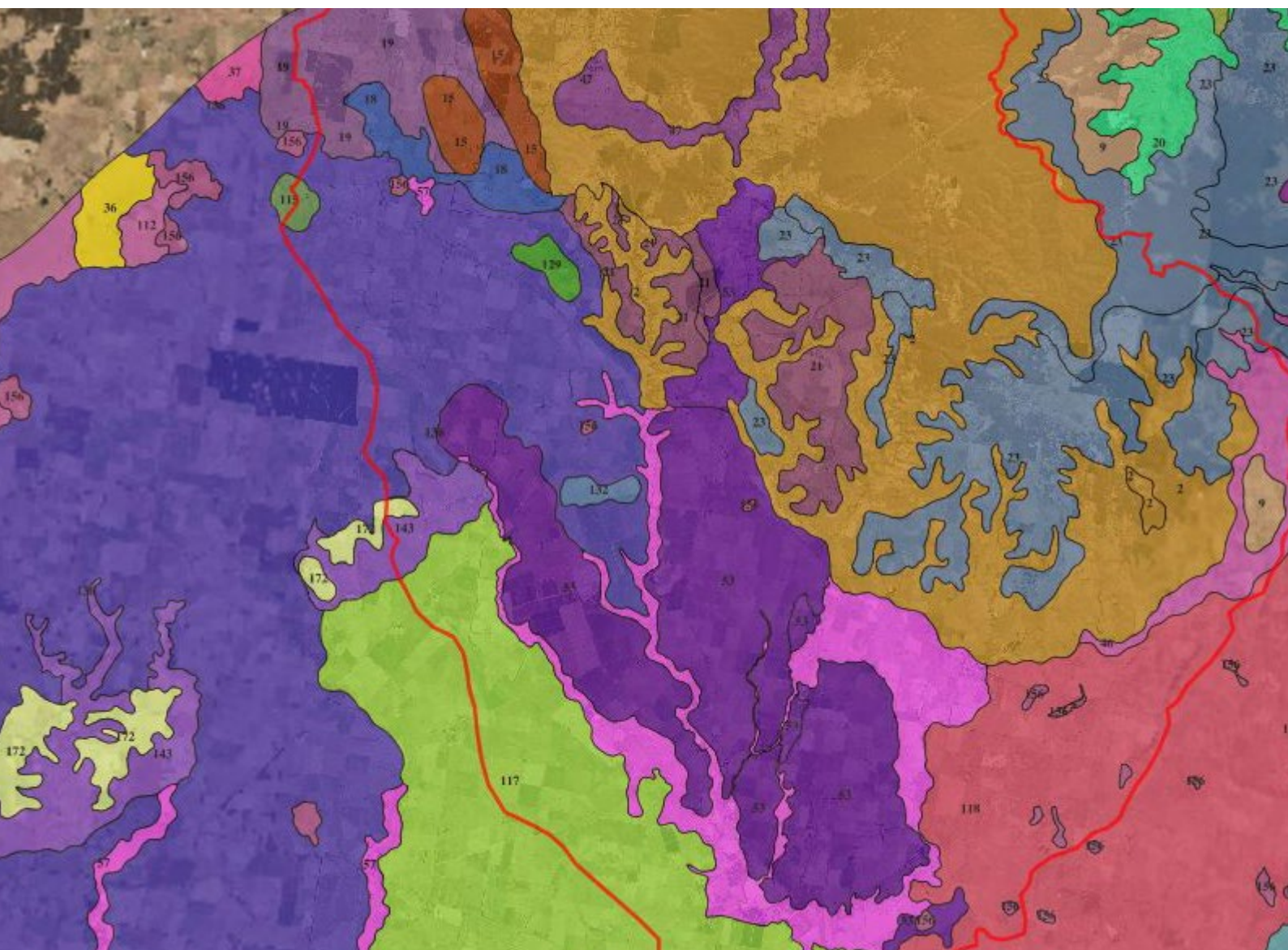


SPATIAL CONNECT

An activity based project



Environmental management in rural catchments

LEVEL 10

SPATIAL CONNECT

Environmental management in rural catchments

Level

Victorian Curriculum: Level 10 Geography, Environmental change and management

Australian Curriculum: Level 10 Geography, Environmental change and management

Aims

Students will:

1. learn how to use a Geographic Information System (GIS) to gather, manipulate and analyse spatial data to develop appropriate conclusions
2. explore the various environmental management projects undertaken by local scale catchment management groups.

Time

2–5 lessons

Teachers are encouraged to choose which activities to use with their classes.



https://en.wikipedia.org/wiki/Woody_Yaloak_River#/media/File:CressyCreek.JPG

Curriculum Links

| Victorian Curriculum Geography Content Description [Australian Curriculum equivalent] |
|---|
| Geographical understanding |
| Different types and distribution of environmental changes and the forms it takes in different places (VCGGK144) [ACGHGK070] |
| Environmental, economic and technological factors that influence environmental change and human responses to its management (VCGGK145) [ACGHGK075] |
| Causes and consequences of an environmental change, comparing examples from Australia and at least one other country (VCGGK147) [ACGHGK073] |
| Application of environmental economic and social criteria in evaluating management responses to an environmental change, and the predicted outcomes and further consequences of management responses on the environment and places, comparing examples from Australia and at least one other country (VCGGK149) |
| Geographical concepts and skills |
| Predict changes in the characteristics of places over time and identify the possible implications of change for the future (VCGGC127) |
| Identify, analyse and explain significant spatial distributions and patterns and identify and evaluate their implications, over time and at different scales (VCGGC128) |
| Identify, analyse and explain significant interconnections within places and between places over time and at different scales, and evaluate the resulting changes and further consequences (VCGGC129) |
| Collect and record relevant geographical data and information, using ethical protocols, from reliable and useful primary and secondary sources (VCGGC130) |
| Select, organise and represent data and information in different forms, including by constructing special purpose maps that conform to cartographic conventions, using digital and spatial technologies as appropriate (VCGGC131) [ACGHGK075] |
| Analyse and evaluate data, maps and other geographical information using digital and spatial technologies and Geographical Information Systems as appropriate, to develop identifications, descriptions, explanations and conclusions that use geographical terminology (VCGGC132) [ACGHGK076] |

Natural Resource Management

Introduction

Environmental management involves the use of strategies to mitigate the impacts of environmental change. Victoria is divided into ten catchment regions, each with its own Catchment Management Authority (CMA) which manage waterways, floodplains, drainage and agriculture programs, referred to collectively as Natural Resource Management (NRM).

Corangamite's CMA has established a NRM Planning Portal which is an online, GIS database containing information about environmental management projects and priorities within the region. This is a pilot program testing how online mapping can be used to match local and regional priorities for catchment management. Access to this spatial data will empower Landcare networks, community groups and stakeholders to help identify joint management priorities and set local priorities. This project allows the Corangamite CMA to grow and share its knowledge and develop enthusiasm for their landscape including catchment management, agricultural soil management and nature conservation.

Resource links:

- [Corangamite CMA Planning Portal](#)
- [Woody Yaloak Catchment Management](#)
- [Leigh Catchment Management](#)

Part 1: What are the geographic characteristics of the Woody Yaloak catchment?


The Woody Yaloak catchment is located in the northern central part of the Corangamite region. It covers 120 000 ha from Ballarat in the north to Cressy in the south.

Rainfall in the catchment flows into the Woody Yaloak River which eventually flows into Lake Corangamite, a waterbody of international conservation significance. Elevation varies across the catchment from 450m in the northern part of the catchment down to 130m in the southern end. The catchment is broadly divided into two distinct subregions: the broad acre agricultural land to the south and smaller blocks to the north. Eighty per cent of the land in the catchment is privately owned by 220 farming families. The remainder is public owned and is predominantly state forest.

This activity will enable students to investigate the geographic characteristics of the Woody Yaloak catchment whilst learning how to use the map portal and GIS layers.



Using data layers

- Open the [Corangamite CMA Planning Portal](#). Click *Agree and Continue*.
- Practise turning layers on and off by ticking and unticking the check boxes (figure 1).
- Expand the various category folders by clicking the + icons and explore the layers within these folders (figure 1).
- The active layer, listed at the bottom of the layers toolbar, is the last layer that you turned on. Practise changing the transparency of the layer by moving the slider. Clicking the  icon will provide information about each layer. This function is not available for all layers.
- Some layers have the option of turning on *query mode*. When query mode is turned on, clicking on the map will reveal information about that place from the data layer.

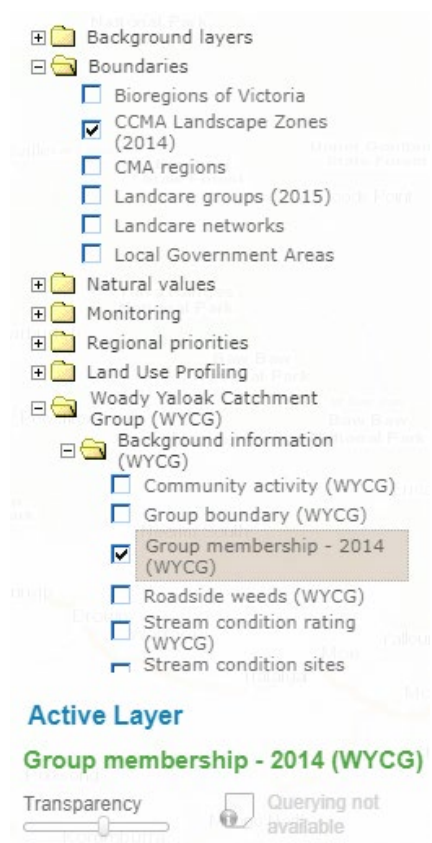



Figure 1: The *Categories and layers* toolbar on the right of the map portal enables you to select the layers you wish to display, find information about the data and change the transparency of the data.

1. Turn on the *Landcare networks* layer from the *Boundaries* category.
 - a) What is the name Landcare network represented in pink?
 - b) Turn on the *Landcare groups (2015)* layer from the *Boundaries* category. Write down four Landcare groups that are found within this Landcare network (1a). Use the transparency slider to help you.
2. Turn on the *Corangamite soil-landforms (2003)* layer from the *Natural values* category and the *Group Boundary* layer from the *Background Information* category within the *Woody Yaloak Catchment Group (WYCG)* folder.
 - a) Click on the  icon and write down the owner of the *Corangamite soil-landforms (2003)* layer.
 - b) Click on the various coloured regions within the catchment of the Woody Yaloak Catchment Group. Write down three of the landforms found within this region. Hint: Reducing the transparency of the *Corangamite soil-landforms (2003)* layer will help to see which landforms are located within the region boundary.

Navigating the map and using the toolbar

- **Zooming:** The map can be zoomed using the plus and minus buttons on the top left corner of the map, by doubling clicking on an area or by using the wheel on your mouse.
- **Moving around:** To move around the map, click on it so that a four-way arrow appears and drag in any direction.
- **Map views:** There are three different map views available and these can be changed by selecting them from the box to the left of the layers toolbar. The default view is *Map* containing roads, population centres, major physical features and, when zoomed in close enough, property boundaries. *Imagery* will provide satellite image data and *Hybrid* will combine map and satellite data.
- **Scale and location:** Note that the scale as a ratio and a scale bar are provided at the bottom left of the map. The latitude and longitude of the cursor position is also provided.
- **Save:** This function allows you to copy a URL link of the map at its current extent with the current layers turned on.
- **Print:** This function will allow you to save a PDF map which can then be printed or emailed.
- **Tools:** These tools allow you to reorganise the order of your layers, search for addresses within the study area, measure the distance between points and calculate the area of polygons (figure 2).
- **Legend:** If you have layers turned on, their colours and symbols will appear in the legend.

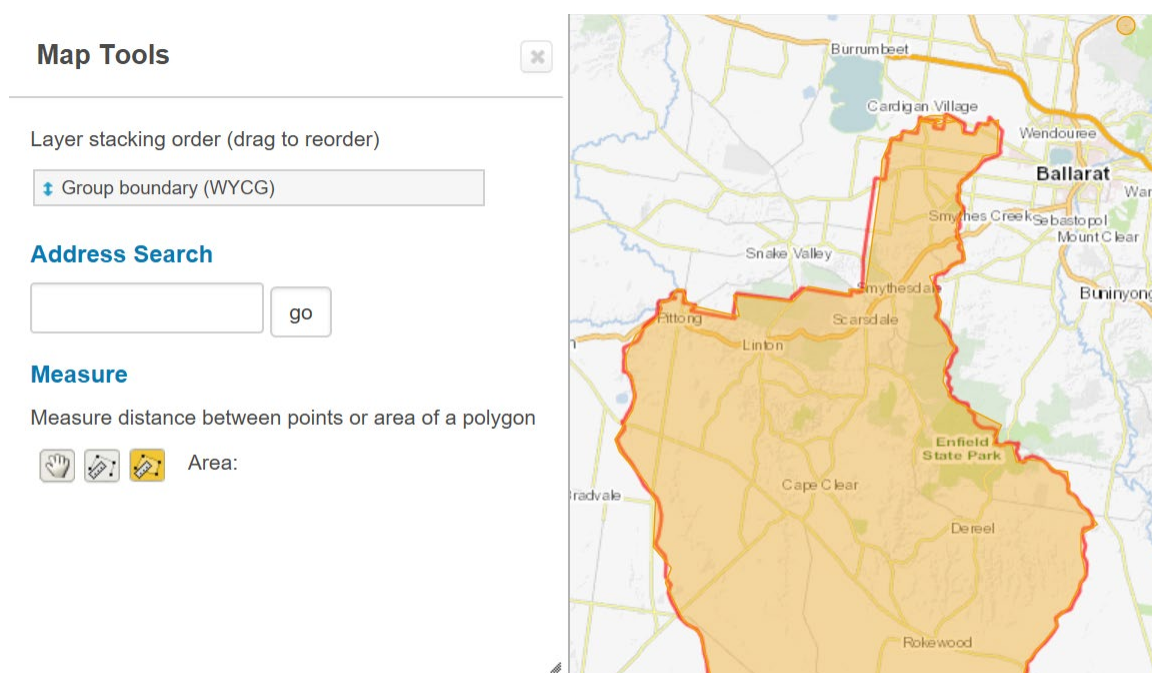


Figure 2: The polygon tool enables you to trace a region to measure its area.

3. Turn on the *Group Boundary* layer from the *Background Information* category within the *Woody Yaloak Catchment Group (WYCG)* folder. Using the area measuring tool, trace a polygon around the catchment boundary and calculate its area (figure 2).
4. Turn on the *Imagery* map view. Zoom in to different parts of the catchment. What different types of land uses are visible from the satellite image?

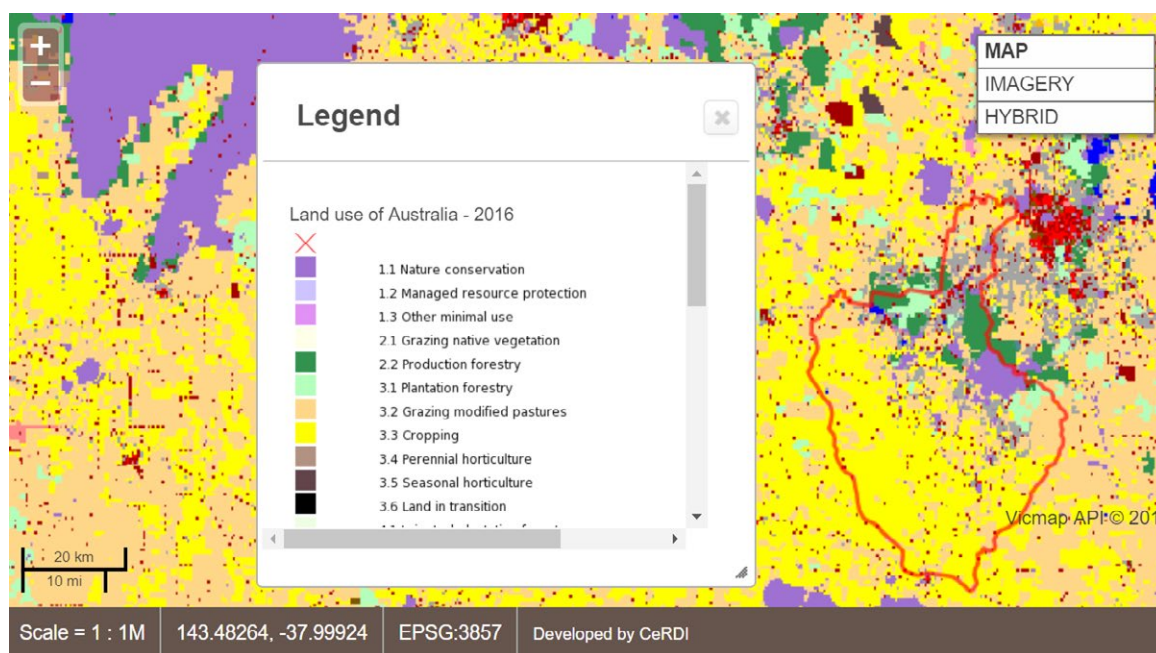



Figure 3: The buttons to the left of the map portal will enable you to zoom. Map view can be selected from the top right and scale and latitude and longitude coordinates are shown on the bottom left. The legend can be turned on and off and will give information for all of the layers that are turned on.

5. Turn on the *Land use of Australia – 2016* layer from the *Background layers* category and open the legend from the toolbar (figure 3).
 - a) Click on the  icon and write down the resolution of the data.
 - b) When was the data published?
 - c) List five different types of land use found within the Woody Yaloak catchment.
 - d) Describe the spatial distribution of these land uses. Consider how the types of land use vary throughout the catchment and which ones are grouped near each other.
 - e) Compare land uses within this catchment with other nearby catchments. Discuss whether or not the distribution is similar.

Part 2: Environmental management in the Woody Yaloak catchment

The Woody Yaloak Catchment Project is a community-based Landcare project providing funding for environmental management projects since 1992. Projects include tree planting, weed control, pest control, wetland development, erosion work, riparian rehabilitation, pasture and cropping trials and the protection of remnant vegetation. This activity focuses on stream condition within the catchment and various management activities aiming at improving water quality and stream habitat.

6. Turn on the *Stream condition rating* layer from the *Background Information* category and open the legend. Describe how the condition of streams vary throughout the Woody Yaloak catchment.

- Overlay the *Stream condition sites* layer from the *Background Information* category onto the *Stream condition ratings* (figure 4).
- Click on the various stream condition sites to reveal the name of the waterway and what the land is used for.

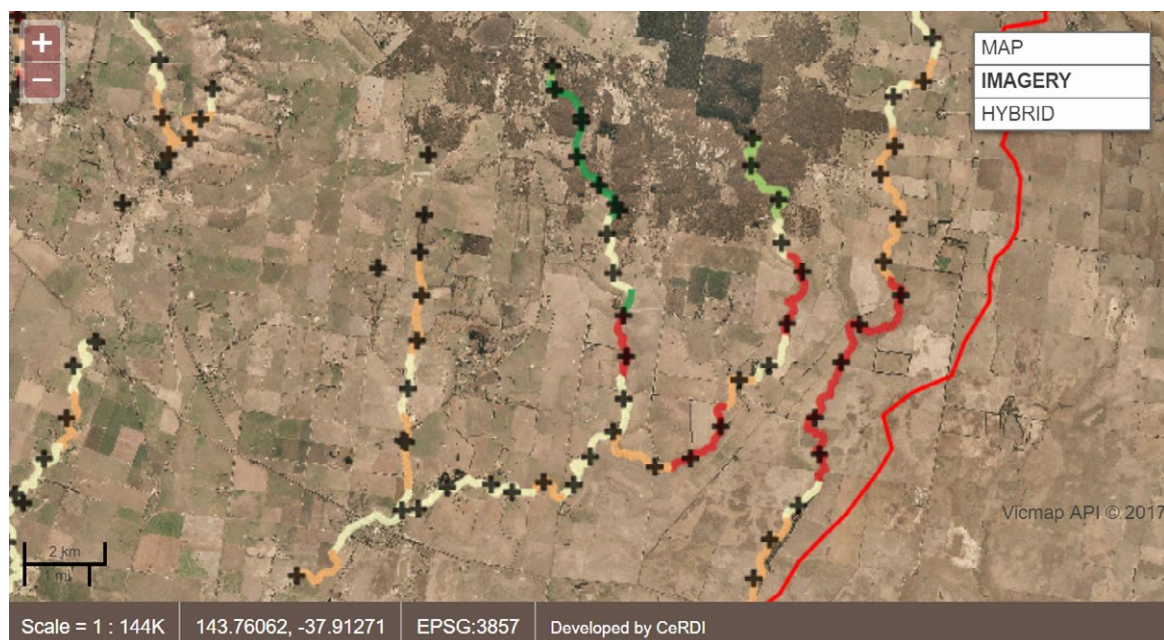



Figure 4: Stream condition sites overlayed onto stream condition ratings.

- Choose two different streams in the Woody Yaloak catchment that contain a variety of different condition ratings.
 - In the table below, list the name of the creek and the land uses associated with regions of different stream health from the *Stream condition sites* layer.

| | Stream 1: | Stream 2: |
|------------------|-----------|-----------|
| Stream Condition | Land use | Land use |
| Excellent/Good | | |
| Moderate | | |
| Poor/Very poor | | |

- Based on your findings, does there appear to be an association between land use and stream condition?
 - What additional information would help you confirm your answer to part b)?
- Turn on the *CWS reaches (CCMA 2014)* layer from the *Waterways and wetlands* category within the *Regional priorities* folder. The dark blue lines represent priority reaches. Environmental management activities have taken place within these reaches (figure 5).
 - What does CWS stand for? Hint: Click on the  icon.
 - Click on one of the priority reaches and view details. List:
 - The name of the reach
 - Two threats to the reach (answers will vary according to stream and section chosen)
 - Two management activities that have taken place.
 - Within the details section, click on *Full details from CWS* and open the PDF. What was the cost of these management activities?

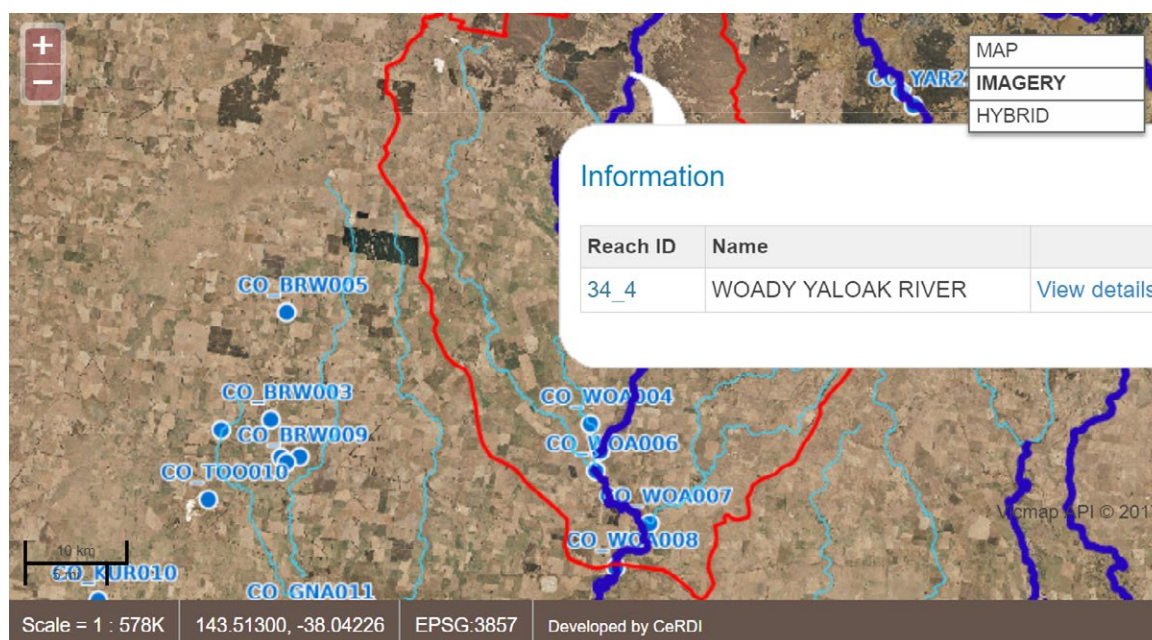


Figure 5: The CWS reaches and Waterwatch sites within the Woody Yalloak catchment.

9. Turn on the Waterwatch sites (Active) layer from the Monitoring category (figure 5).

- Choose two Waterwatch sites, one from a CWS priority reach and one from a non-priority reach.
- Click on the two Waterwatch sites and visit the weblink to access the data portal.
 - a) Use the data at the bottom of the website to fill out the following table summarising the site's water quality. If there are multiple measurements for this site then take the average of each column. (answers will vary according to stream and section chosen).

| Reach name | CWS Priority (Y/N) | Dissolved Oxygen (%) | EC $\mu\text{S}/\text{cm}$ | pH | rP mg/L P | Turbidity FTU |
|------------|--------------------|----------------------|----------------------------|----|-----------|---------------|
| | | | | | | |
| | | | | | | |

| Water Quality Measure | Healthy Range | Level that will cause damage to ecosystems |
|---|-------------------|--|
| Dissolved Oxygen % | 50–100 | ≤ 40 |
| Electrical Conductivity $\mu\text{S}/\text{cm}$ | <1500 | >6000 |
| pH | Between 6.5 and 8 | Less than 6 or greater than 9 |
| Reactive Phosphorus mg/L P | <0.5 | >0.1 |
| Turbidity FTU | ≤ 20 | ≥ 100 |

Figure 6: Healthy and unhealthy ranges of various water quality measures adapted from:
http://www.vic.waterwatch.org.au/cb_pages/waterwatch_publications.php?category_id=3144

- b) Based on the ranges, indicate whether each of the water quality measurements in your table indicate a high, moderate or low water quality by writing a H, M or L beside each value. High would be in the healthy range, low would be in the range that would cause damage to ecosystems and medium would be between those two levels.
- c) Discuss whether the two reaches you have investigated have a high, medium or low water quality overall.
- d) Based on these results, does the management undertaken in the priority reach appear to have had an effect on water quality?
- e) What additional information would help you confirm your answer to part d?

Part 3: Environmental management in the Leigh catchment

Using the skills acquired in the previous two activities, answer the following questions about the Leigh catchment. Many of the data layers needed can be found within the *Leigh Catchment Group* folder while others can be found in the *Background layers*, *Boundaries* and *Natural values* categories. Take screenshots of your map throughout to use in your answers.

1. In one paragraph, summarise the geographic characteristics of the Leigh catchment. Include:
 - the size of the catchment and its location within the Corangamite region
 - examples of land use within the catchment and the way these land uses are spatially distributed
 - the shape of the landscape, referring to topography using the *LCG_Countours_10m* layer
 - major landforms found in the catchment including rivers and lakes.
2. Invasive weeds are a major issue for catchment management groups across Australia.
 - a) What are the common names of the two major weeds found in the Leigh catchment?
 - b) In what part of the catchment are they found?
 - c) Does the location of these weeds appear to be associated with any particular type of landform or land use?
 - d) Choose one of these weeds and research the impact that it can have on the agricultural industry and the natural environment.
 - e) Read about the impacts of weeds and their management in the Leigh catchment here: <http://www.leighcatchmentgroup.org/attachments/article/150/Weeds.pdf>
3. In December 2015, a bushfire occurred within the Leigh catchment.
 - a) Turn on the layer representing the spatial extent of the Scotsburn fire and measure its area using a polygon.
 - b) Read the following two articles about the fire and record five key facts such as the cause of the fire and the extent of the impact:
 - <http://www.abc.net.au/news/2016-01-05/other-victorian-bushfire-aftermath-of-the-scotsburn-fire/7069426>
 - <http://www.theage.com.au/victoria/victorian-fires-homes-lost-at-scotsburn-after-fires-tear-through-victoria-20151219-glzp0o.html>
 - c) Visit <http://www.leighcatchmentgroup.org/bushfire-recovery> and choose one of the management priorities following the fire such as fences, agriculture or river health.
 - d) What is the potential threat to one of these priorities following the fire?
 - e) What management needs to be undertaken by landholders to reduce these potential impacts?

Extension activities

1. Read more about the management of stream condition in the Woary Yaloak catchment:
[http://www.woadyyaloak.com.au/resources/Waterways%20final%20report%20\(2013\).pdf](http://www.woadyyaloak.com.au/resources/Waterways%20final%20report%20(2013).pdf)
 - a) Has the overall health of the waterways within the catchment improved recently?
 - b) What were the four main categories assessed?
 - c) What was the main method used to gather data?
2. The map portal contains data for various other projects and priorities within the Woody Yalloak and Leigh catchments. Choose one of these priorities and conduct additional research into the extent of the environmental impacts and the management undertaken to reduce this impact. Examples include salinity, weeds and erosion.
3. Data collected to monitor environmental impacts often relies on citizen scientists. Join the wildlife database, Bowerbird, and contribute to a project by uploading images, videos and sounds of nature in your local area.
<http://www.bowerbird.org.au/>
4. Find the website of your local catchment management group or a local Landcare group. Read about some of the recent environmental management projects that have been undertaken or proposed future projects. How can local residents can get involved in these initiatives?
5. Open the [Waterwatch portal](#) and compare the health of two or more waterways near your school. Consider the quality of the water, habitat and vegetation. Instructions on how to collect data can be found here:
<http://www.environment.nsw.gov.au/resources/waterwatch/SnrFieldmanual/20090497SeniorFieldManualSection08.pdf>