbourne Water</b>
Promote Melbourne Water’s Stream Frontage Management Program to private landholders with freehold or licensed waterway frontage (grants for fencing, off-stream stock watering, weed control and revegetation).	<b>Landholders and Melbourne Water</b>



Photo by Doug Evans

## 8.3 Biodiversity

### Goals

- To protect and enhance native vegetation, and fauna and ecosystems.
- To secure important biolinks by protecting and enhancing remnant native vegetation and linking core areas.

ACTIONS	RESPONSIBILITY
<b>Place a Conservation Covenant on good quality native vegetation on your property.</b>	<b>Landholders and Trust for Nature</b>
<b>Prepare a property management plan.</b> To cover: <ul style="list-style-type: none"> <li>• Fitting together personal aspirations and community benefit.</li> <li>• Weed and pest animal control.</li> <li>• Biodiversity protection and enhancement.</li> <li>• Opportunities to revegetate using indigenous species to extend and/or link remnant vegetation.</li> <li>• Bushfire safety planning.</li> </ul>	<b>Landholders</b>
<b>Protect biodiversity assets.</b> <ul style="list-style-type: none"> <li>• Minimise clearing of native vegetation.</li> <li>• Retain fallen trees, branches and leaf litter as habitat (or relocate to designated habitat areas).</li> <li>• Environmental weed management (learn to recognise and develop skills to control).</li> <li>• Fox and rabbit control (engage contractors and/or develop own skills).</li> <li>• Establish and/or strengthen vegetation corridors to improve links between vegetation remnants through revegetation with indigenous species (with a focus on ABZECCO's 'buffer' areas).</li> <li>• Collaborate with neighbours where assets or threats extend beyond the property.</li> </ul>	<b>Landholders</b>
<b>Prevent domestic animals, especially cats and dogs, from accessing fauna habitat.</b>	<b>Landholders</b>
<b>Monitor and record observations of rare or unusual native plants and animals.</b>	<b>Landholders</b>
<b>Create opportunities for landholders to undertake environmentally-sensitive bushfire safety planning.</b> <ul style="list-style-type: none"> <li>• Help landholders understand fire behavior and fire risk management.</li> <li>• Sensitive management of fuel loads, including Burgan.</li> </ul>	<b>Council, Landcare and CFA</b>
<b>Build landholder capacity to recognise and control pest plants and animals.</b> <ul style="list-style-type: none"> <li>• Provide weed identification information.</li> <li>• Provide events to explain and demonstrate pest plant and animal control methods.</li> <li>• Provide training for qualifications in pest plant and animal control for landholders (e.g. Farm Chemical Users course, ACUP accreditation, 1080 pest animal baiting accreditation).</li> <li>• Help landholders overcome initial obstacles (e.g. develop projects that engage pest plant and animal control contractors to knock down major infestations, community "Help a Neighbour" events).</li> <li>• Provide access to tools and equipment for pest plant and animal control.</li> </ul>	<b>Council and Landcare</b>

## 8.3 Biodiversity (continued)

ACTIONS	RESPONSIBILITY
<b>Promote relevant grants and programs available to landholders.</b> <ul style="list-style-type: none"> <li>• Melbourne Water's Stream Frontage Management program.</li> <li>• Nillumbik's Land Management Incentive program.</li> <li>• Multi-landholder projects developed by Landcare.</li> </ul>	<b>Landcare, Council and Melbourne Water</b>
<b>Establish one or more local bush restoration demonstration properties.</b>	<b>Council, Landcare and key landholders</b>
<b>Create opportunities for landholders to connect to and value their local flora and fauna.</b> <ul style="list-style-type: none"> <li>• Help landholders observe native plants and animals on their property (e.g. access to motion-sensing cameras, plant and animal identification events, access to call-playback equipment).</li> <li>• Develop opportunities for landholders to share observations (e.g. web-based recording of observations, community events to share observations).</li> </ul>	<b>Landcare</b>
<b>Develop, implement and enforce bylaws to control domestic cats and dogs to minimise impact in important fauna habitat and links.</b>	<b>Council</b>
<b>Apply appropriate planning tools to protect important native vegetation (e.g. planning overlays).</b>	<b>Council</b>
<b>Coordinate roadside weed management programs with weed management programs of neighbouring properties (Parks Victoria, Melbourne Water, Landcare, landholders).</b>	<b>Council</b>

## 8.4 Rural living

### Goals

- To encourage adoption of sustainable land management practices.
- To encourage protection and enhancement of biodiversity values.

ACTIONS	RESPONSIBILITY
<b>Carry out strategic planning for the future of 'rural living' in the Shire.</b>	<b>Council</b>
<b>Coordinate and design targeted engagement and capacity-building programs.</b> <ul style="list-style-type: none"> <li>• Establish networks and forums (e.g. NERWG) to ensure program / project coordination between all relevant agencies and community organisations in relation to enhancing biodiversity and sustainable agriculture</li> </ul>	<b>Council, Landcare, Melbourne Water and Parks Victoria</b>



Photo by Nev Ragg

## 9. Potential Demonstration and Priority Projects

While all goals and problems need to be tackled over time, financial and personnel resources will nearly always be limited. Therefore priorities need to be identified. It is also good practice to have a range of projects developed and ready to be activated as opportunities arise. Public funding associated with natural resource management is now typically project-based; for example, the Australian Government's Caring for Our Country funding.

The Christmas Hills CERAP follows a project-based approach, and this requires the following:

- a focus on cooperation between land managers
- communication with all residents in the catchment
- technical and coordination support
- support for community leaders
- establishment of a focused project team
- maximising access to funding.

The scale of projects may be geographically contained within the Christmas Hills catchment, developed across two or more of the Christmas Hills, St Andrews and Strathewen catchments, or Shire-wide.

Final selection of projects and their scale requires decision by the Christmas Hills community in consultation with the Council, Nillumbik Natural Environment Recovery Working Group (NERWG) and, as needed, the other CERAP communities.

The process builds directly on the goals of the CERAP and actions identified above in **Section 7**. Five initial projects emerge under these goals.

- **Improving agricultural and conservation assets.** This project takes an integrated approach to the control of weeds and pest animals to protect both agricultural and biodiversity assets.
- **Agricultural futures.** This project examines the future for small farms in this peri-urban area.
- **Waterways and biolinks.** This project would establish landscape-scale regional biolinks to combine outcomes for both improved water quality and protection and enhancement of biodiversity values.
- **Demonstration sustainable farming project.** This project responds to a series of sustainability issues on a single property that require attention. It 'kicks early goals' for further development and implementation of the Christmas Hills CERAP, by providing incentive for other projects and best practice management of land and biodiversity assets in general.
- **Demonstration bush restoration project.** This project aims to restore native vegetation to a largely cleared property according to a detailed whole-property management plan undertaken by the landholders pursuant to training accredited by the Department of Primary Industries. The approach will be promoted to other landholders.

## 9.1 Improving agricultural and conservation assets

<b>PROJECT TITLE:</b> Improving agricultural and conservation assets through control of weeds and pest animals	
<b>LOCATION</b>	The Christmas Hills catchment.
<b>GOALS</b>	To encourage adoption of sustainable agricultural practices. To protect and enhance native vegetation and fauna populations.
<b>PROJECT DESCRIPTION</b>	<b>Problems and effects</b>
	<b>Weeds</b> Impact of Blackberry and Patterson's Curse as established weeds. Impacts of Serrated Tussock and Chilean Needle Grass as emerging noxious weeds.
	<b>Pest animals</b> Impact of rabbits and foxes.
	<b>Effects of weeds and feral animals</b>
	<b>Weeds</b> <ul style="list-style-type: none"> <li>• Presence and spread of noxious weed species through invasion from neighbouring properties or roadsides.</li> <li>• Impact of poisonous or spiny weeds.</li> <li>• Incursion of new and emerging weeds.</li> <li>• Competition with pasture species and reduced carrying-capacity.</li> <li>• Reduced animal production.</li> <li>• Competition with native vegetation.</li> <li>• Degradation of fauna habitat.</li> <li>• Potential for adverse animal health issues.</li> </ul>
	<b>Pest animals</b> <ul style="list-style-type: none"> <li>• Loss of stock by predation.</li> <li>• Reduced availability of pasture for stock through grazing competition.</li> <li>• Reduced productivity.</li> <li>• Soil erosion due to lack of ground cover and soil disturbance.</li> <li>• Loss of native flora and fauna by predation.</li> </ul>
	<b>Causes/Why this is happening</b>
	<b>Weeds</b> <ul style="list-style-type: none"> <li>• Lack of knowledge, particularly for new property managers.</li> <li>• Lack of time, ability and financial resources or equipment to carry out control works.</li> <li>• Roadsides act as weed harbours.</li> <li>• Lack of knowledge of impact of weeds on native ecosystems.</li> <li>• Invasion of garden escapes from interface with rural living areas.</li> </ul>
	<b>Pest animals</b> <ul style="list-style-type: none"> <li>• Lack of knowledge, particularly for new property managers.</li> <li>• Lack of time, financial resources or equipment to implement control works.</li> <li>• Ease of access to grazing and permanent water for wildlife.</li> <li>• The landscape provides favourable rabbit harbour.</li> <li>• Inadequate control of pest animals.</li> <li>• Increase in pest animals due to increase in fresh growth post-fires.</li> <li>• Domestic cats and dogs are left unrestricted.</li> </ul>

<b>Continued</b>	
<b>PROJECT DESCRIPTION</b>	<b>Actions</b>
	<b>Weeds</b>
	<b>Research and investigation</b> <ul style="list-style-type: none"> <li>• Analysis and prioritisation of the agricultural and biodiversity assets in the Christmas Hills catchment.</li> <li>• On-ground assessment and mapping of the extent of weed infestation by species, and control options.</li> <li>• Research into which weeds pose the biggest threat.</li> <li>• Implementation of appropriate weed monitoring programs.</li> </ul>
	<b>Coordination</b> <ul style="list-style-type: none"> <li>• Coordinated action to eradicate or contain newly emerging weeds, particularly noxious weeds.</li> <li>• Tie in Council works with private landholder works.</li> <li>• Cooperation with the adjacent Shire of Yarra Ranges, Parks Victoria and Melbourne Water.</li> </ul>
	<b>Community awareness</b> <ul style="list-style-type: none"> <li>• Promotion of the Urban Fringe Weed Management Initiative Project.</li> <li>• Information for new landholders on weed identification, control and benefits.</li> <li>• Communication of the Council's strategy for roadsides.</li> <li>• Increased community education and capacity to adequately control weeds on private land.</li> <li>• Increased community understanding of the potential impacts of garden escapees and which garden species may be invasive.</li> </ul>
	<b>Extension and technical support</b> <ul style="list-style-type: none"> <li>• Improvement in knowledge, particularly of new property managers, through improved information access and identification of weeds.</li> <li>• Whole farm planning advice or courses.</li> <li>• Improved training of Council road maintenance crews and contractors.</li> <li>• Improved machinery and machinery hygiene by Council maintenance crews to prevent spread of weeds.</li> </ul>
	<b>Incentives</b> <ul style="list-style-type: none"> <li>• Access to machinery and equipment for weed control.</li> <li>• Access to weed control contractors.</li> <li>• Rebates to landholders through the Nillumbik Shire Council Land Management Incentives Scheme.</li> </ul>
	<b>On-ground works</b> <ul style="list-style-type: none"> <li>• Neighbourhood projects with works and a voluntary opt-in process.</li> <li>• Augment existing roadside weed control program.</li> <li>• Working with local nurseries to discourage them from selling potentially invasive species.</li> </ul>
	<b>Pest animals</b>
	<b>Research and investigation</b> <ul style="list-style-type: none"> <li>• Analysis and prioritisation of the agricultural and biodiversity assets in the Christmas Hills catchment.</li> <li>• On-ground assessment and mapping of the extent of pest animal infestation by species, and control options.</li> <li>• Research into which pest animals pose the biggest threat.</li> <li>• Implementation of appropriate pest monitoring programs.</li> <li>• Assessment and control options for rabbits, foxes and rodents.</li> </ul>
<b>Community awareness</b> <ul style="list-style-type: none"> <li>• Increased community education and capacity of landholders to adequately control pest animals on their land.</li> </ul>	

Continued	
<b>PROJECT DESCRIPTION</b>	<p><b>Pest animals</b></p> <p><b>Extension and technical support</b></p> <ul style="list-style-type: none"> <li>Improved knowledge, particularly of new property managers, through improved information access.</li> <li>Whole farm planning advice and/or courses.</li> <li>Assistance with resources and advice for erosion control and prevention works including for damage arising from rabbit activity.</li> </ul> <p><b>Incentives</b></p> <ul style="list-style-type: none"> <li>Access to machinery and equipment for rabbit and weed control.</li> <li>Access to rabbit control contractors and coordinated rabbit control program.</li> </ul> <p><b>On-ground works</b></p> <ul style="list-style-type: none"> <li>Stricter controls on roaming dogs.</li> <li>By-laws to control domestic cats and dogs.</li> <li>Investigating implementation of conditions in important fauna habitat links that prohibit dogs and cats.</li> </ul>
	<p><b>Key stakeholders list</b> (state and regional agencies / local government / community)</p> <p>Nillumbik Shire Council, Christmas Hills Landcare Group, Melbourne Water, DPI, DSE, Parks Victoria, PPWCMA, CFA.</p>
<b>PROJECT STAKEHOLDERS</b>	<p><b>Project Team</b></p> <p>A core project management team, a responsible lead organisation, and a nominated project manager need to be identified for the project. The project team should include representation from key stakeholders including the Urban Fringe Weed Management initiative.</p>
	<p><b>Objectives</b></p> <p>The objective is to be achieved within a five-year timeframe:</p> <ul style="list-style-type: none"> <li>Pest plants and animals managed to protect agricultural and conservation assets.</li> </ul>
<b>PROJECT DEVELOPMENT</b>	<p><b>Targets</b></p> <p>Targets are to be established. (The targets need to be measurable and capable of being reported on an annual basis).</p>
	<p><b>Methodology</b></p> <p>A methodology needs to be developed following the acceptance of this project as a formal priority project.</p>
	<p>Caring for Our Country 2011-2012 Environmental Stewardship Program (part of the Caring For Our Country initiative). This program gives landholders access to 15-year grants so that they can take long-term action on their land to reduce grazing intensity, control weeds and feral animals and protect key species and ecological communities. Port Phillip and Westernport CMA Community Grants Program Nillumbik Shire Community Rabbit Control Program Nillumbik Shire Landcare Support Grants Nillumbik Shire Community Weed Control Program</p>
<b>MONITORING AND REPORTING</b>	Requirements for monitoring and reporting should be identified following the acceptance of this project as a formal priority project.

## 9.2 Agricultural futures

<b>PROJECT TITLE:</b> Agricultural futures for the Christmas Hills/ Watsons Creek catchment.	
<b>GEOGRAPHIC LOCATION</b>	<p><b>Project Objectives</b></p> <p>To develop sufficient information about the agricultural potential of the high quality agricultural land in Christmas Hills to enable investment in alternative agricultural enterprises. To strengthen protection of high quality agricultural land, and encourage and provide support for increased production. To make the information widely available through the Council's rural land use webpage.</p>
	<p><b>INTRODUCTION</b></p> <p>Christmas Hills has potential for high yields per hectare by small farming businesses where high quality land management units are located and there is access to water. There could be a much greater diversity in agricultural industries, including vegetables, fruit, grapes/wine, floriculture, nurseries and livestock production. The purpose of this project is to scope the agricultural potential of the Watsons Creek catchment to increase agricultural diversification and capitalise on farmers markets, which would attract regional visitors willing to pay premium prices for fresh quality local produce.</p>
<b>PROJECT DESCRIPTION</b>	<p>The Christmas Hills landscape has a geology of very old sedimentary rock. It comprises the three narrow valleys of Watsons, Reedy and Five Mile Creeks surrounded by a landscape of predominantly low hills through the central part of the catchment that merge with long ridges of steep hills and rugged terrain on the northern, eastern and western boundaries. Much of the steep land remains in forest while most of the low hills have been cleared for agriculture.</p> <p>The soils of the low hills are light-textured yellow, brown or red duplex, and grey clay of uniform profile occurs along narrow terraces. They form the Gently Undulating Land Management Unit. Small areas of the lower slopes (up to 5 per cent gradient) have been classified as high quality for agriculture. They have a growing season up to 9 to 10 months, extended to 12 months where irrigation water is available. They have moderate fertility and are suited to orchards and potentially other horticulture on the deeper soils. Annual rainfall is approximately 750 millimetres, and the growing season is approximately 8 to 9 months, extended to 12 months where irrigation water is available.</p>
	<p><b>Problems</b></p> <ul style="list-style-type: none"> <li>Reduced viability of traditional commercial agricultural enterprises.</li> <li>Lack of information about alternative enterprises.</li> <li>Minimal information on soil suitability and available water resources.</li> <li>Many people purchasing rural land without knowledge and skills required for farming.</li> </ul>
	<p><b>Problems</b></p> <ul style="list-style-type: none"> <li>Experienced farmers leaving their industries.</li> <li>High quality agricultural land being used.</li> </ul>
	<p><b>Causes/Why this is happening</b></p> <ul style="list-style-type: none"> <li>Small properties do not have economies of scale.</li> <li>Opportunities to sell land for lifestyle purposes, which commands higher land prices than can be justified for commercial agriculture.</li> </ul>

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<b>PROJECT DESCRIPTION</b>	<p><b>Actions</b></p> <ul style="list-style-type: none"> <li>• Protection of high quality agricultural land from further development.</li> <li>• Identification of source, volume and availability of water resources for agriculture.</li> <li>• More detailed definition of high quality land management units, resulting in high resolution soil mapping for decisions about soil suitability for particular agricultural enterprises.</li> <li>• Research/information gathering about the type and value of suitable agricultural enterprises, including their strengths, weaknesses and opportunities.</li> <li>• Identification and elaboration of market trends and value-adding that could provide opportunities for small growers.</li> <li>• Publicising alternative farming opportunities.</li> <li>• Education and training in production systems, enterprise business practice and farming sustainability.</li> <li>• Support for the development of farmers markets.</li> </ul>
	<p><b>Key stakeholders (state and regional agencies / local government / community)</b></p> <p>Christmas Hills community, Nillumbik Shire Council, Department of Primary Industries, Yarra Valley Agribusiness Forum.</p> <p><b>Project Team</b></p> <p>The project team needs to identify a core project management team, an organisation responsible for leading the project and a nominated project manager.</p>
<b>PROJECT DEVELOPMENT</b>	<p><b>Targets</b></p> <p>The targets need to be measurable and capable of being reported on an annual basis.</p>
	<p><b>Methodology</b></p> <p>A methodology will need to be refined for this project from the following list of opportunities.</p> <ul style="list-style-type: none"> <li>• Council to strengthen protection of high quality agricultural land from further development.</li> <li>• Work with Southern Rural Water to identify source, volume and availability of water resources for agriculture.</li> <li>• Undertaking a high definition survey of high quality land management units in Christmas Hills, resulting in high resolution soil mapping for decisions about soil suitability for particular agricultural enterprises.</li> <li>• Collation of information on the type and value of suitable agricultural enterprises, including their strengths, weaknesses and opportunities and place on Council's rural land use webpage.</li> <li>• Identification and elaboration of market trends and value-adding that could provide opportunities for small growers.</li> <li>• Publicising alternative farming opportunities in Christmas Hills.</li> <li>• Education and training in production systems, enterprise business practice and farming sustainability for residents interested in investing in alternative agricultural enterprises.</li> <li>• Identification of and providing means to support the development or expansion of farmers' markets in the Shire of Nillumbik.</li> </ul>

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<b>POTENTIAL FUNDING AND RESOURCING SOURCES</b>	The Victorian Government's Farmers' Markets Support Program – funding for rural, regional and peri-urban councils to undertake feasibility studies into proposed farmers markets, establish new markets and expand on existing ones
<b>MONITORING AND REPORTING</b>	Requirements for monitoring and reporting should be identified following the acceptance of this project as a formal priority project.

### 9.3 Waterways and biolinks

<b>PROJECT TITLE:</b> The Warrandyte–Kinglake Biolink Project	
<b>LOCATION</b>	Warrandyte-Kinglake Habitat Corridor
<b>GOAL</b>	To secure important biolinks by protecting and enhancing remnant native vegetation and filling in the gaps
	<b>Project objective</b>
	To protect and enhance the Warrandyte-Kinglake Habitat Corridor.
<b>PROJECT DESCRIPTION</b>	<b>Problems</b>
	<ul style="list-style-type: none"> <li>• Loss of scattered trees on agricultural land.</li> <li>• Incremental loss of native vegetation on smaller properties being used for rural living.</li> <li>• Stock access to waterways.</li> <li>• Degradation of waterways and gullies.</li> </ul>
	<b>Effects</b>
	<ul style="list-style-type: none"> <li>• Loss of canopy and understorey vegetation for movement of some fauna species across properties and open paddocks.</li> <li>• Grazing and trampling of vegetation in the riparian zone.</li> <li>• Stream bank erosion, sedimentation of waterways and deterioration of the in-stream biota habitat.</li> </ul>
	<b>Causes/Why this is happening</b>
	<ul style="list-style-type: none"> <li>• Lack of protection of native vegetation.</li> <li>• Lack of understanding of biodiversity values by landholders.</li> <li>• Waterways unfenced giving stock unmanaged access.</li> <li>• Overgrazing of pastures, particularly in times of low rainfall or due to overstocking.</li> <li>• Removal of vegetation cover and exposure of the soil along waterway banks.</li> </ul>

<b>ACTIONS</b>	<p><b>Research and investigation</b></p> <ul style="list-style-type: none"> <li>• GIS mapping of current works funded under Melbourne Water's Streamside Frontage Grants Program and identification of gaps.</li> <li>• Analysis of the recommendations made in the ABZECO mapping. These recommendations should guide habitat link restoration priorities in conjunction with community engagement.</li> </ul> <p><b>Coordination</b></p> <ul style="list-style-type: none"> <li>• Council to ensure that all new landholders are made aware of ecological values within their property and understand their responsibilities to maintain native vegetation.</li> <li>• Managing development applications for the protection and enhancement of agriculture, conservation and waterway health.</li> <li>• Progress on a proposal with Melbourne Water for completion of works along the waterways to fill in the gaps for both improving waterway health and providing a wildlife corridor.</li> <li>• Landcare and Nillumbik Shire Council to work with landholders to improve strategic habitat links on private land.</li> </ul> <p><b>Community awareness</b></p> <ul style="list-style-type: none"> <li>• Implementation of a program to enhance community education about retaining and regenerating native tree species on smaller properties and in paddocks.</li> <li>• Improved knowledge, particularly of new property managers, through improved information access.</li> </ul> <p><b>Extension and technical support</b></p> <ul style="list-style-type: none"> <li>• Nillumbik Shire Council and external expertise can be engaged to provide technical support.</li> </ul> <p><b>Incentives</b></p> <ul style="list-style-type: none"> <li>• Incentives to fence waterways can be provided, sharing costs with Melbourne Water.</li> <li>• Landholders need to be educated about the benefits of protecting and retaining native vegetation. Landholders adequately managing their land may be eligible for the Nillumbik Shire Land Management Incentive Program.</li> </ul> <p><b>On-ground works</b></p> <ul style="list-style-type: none"> <li>• Application of planning tools to reinforce importance of native vegetation (e.g. planning overlays).</li> <li>• Fencing all waterways.</li> <li>• Fencing around remnant vegetation within the project area where possible.</li> <li>• Fencing-off areas that can act as corridors to link core areas of native vegetation within the project area.</li> <li>• Revegetation in areas where natural regeneration is not adequate.</li> </ul>
	<p><b>Project Team</b></p> <p>A Project Team will be responsible for developing a work program for the project actions and costings. The Project Team will comprise a committee from the Christmas Hills community, Council and Melbourne Water.</p> <p><b>Key stakeholders</b></p> <p>Melbourne Water, Parks Victoria, Nillumbik Shire Council, Christmas Hills Landcare Group, DSE, PPWCMA.</p>
<b>PROJECT STAKEHOLDERS AND TEAM</b>	

<b>PROJECT DEVELOPMENT</b>	<p><b>Targets</b></p> <p>Targets need to be established that are measurable and capable of being reported on an annual basis.</p>
	<p><b>Methodology</b></p> <p>Methodology will need to be developed for the chosen action(s) and the project as a whole.</p>
<b>POTENTIAL FUNDING AND RESOURCING SOURCES</b>	<ul style="list-style-type: none"> <li>• Caring for Our Country 2011-2012.</li> <li>• Environmental Stewardship Program. This program gives landholders access to 15-year grants so that they can take long-term action on their land to reduce grazing intensity, control weeds and feral animals and protect key species and ecological communities.</li> <li>• Port Phillip and Westernport Catchment Management Authority Community Grants Program.</li> <li>• Victorian Department of Sustainability and Environment Bush Guardians Grants.</li> <li>• Nillumbik Shire Council Landcare Support Grants.</li> </ul>
<b>MONITORING AND REPORTING</b>	<p>Requirements for monitoring and reporting should be identified following the acceptance of this project as a formal priority project.</p>
<b>EXISTING INFORMATION</b>	<p>The following information sources are identified that will assist with the development and implementation of this project:</p> <ul style="list-style-type: none"> <li>• Environment Protection and Biodiversity Conservation Act 1999</li> <li>• Flora and Fauna Guarantee Act 1988 / Protected Flora list and Action Statements</li> <li>• Australia's Biodiversity Conservation Strategy 2010 – 2030</li> <li>• Victoria's Resources On-line</li> <li>• Recovery Plan for Twelve Threatened Spider-Orchid Caladenia R. Br. Taxa of Victoria and South Australia</li> <li>• Sites of Faunal and Habitat Significance in NE Melbourne 1997 – the NEROC report</li> <li>• Port Phillip and Westernport Regional Catchment Management Strategy 2004-2009</li> <li>• Port Phillip and Westernport Native Vegetation Plan 2006</li> <li>• Nillumbik Biodiversity Strategy and Action Plan</li> <li>• Watsons Creek State of the Environment Summary 1999</li> <li>• Watsons Creek Catchment Management Plan</li> </ul>

## 9.4 Demonstration sustainable farming project

<b>PROJECT TITLE:</b> Whole Farm Management Demonstration - a Christmas Hills example	
<b>GEOGRAPHIC LOCATION</b>	Property of Peter and Jane Russ, Eltham-Yarra Glen Road Grazing land on the Gently and Moderately Undulating Land Management Units in the Christmas Hills catchments
<b>GOAL</b>	To demonstrate a sustainable farming system that works well in Christmas Hills (Land classes 2-3).
<b>PROJECT DESCRIPTION</b>	<p>This project will demonstrate a productive farming system that integrates the following objectives:</p> <ul style="list-style-type: none"> <li>• an integrated land management plan</li> <li>• farming within the capability of the land</li> <li>• cell and rotational grazing systems that favour productive pasture species and allow stock to efficiently use available pasture</li> <li>• pasture management</li> <li>• fodder conservation</li> <li>• farm water supply</li> <li>• farm access and stock movement</li> <li>• stock and enterprise management</li> <li>• managing the remnant native vegetation to enable biodiversity to flourish (e.g. revegetation and protective fencing)</li> <li>• waterway management</li> <li>• management of agricultural and environmental weeds</li> <li>• pest animal control</li> <li>• soil conservation measures</li> <li>• bushfire safety plan.</li> </ul>
<b>METHODOLOGY</b>	<p>The project will involve the following activities:</p> <ul style="list-style-type: none"> <li>• provision of professional services to prepare interpretive information and fact sheets about the farming system and development of a property tour and information charts suited to field days with the assistance of Peter and Jane Russ</li> <li>• up to two field days on the property per year for three years with the local community to enable informed discussion about sustainable farming in the Christmas Hills catchment</li> <li>• funding for any on-ground works on the property deemed useful to improve field day messages by the project team</li> <li>• funding for any costs and time incurred by the landowners.</li> </ul>
<b>PROJECT TEAM</b>	A project team should comprise Peter and Jane Russ, farming members of the Christmas Hills community, an extension agronomist (DPI) and a NERWG representative.

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<b>FUNDING</b>	<p>Funding will be required over the three-year period of the demonstration to cover:</p> <ul style="list-style-type: none"> <li>• set up costs potentially comprising on-ground works to enhance the demonstration – \$10,000 in year one</li> <li>• field extension activities and publicity. (These activities would rely on volunteers to organise, but there would be costs incurred for interpretive material, signage, publicity and documentation/publishing, as well as landowner time and expenses) – \$3000 per year.</li> </ul>
<b>MONITORING AND REPORTING</b>	<p>This demonstration project should ideally extend over at least three years to demonstrate the benefits of best practice and maintain interest in the community.</p> <p>Over a three-year period there should be:</p> <ul style="list-style-type: none"> <li>• records kept of participation at field days</li> <li>• measures of community interest and attitudes to the demonstrated farming system</li> <li>• improved capacity by Christmas Hills Landcare to recommend and document sustainable land management in the Christmas Hills catchment.</li> </ul>

## 9.5 Demonstration bush block project

<b>PROJECT TITLE:</b> From steers to bush: Bringing back native vegetation	
<b>PROPOSED PROJECT SITE</b>	The proposed project is at Tanja and Nick Bird's property at 29 Sugarloaf Track, Christmas Hills in the south of the Christmas Hills Landcare area, east of Sugarloaf Reservoir. The site has a house in the south of a north-facing paddock used for horse grazing on pasture grasses and native Weeping grass ( <i>Microlaena stipoides</i> ). A tributary gully to Sugarloaf Creek with a small dam in the centre of the property runs west to east. The gully supports a mix of native and introduced grasses and semi-aquatic plants and some revegetation of native species. The south-facing paddock is dominated by pasture grasses. Scattered, mature eucalypt trees occur across the property, with a strip of trees along the northern border. The grazing of horses for private use has replaced past cattle grazing.
<b>ECOLOGICAL ASSETS</b>	<ul style="list-style-type: none"> <li>• The property is adjacent to larger areas of remnant native vegetation (mapped as medium and regional habitat significance), which forms part of a NEROC habitat link (<b>Figure 4</b>) and is within the Warrandyte–Kingslake Habitat Corridor.</li> <li>• Remnant native vegetation on the property is highly modified in places, with affinities to a mix of ecological vegetation classes. The strip of eucalypts along the northern boundary has affinities to Herb-rich Foothill Forest (EVC 23). Remnant vegetation in the gully has affinities to Creekline Herb-rich Woodland (EVC 164).</li> <li>• The following state-significant fauna species have been recorded in the local area: Brush-tailed Phascogale (<i>Phascogale tapoatafa</i>), Southern Toadlet (<i>Pseudophryne semimarmorata</i>), Chestnut-rumped Heathwren (<i>Calamanthus pyrrhopygius</i>) and Powerful Owl (<i>Ninox strenua</i>).</li> <li>• The site is identified as 'Buffer' in the ABZECO ecological mapping. This indicates that restoration works are preferred in this zone when taking a landscape-scale approach.</li> </ul>
<b>PROJECT GOALS</b>	<p>To protect, enhance and restore native vegetation and fauna habitat through:</p> <ul style="list-style-type: none"> <li>• Management Plan and training completed by the landholders</li> <li>• gully adequately fenced</li> <li>• revegetation of south-facing paddock</li> <li>• installation of nest boxes</li> <li>• monitoring for the existence of the significant frog, the Southern Toadlet, and other frogs.</li> </ul>

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<p><b>PROJECT DESCRIPTION</b></p>	<p>The landholders are to prepare a whole property management plan. Activities to be included in the plan include conservation restoration works through fencing off the dam and gully and planting out the gully and south-facing paddock. Nesting boxes are proposed to assist with fauna habitat, and monitoring of the dam for frog species, in particular the Southern Toadlet, is to be implemented.</p>
<p><b>CERAP INFORMATION</b></p>	<p><b>Problems</b></p> <p>The property currently has a number of conservation issues:</p> <ul style="list-style-type: none"> <li>• weed control is occurring, although current infestations of Blackberry (<i>Rubus fruticosus</i> spp. agg.) remain an issue, as do occasional incursions of Thistles (<i>Cirsium</i> spp.) and Briar Rose (<i>Rosa rubignosa</i>)</li> <li>• erosion continues in the head of the gully</li> <li>• there is a lack of intact native vegetation and fauna habitat</li> <li>• feral animals include rabbits, wild deer and occasional foxes.</li> </ul> <p><b>Causes/Why this is happening</b></p> <p>The property was historically cleared for grazing, and weeds were present when the current owners purchased the property. While weed control occurs, ongoing follow-up and maintenance work is always required. The property's steep terrain makes access for weed control difficult at times.</p> <p>The current landholders want to continue horse grazing at a reduced rate in the southern paddock, but they wish to restore the gully and northern paddock. The gully has been previously fenced, with some planting of indigenous plants. However, the fence has collapsed, and the revegetation has suffered from browsing by rabbits and kangaroos. Some revegetation has been successful at the eastern end of the erosion gully.</p> <p>Erosion is occurring in two locations in the west of the property due to a lack of established vegetation.</p> <p>While some native trees exist, there is a lack of suitable habitat hollows. Feral animals are a problem across the landscape, and although there are some effective control programs operating, control must be ongoing.</p>
<p><b>METHODOLOGY</b></p>	<p>A detailed whole property management plan is to be created by the landholders through a whole property management plan course that could be subsidised by the Landcare Network or Nillumbik Shire Council and offered to the local community.</p> <p>The training includes a biodiversity component, and it is expected that the following actions will be included in the Plan:</p> <p><b>Fencing</b></p> <p>Fencing to exclude horses will need to be erected to the south of the gully according to DSE's Revegetation Planting Standards (DSE 2006).</p> <p>Consideration should also be given to the efficacy of fencing the entire area to be revegetated to exclude rabbits, deer and kangaroos to allow sufficient time for the young plants to establish with minimal grazing pressure.</p> <p><b>Revegetation</b></p> <p>Vegetation modelled on the property for the period prior to European settlement has been used to guide species selection for revegetation at the property. It includes the following:</p> <ul style="list-style-type: none"> <li>• EVCs with bioregional conservation status of least concern: Herb-rich Foothill Forest (EVC 23) and Grassy Dry Forest (EVC 22)</li> <li>• EVCs with bioregional conservation status of vulnerable: Valley Grassy Forest (EVC 47), Creeklime Herb-rich Woodland (EVC 164).</li> </ul> <p>Revegetation should occur to DSE Revegetation Planting Standards (DSE 2006) and the EVC benchmarks (typical species composition) for each EVC. Planting lists and species numbers are detailed in A1, A2, and A3 below, and in Figure 1. (Understorey species are not yet included for Herb-rich Foothill Forest and Creeklime Herb-rich Woodland, as mortality is often high for these species when used for revegetation.)</p>

Continued

<p><b>METHODOLOGY</b></p>	<p><u>Revegetation protection from rabbit and kangaroo browsing</u></p> <p>As browsing of plantings by rabbits and kangaroos has caused previous problems, planted seedlings will be treated with 'Sen-tree Browsing Deterrent'. This three-part product is applied to certain seedling trees to help reduce browsing damage. Whole egg solids and an acrylic polymer adhesive are mixed together with water and sprayed onto seedling foliage. Before the mixture dries, a silicon-carbide grit is sprinkled onto the foliage. Browsing behaviour is reduced when animals associate the odour with the unpalatable texture of the grit on the treated foliage. The product needs to be reapplied to new growth (approximately four times each year) until the tree is resilient enough to withstand browsing.</p> <p>It is proposed to trial this browsing deterrent method in the first year with 500 plants. If plant mortality from browsing is reduced so that at least 70 per cent of plants survive (i.e. 350 plants), then the rest of the plants should be planted. If fewer than 70% per cent of plants survive, other protection methods (e.g. use of robust guards, or companion planting with non-preferred species) may be trialled.</p> <p><b>Erosion</b></p> <p>It is proposed to rip, collapse and smooth out erosion tunnels at the two erosion sites in the west of the property using a tractor with rippers. This will be followed by the sowing of sterile Rye Grass, and revegetation with indigenous trees and shrubs to dry and bind the soil. Straw bales will be staked into place to divert surface water around the treated areas.</p> <p><b>Nest boxes</b></p> <p>A high proportion of Australian birds and mammals are dependent on tree hollows for nesting and shelter. However, natural tree hollows suitable for nesting by native animals can take over 120 years to form. To compensate for the absence of such hollows, five nesting boxes should be installed in the property. These can also be used for monitoring fauna use of the property over time.</p> <p><b>Frog surveys</b></p> <p>Surveying for rare and threatened fauna by community groups is an excellent way to increase community capacity and enthusiasm for conserving and protecting threatened fauna habitat. Surveys for the presence of adult frogs should occur during April and May, and tadpole surveys during July. Frog calls should be recorded and any recordings sent to Melbourne Water.</p>																		
<p><b>ACTIONS</b></p>	<table border="1"> <thead> <tr> <th data-bbox="1843 1171 2665 1220">Outputs</th> <th data-bbox="2665 1171 2902 1220">Estimated Cost</th> </tr> </thead> <tbody> <tr> <td data-bbox="1843 1220 2665 1318"> <ul style="list-style-type: none"> <li>• Landholder completion of whole property planning course, eg Victorian DPI training course RTE5516A: Develop a whole farm plan.</li> </ul> </td> <td data-bbox="2665 1220 2902 1318" style="text-align: right;"><b>\$311</b></td> </tr> <tr> <td data-bbox="1843 1318 2665 1396"> <ul style="list-style-type: none"> <li>• Fence 500 metres along the southern side of the gully (Use of local contractor) (\$15 per metre).</li> </ul> </td> <td data-bbox="2665 1318 2902 1396" style="text-align: right;"><b>\$7,500</b></td> </tr> <tr> <td data-bbox="1843 1396 2665 1556"> <ul style="list-style-type: none"> <li>• Revegetate 1.5 hectares of overstorey using locally indigenous species from the Herb-rich Foothill Forest (EVC 23) (1969 plants at \$1.30 per plant, plus \$0.50 per plant to spot spray. Spraying to be by contractors, planting to be by landholders or contractors.)</li> </ul> </td> <td data-bbox="2665 1396 2902 1556" style="text-align: right;"><b>3,544 - \$5500</b></td> </tr> <tr> <td data-bbox="1843 1556 2665 1686"> <ul style="list-style-type: none"> <li>• Revegetate 0.8 hectares of overstorey of Creeklime Herb-rich Woodland (EVC 164) (550 plants at \$1.30 per plant, plus \$0.50 per plant to spot spray. Spraying to be by contractors, planting to be by landholders or contractors).</li> </ul> </td> <td data-bbox="2665 1556 2902 1686" style="text-align: right;"><b>\$990 - \$1500</b></td> </tr> <tr> <td data-bbox="1843 1686 2665 1738"> <ul style="list-style-type: none"> <li>• Use of Sen-tree browsing deterrent.</li> </ul> </td> <td data-bbox="2665 1686 2902 1738" style="text-align: right;"><b>\$305</b></td> </tr> <tr> <td data-bbox="1843 1738 2665 1791"> <ul style="list-style-type: none"> <li>• Install five nest boxes at \$90 each (Installed by landholder).</li> </ul> </td> <td data-bbox="2665 1738 2902 1791" style="text-align: right;"><b>\$450</b></td> </tr> <tr> <td data-bbox="1843 1791 2665 1927"> <ul style="list-style-type: none"> <li>• Conduct of workshop (Cost of consultant \$300) to teach local community to identify Southern Toadlet and other frogs (Landholders to survey for Southern Toadlet and other frogs in dam).</li> </ul> </td> <td data-bbox="2665 1791 2902 1927" style="text-align: right;"><b>\$300</b></td> </tr> <tr> <td data-bbox="1843 1927 2665 2001"> <p><b>TOTAL COST</b> (excluding subsequent understorey plantings to be added in the longer term).</p> </td> <td data-bbox="2665 1927 2902 2001" style="text-align: right;"><b>\$13,400</b></td> </tr> </tbody> </table>	Outputs	Estimated Cost	<ul style="list-style-type: none"> <li>• Landholder completion of whole property planning course, eg Victorian DPI training course RTE5516A: Develop a whole farm plan.</li> </ul>	<b>\$311</b>	<ul style="list-style-type: none"> <li>• Fence 500 metres along the southern side of the gully (Use of local contractor) (\$15 per metre).</li> </ul>	<b>\$7,500</b>	<ul style="list-style-type: none"> <li>• Revegetate 1.5 hectares of overstorey using locally indigenous species from the Herb-rich Foothill Forest (EVC 23) (1969 plants at \$1.30 per plant, plus \$0.50 per plant to spot spray. Spraying to be by contractors, planting to be by landholders or contractors.)</li> </ul>	<b>3,544 - \$5500</b>	<ul style="list-style-type: none"> <li>• Revegetate 0.8 hectares of overstorey of Creeklime Herb-rich Woodland (EVC 164) (550 plants at \$1.30 per plant, plus \$0.50 per plant to spot spray. Spraying to be by contractors, planting to be by landholders or contractors).</li> </ul>	<b>\$990 - \$1500</b>	<ul style="list-style-type: none"> <li>• Use of Sen-tree browsing deterrent.</li> </ul>	<b>\$305</b>	<ul style="list-style-type: none"> <li>• Install five nest boxes at \$90 each (Installed by landholder).</li> </ul>	<b>\$450</b>	<ul style="list-style-type: none"> <li>• Conduct of workshop (Cost of consultant \$300) to teach local community to identify Southern Toadlet and other frogs (Landholders to survey for Southern Toadlet and other frogs in dam).</li> </ul>	<b>\$300</b>	<p><b>TOTAL COST</b> (excluding subsequent understorey plantings to be added in the longer term).</p>	<b>\$13,400</b>
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**MONITORING AND REPORTING**

Monitoring and reporting would measure the completion of the targets over a ten-year period. For example:

*Year 1 measures of success*

- Whole property plan training completed, fencing implemented, nest boxes installed, revegetation of 500 plants implemented.

*Year 2 measures of success*

- At least 350 plants surviving. If so, continue with revegetation using Sen-tree Browsing Deterrent. If browsing not adequately reduced, trial other methods of browsing deterrent.

*Year 3 measures of success*

- Assess revegetation survival, and implement follow-up planting as required.

*Year 5 measures of success*

- Assess revegetation survival, and implement follow-up planting as required.
- Use of the site by fauna species would be assessed through regular monitoring of the use of installed nesting boxes, and use of the dam by frog species.

**PROJECT TEAM**

The project team will be responsible for developing the work program for the actions. The team should include the landholders, Christmas Hills Landcare Group, Melbourne Water and Nillumbik Shire Council.

**POTENTIAL FUNDING PROGRAMS**

To best place this demonstration project for state or national funding, it should be incorporated into an integrated community plan for the local catchment. Victoria's Communities for Nature grants may be a suitable funding source, if the project takes a landscape-scale approach via the Develop a whole farm plan training being available to the Christmas Hills community (and adjoining Landcare groups), and the local area focus on conserving the significant Southern Toadlet. Such a project could potentially pull together partners from the Landcare groups, Parks Victoria, DSE, Melbourne Water and the Port Phillip and Westernport Catchment Management Authority.

**REFERENCES**

DSE (2006) Native Vegetation Revegetation planting standards – Guidelines for establishing native vegetation for net gain accounting. Victorian Government, Department of Sustainability and Environment, East Melbourne.



Photo by Nev Ragg



Photo by Nev Ragg

# 10. Monitoring and Reporting

This CERAP is a living document, intended to provide ongoing use to the Christmas Hills community in guiding sustainable catchment management. In time, as the Christmas Hills CERAP is implemented, the condition of the catchment will change. Some actions will no longer be necessary or will need to be revised and new actions will become useful and important. Research into the ecology of the Christmas Hills area and innovation in catchment management, will play a role in this.

Accordingly, the CERAP should be reviewed every five years in order to revise its vision and goals, assess and revise its current list of actions and develop new actions. Community input will be vital to this process.

The following key principles will be taken into account when conducting the review of the Christmas Hills CERAP:

- be relevant and useful for all partners and stakeholders
- be simple, cost-effective, affordable and practical by:
  - avoiding duplication of effort
  - using data for multiple purposes
  - ensuring that users can obtain the data
  - ensuring that users can easily find out whether suitable data already exists
- recognise that catchment management outcomes occur over a range of time-scales (often outside funding periods)
- recognise that most targets set within the first five years will represent only the earliest stages of progress towards remedying key catchment issues
- allow meaningful interpretation of data over time
- specify assumptions within strategies and decision-making processes.



Photo by Nev Ragg



Photo by Nev Ragg

# Appendices

## Appendix 1

Significant Flora Records within the Christmas Hills catchment

Common Name	Scientific Name	EPBC Listing	VROT Listing	FFG Listing	Last Record	Number of Records	Habitat
<b>NATIONALLY SIGNIFICANT</b>							
Little Pink Spider-orchid	<i>Caladenia rosella</i>	Endangered	Endangered	Listed	2002	4	Grassy Dry Forest; Heathy Dry Forest on sandy clay loams derived from sandstone and mudstone.
<b>STATE SIGNIFICANT</b>							
Wine-lipped Spider-orchid	<i>Caladenia oenochila</i>	-	Vulnerable	-	2001	13	Damp and valley sclerophyll forests.
Southern Varnish Wattle	<i>Acacia verniciflua</i> (southern variant)	-	Poorly Known	-	2002	6	Dry eucalypt forests and woodlands, often along rocky streams or on skeletal ridges.
Pale Swamp Everlasting	<i>Helichrysum aff. rutidolepis</i> (Lowland Swamps)	-	Vulnerable	-	2001	4	Swampy Areas.
Green-top Sedge	<i>Carex chlorantha</i>	-	Poorly Known	-	2002	2	Woodlands and river flats prone to flooding.
Large-leaf Cinnamon Wattle	<i>Acacia leprosa</i> (large phyllode variant)	-	Rare	-	2006	2	Woodlands.
Round-leaf Pomaderris	<i>Pomaderris vacciniifolia</i>	-	Vulnerable	-	2006	2	Moist loamy soils in moist forest and scrubs.
Sharp Greenhood	<i>Pterostylis X ingens</i>	-	Rare	-	2001	2	Unknown.
Late Beard-orchid	<i>Calochilus therophilus</i>	-	Poorly Known	-	2002	2	Unknown.
Slender Ruddyhood	<i>Pterostylis aciculiformis</i>	-	Poorly Known	-	1997	2	Low eucalypt forest, often on rocky hills and ridges.
Slender Tick-trefoil	<i>Desmodium varians</i>	-	Poorly Known	-	1987	2	Plains grassland and crevices in escarpments.

Common Name	Scientific Name	EPBC Listing	VROT Listing	FFG Listing	Last Record	Number of Records	Habitat
<b>STATE SIGNIFICANT</b>							
Austral Crane's-bill	<i>Geranium solanderi var. solanderi s.s.</i>	-	Vulnerable	-	2001	1	Occurs on a range of soil types and situations.
Crested Sun-orchid	<i>Thelymitra X irregularis</i>	-	Rare	-	1999	1	Favours heathland and heathy forest.
Green Scentbark	<i>Eucalyptus fulgens</i>	-	Rare	-	2002	1	Moist loam soils of valleys in the foothills.
Pale-flower Crane's-bill	<i>Geranium sp. 3</i>	-	Rare	-	2002	1	Well drained soils tolerating dryness once established.
Velvet Apple-berry	<i>Billardiera scandens s.s.</i>	-	Rare	-	2002	1	Unknown.
<b>Total</b>						<b>46</b>	



Photo by Nev Ragg

## Appendix 1

### Significant Fauna Records within the Christmas Hills catchment

Common Name	Scientific Name	EPBC Listing	VROT Listing	FFG Listing	Last Record	Nr of Records	Habitat
<b>NATIONALLY SIGNIFICANT</b>							
Growling Grass Frog	<i>Litoria raniformis</i>	Vulnerable	Endangered	Listed	1988	1	In water or very wet areas in woodlands, shrublands, and open and disturbed areas.
Common Bent-wing Bat	<i>Miniopterus schreibersii</i>	Critically Endangered	Endangered	Listed	1998	17	Habitat preference is associated with the availability of foraging areas and proximity to suitable roosting caves.
<b>STATE SIGNIFICANT</b>							
Powerful Owl	<i>Ninox strenua</i>	-	Vulnerable	Listed	2004	31	Drier forest types which have many live hollow bearing eucalypt trees.
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	-	Vulnerable	Listed	2004	21	Open dry foothill forest with little ground cover, typically associated with box, ironbark and stringybark eucalyptus.
Common Dunnart	<i>Sminthopsis murina</i>	-	Vulnerable	-	2006	6	Open forests, woodlands and heathland areas.
Spotted Quail-thrush	<i>Cinclosoma punctatum</i>	-	Near Threatened	-	2004	5	Sclerophyll woodlands dominated by Eucalyptus trees and have sparse understorey vegetation.
Barking Owl	<i>Ninox connivens</i>	-	Endangered	Listed	1991	3	Open woodlands and forest edge habitats where forests adjoin farmlands.
Southern Toadlet	<i>Pseudophryne semimarmorata</i>	-	Vulnerable	-	1988	3	Lower elevations in damp areas usually under leaf litter, logs or rocks.
Azure Kingfisher	<i>Alcedo azurea</i>	-	Near Threatened	-	1992	1	Creeks and rivers.
Brown Toadlet	<i>Pseudophryne bibronii</i>	-	Endangered	Listed	1992	1	A wide variety of habitats, including dry forests, woodland, shrubland, grassland, coastal swamps, heathland, and sub-alpine areas.
Eastern Horseshoe Bat	<i>Rhinolophus megaphyllus</i>	-	Vulnerable	Listed	1988	1	Habitat preference is associated with the availability of foraging areas and proximity to suitable roosting caves.
Lace Goanna	<i>Varanus varius</i>	-	Vulnerable	-	1988	1	Rainforests, wet sclerophyll forests, woodland and coastal scrub.

Common Name	Scientific Name	EPBC Listing	VROT Listing	FFG Listing	Last Record	Number of Records	Habitat
<b>STATE SIGNIFICANT</b>							
Masked Owl	<i>Tyto novaehollandiae</i>	-	Endangered	Listed	1992	1	A range of habitats from wet sclerophyll forest, dry sclerophyll forest, non-eucalypt dominated forest, scrub and cleared land with remnant old growth trees.
Speckled Warbler	<i>Pyrrholaemus sagittatus</i>	-	Vulnerable	Listed	1989	1	Dry sclerophyll forests and woodlands.
<b>Total</b>						<b>93</b>	

## Appendix 2

### Most likely Common Dunnart locations

In support of the Christmas Hills Landcare Group's community fauna monitoring project, a student at Deakin University undertook a GIS project to help predict suitable locations for placing artificial habitat for a local threatened species, the Common Dunnart.

A number of sites where Common Dunnarts have been recorded in the past were assessed for altitude, slope, aspect, geology and EVC. The most common site characteristics where Common Dunnarts had occurred were determined from this analysis, and GIS was used to locate other areas with these site characteristics. These areas were assumed to be appropriate habitat for dunnarts and therefore good locations to search for further dunnart populations. The green polygons in **Figure 14** identify suitable Common Dunnart habitat.



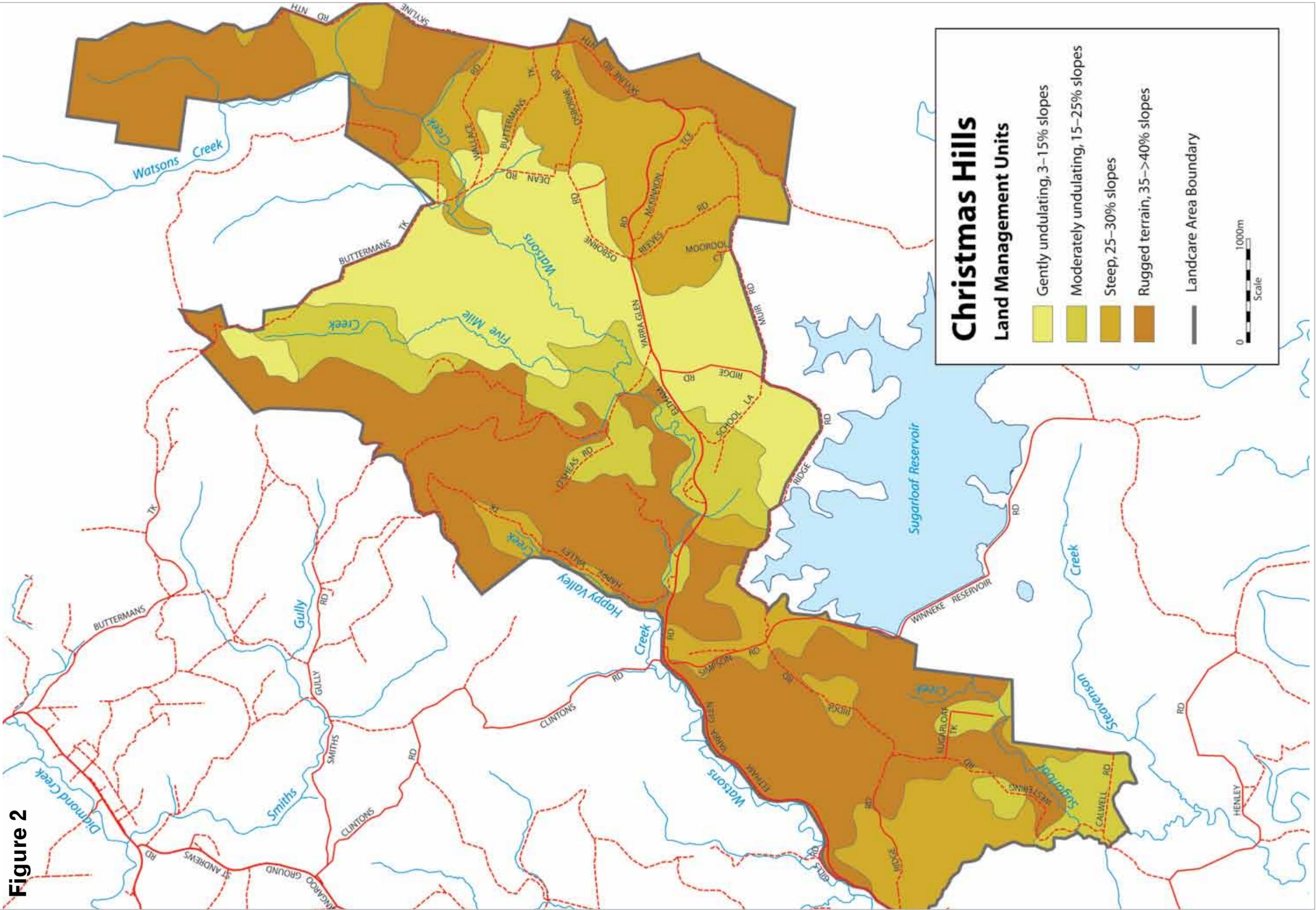


Figure 2

Figure 3

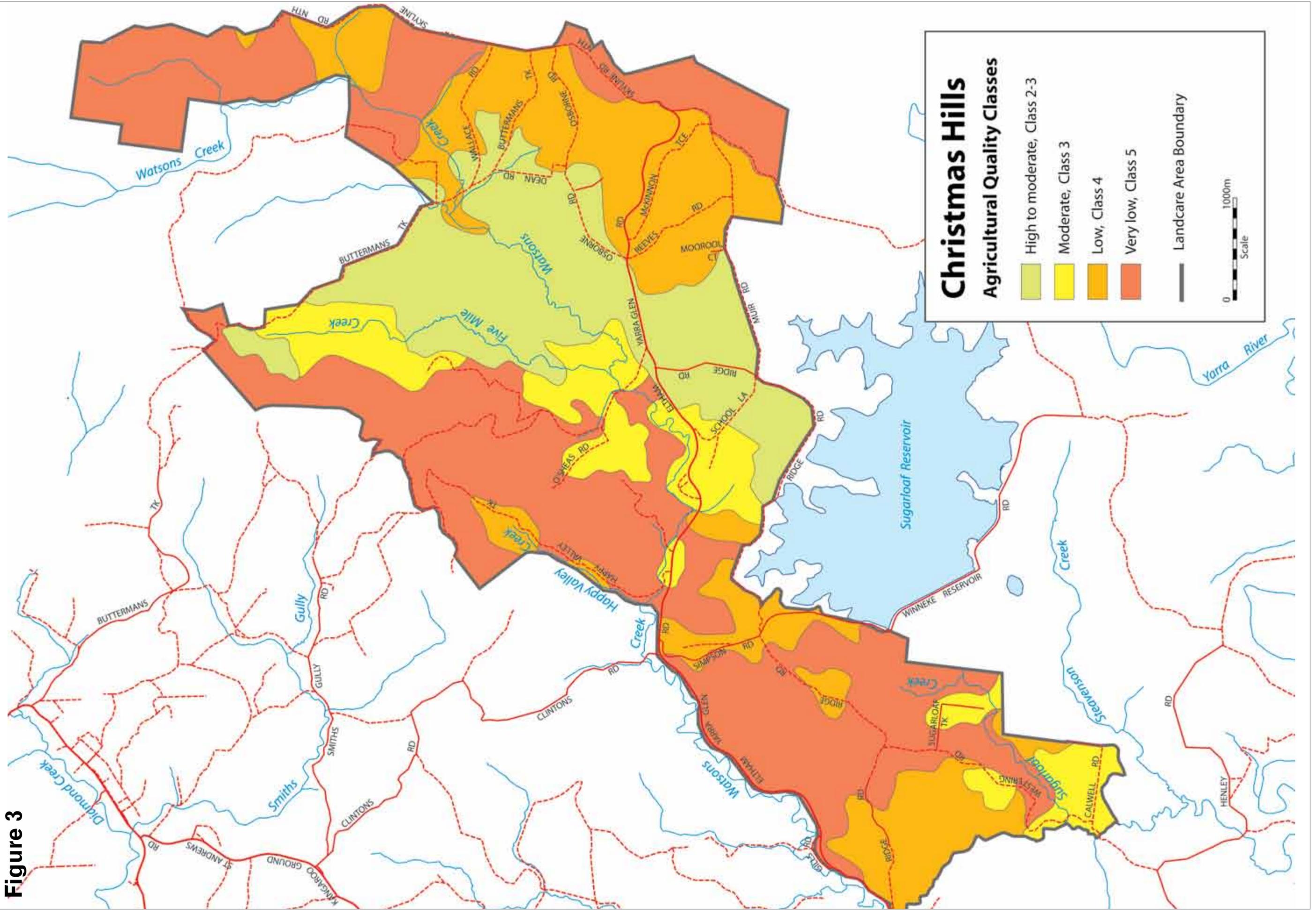


Figure 4

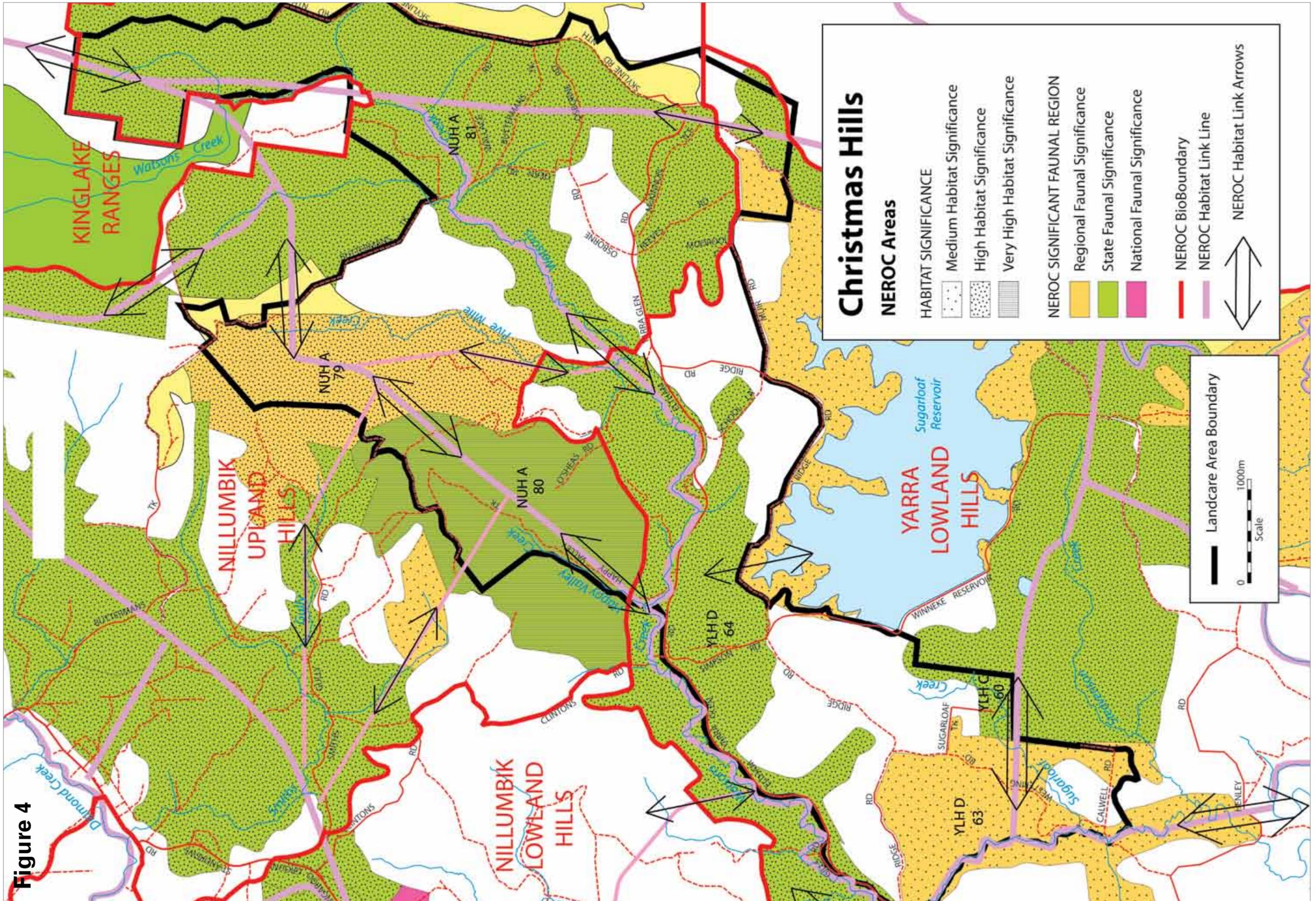


Figure 5

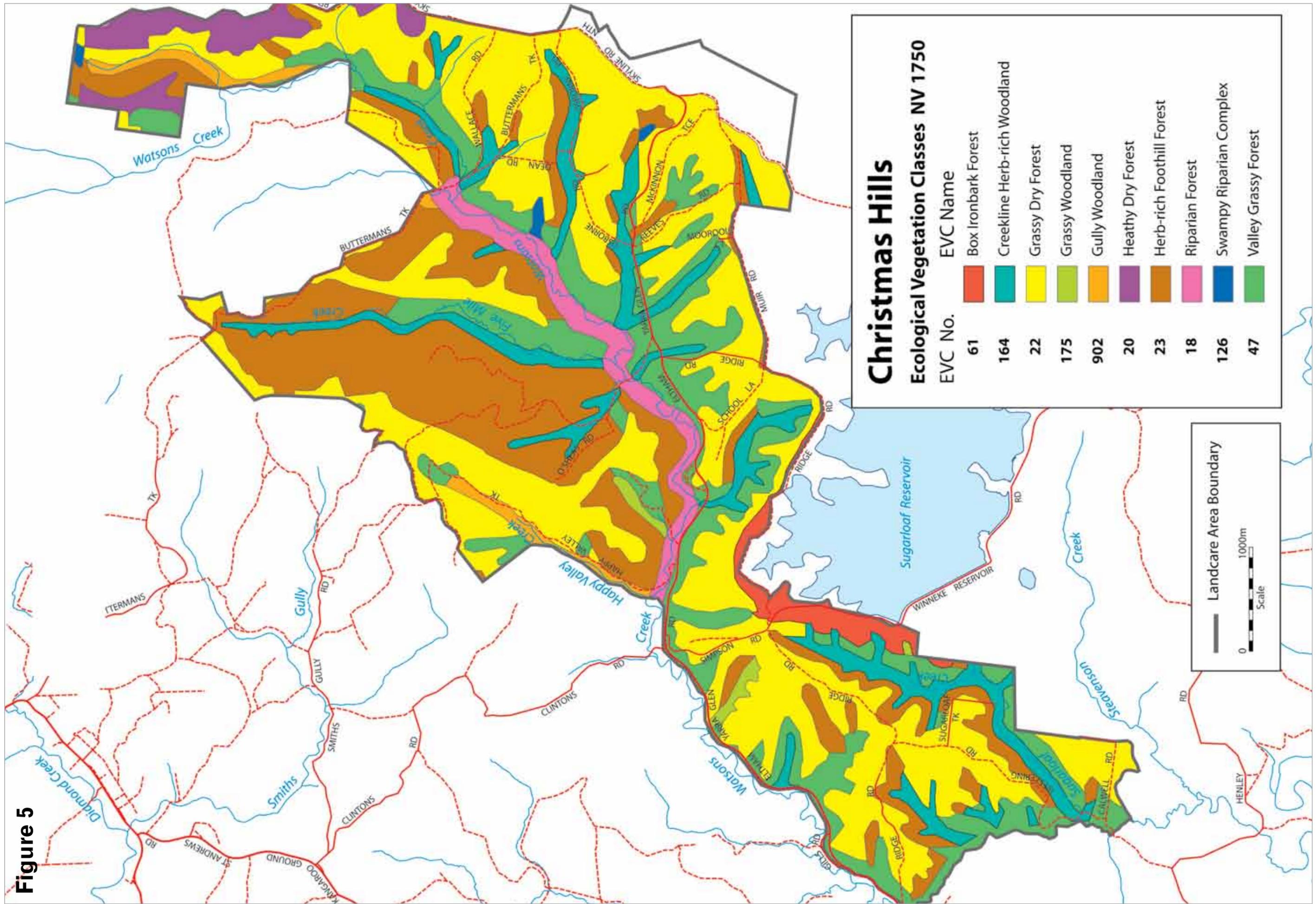


Figure 6

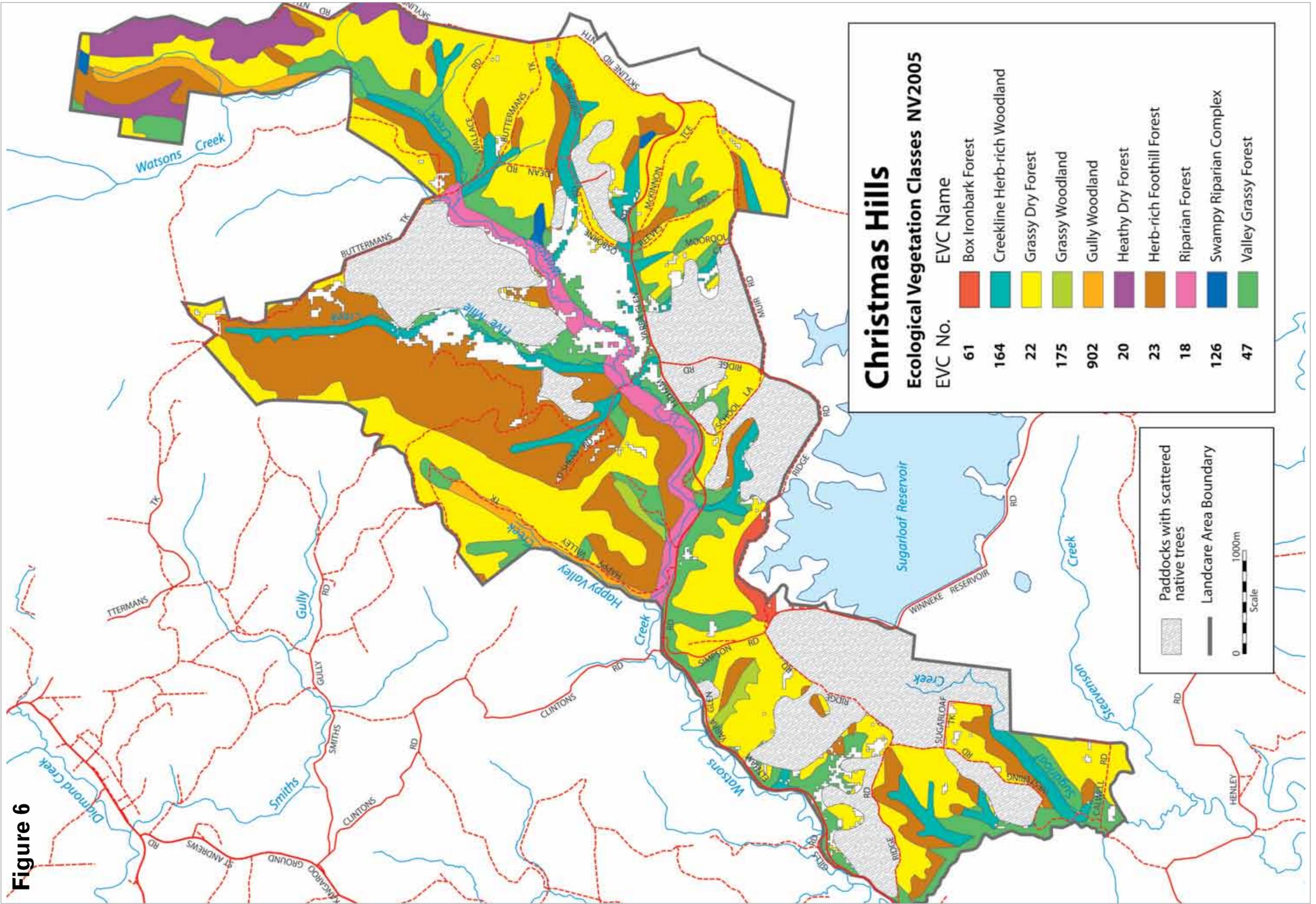
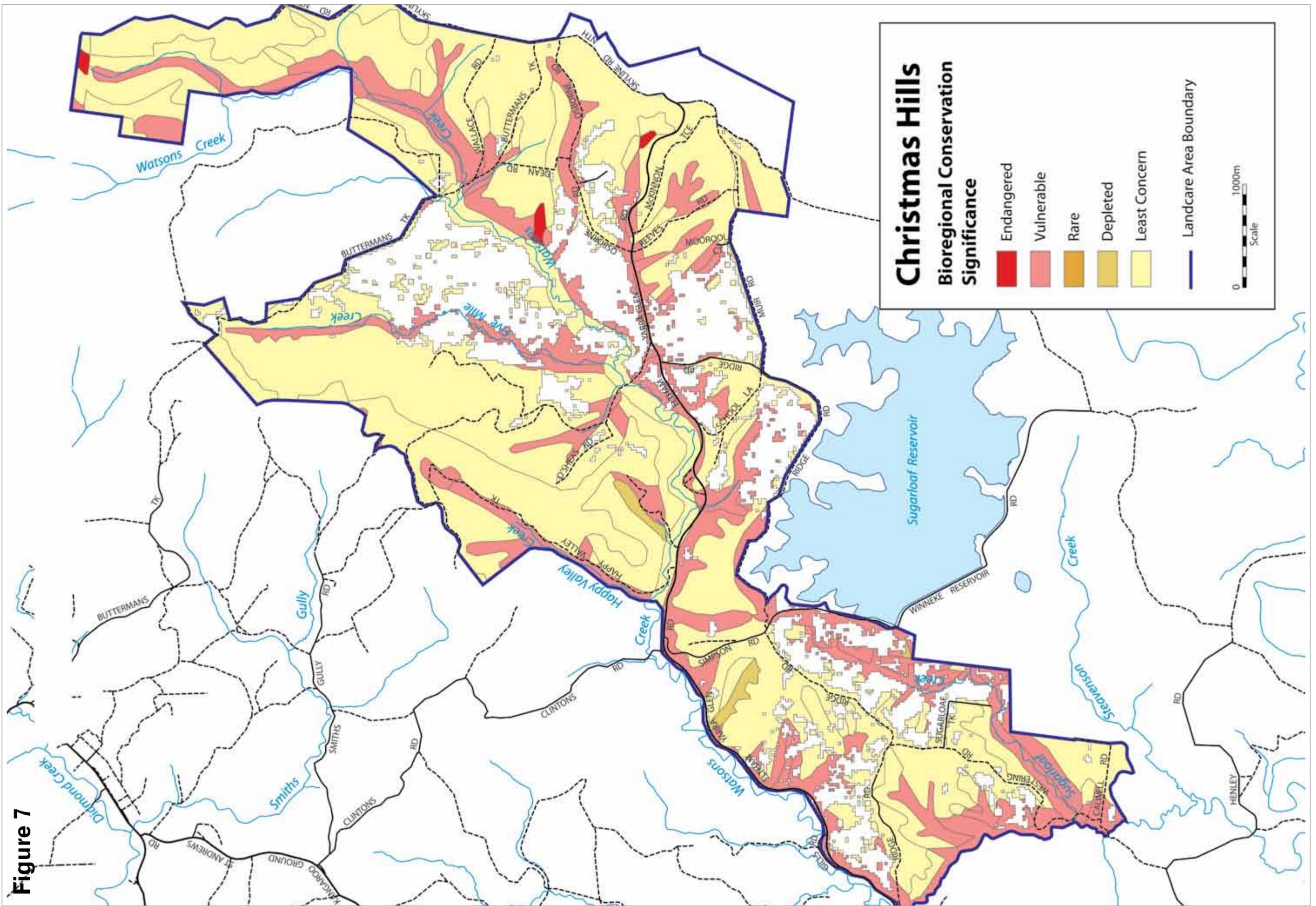
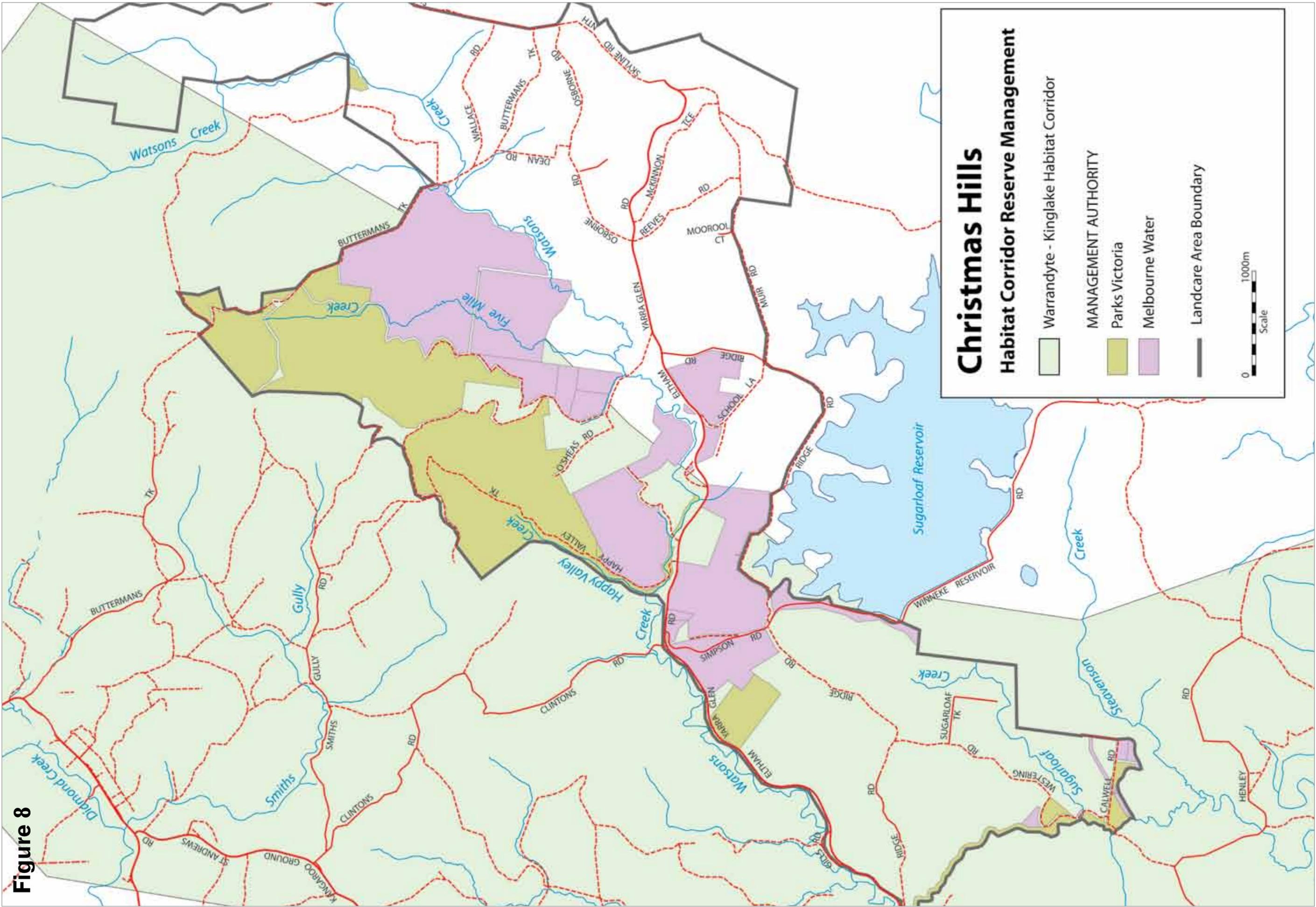


Figure 7





**Figure 8**

Figure 9

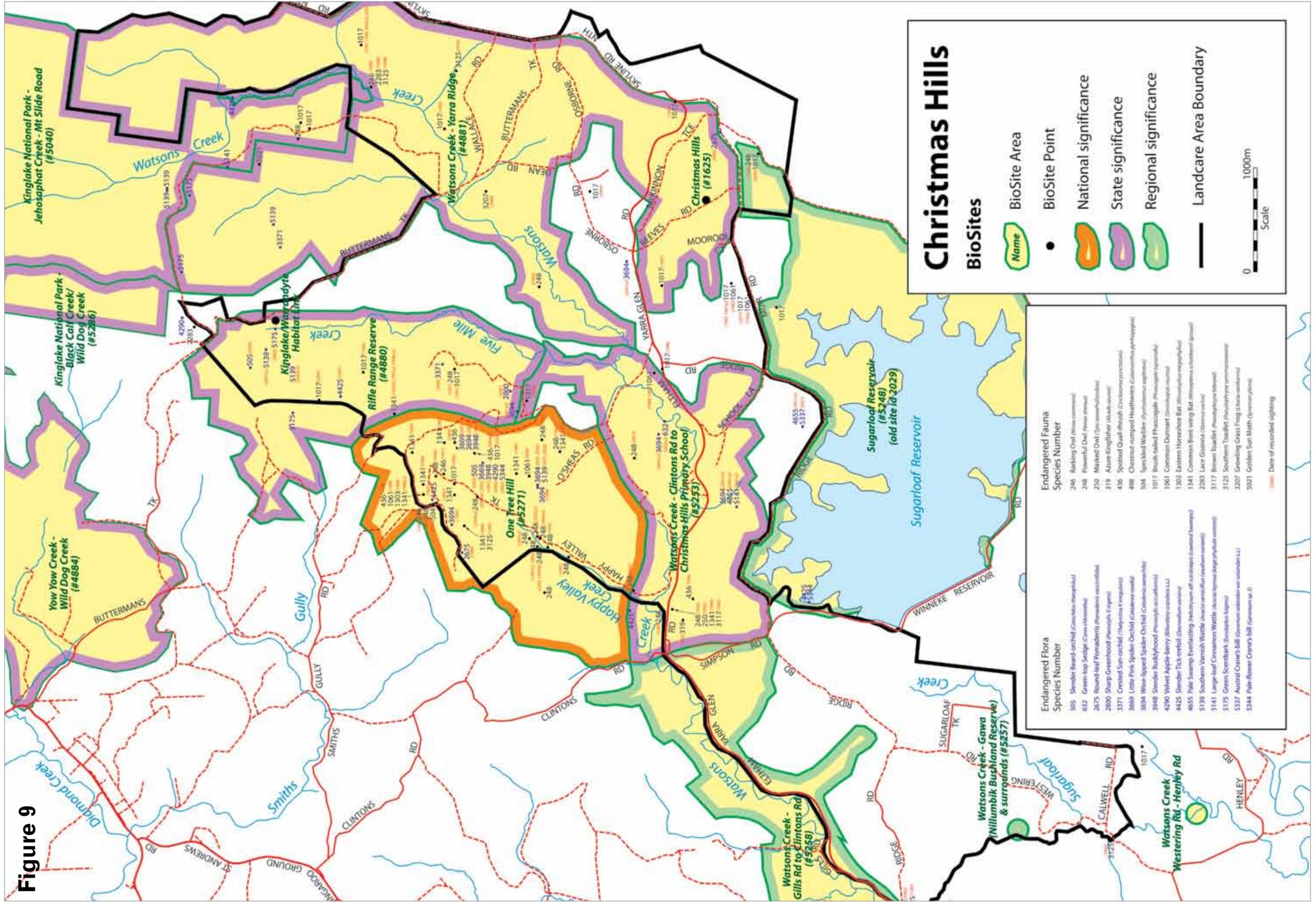


Figure 10

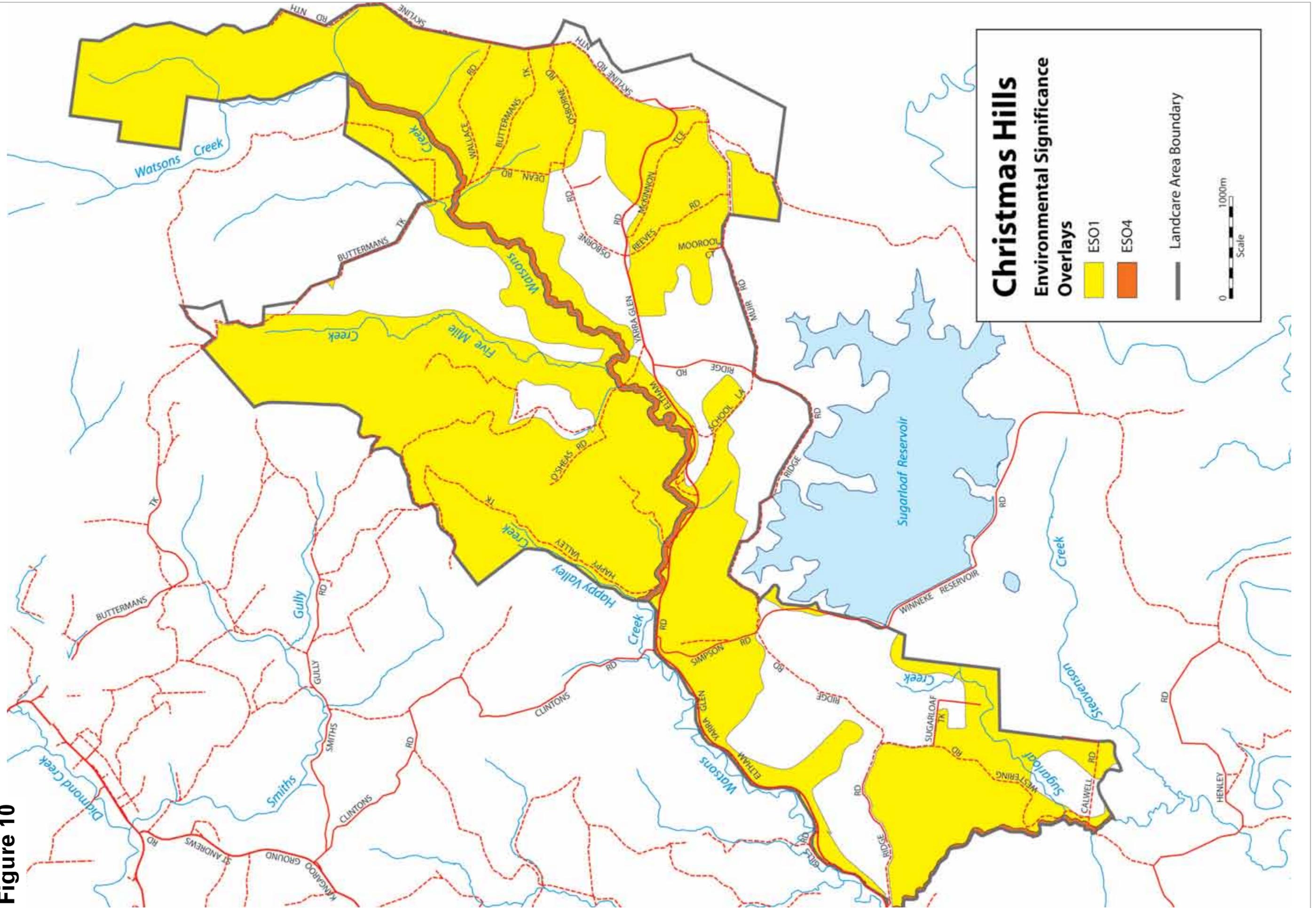
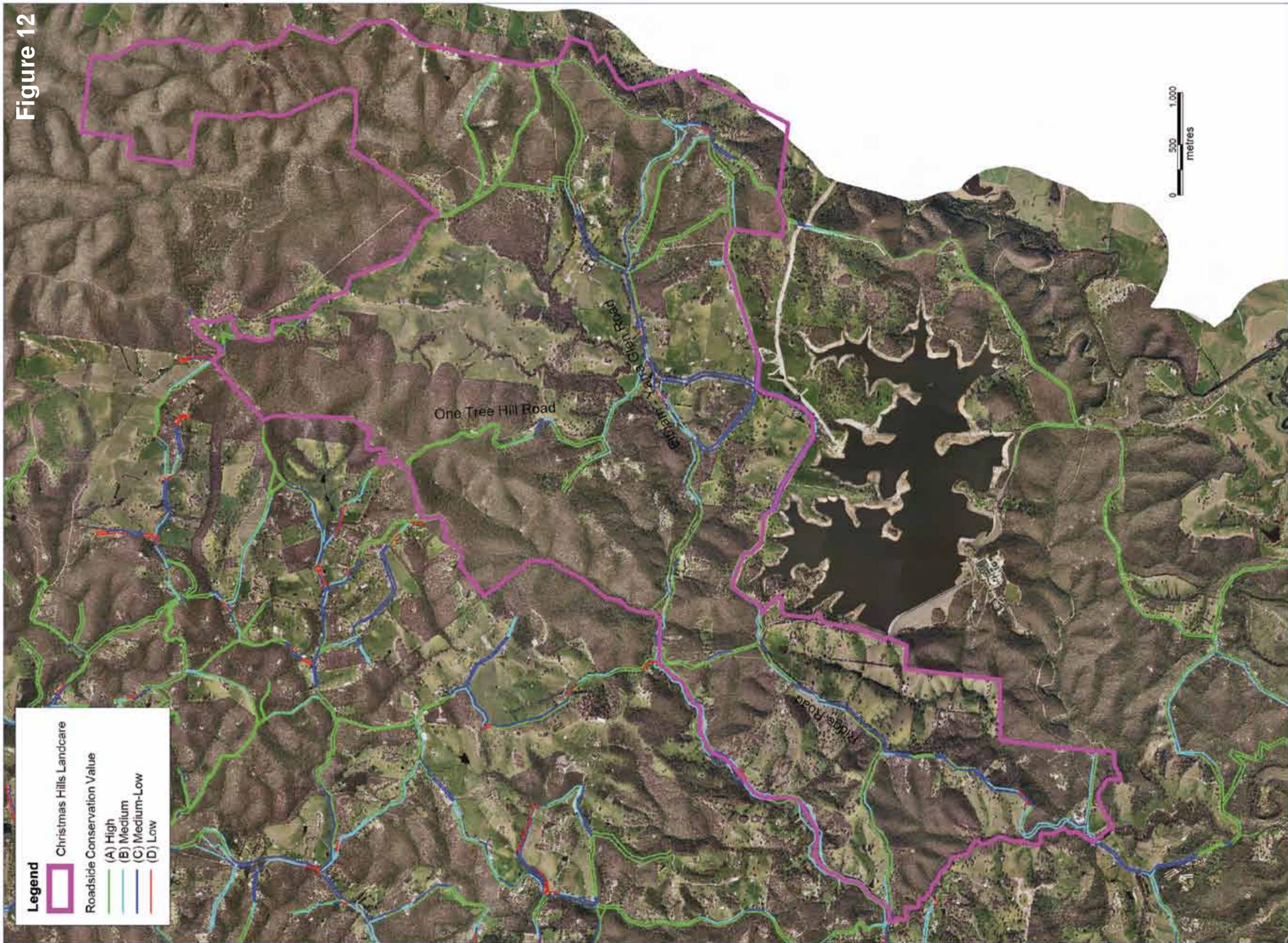




Figure 12



**Legend**

Christmas Hills Landcare

Roadside Conservation Value

- (A) High
- (B) Medium
- (C) Medium-Low
- (D) Low

**Christmas Hills  
Roadside Conservation Value**

Maplebank No: 17861  
 Print on: 5/7/2012  
 Print by: EC

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GIS**

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**Figure 14:** Most likely Dunnart locations

