



Year 11 Biology
Lake Cowal
Fieldwork Ecosystem Study – River Red Gum
Student Workbook



Name: _____

Date: _____

Produced in association with the Riverina Environmental Education Centre



Setting The Scene – A Local Ecosystem Study

Lake Cowal

Lake Cowal forms part of the Wilbertroy Wetland System in the Lachlan Catchment. The Wilbertroy Wetland System is recognised as a nationally significant ephemeral ecosystem that covers approximately 29,000 ha. Lake Cowal is located approximately 43 km north of West Wyalong and 90km south-west of Forbes.

When full, Lake Cowal is 21km long, 10km wide and up to 3.5m deep. The wetlands are fed by water inflows from Bland and Sandy Creeks as well as the Lachlan River in times of flood. The lake is located on the fluvial landforms of the Jemalong Plains and has an underlying sediment base of 1m to 50m. The soils in the Lake Cowal area range from silty loam on the higher undulating country to self-mulching grey clays soils on the seasonally inundated floodplains. Lake Cowal is located on the Lachlan Fold belt which has historically been the source of many mineral discoveries of local, regional and national importance. Gold mineralisation has occurred in pods which have been found throughout the Lake Cowal area.

Lake Cowal supports a diverse range of native flora and fauna with nine major vegetation communities comprised of over 411 different species of flora. These vegetation communities are dominated by species such as River Red Gum, River Coobah, Lignum, Swamp Canegrass, Dwyer's Red Gum, Mugga Ironbark, Spearwood, Deane's Wattle, Black Cypress Pine, Western Grey Box, Bimble Box, White Cypress Pine, Belah, Myall and Wilga.

The vegetation communities provide habitat for Lake Cowal's unique fauna which includes a total of 72 terrestrial species: 30 mammals; 31 reptiles; and 11 amphibians have been recorded in the Lake Cowal area. The Yellow-bellied Sheath Bat, Little Pied Bat and Troughton's Bat are some of the endangered species that can be found within the area. Lake Cowal is also renowned for its bird life with a total of 277 bird species recorded in the area. Great Egret, Royal Spoonbill, Pacific Black Duck, Australasian Shoveller, Masked Lapwing, Latham's Snipe and Silver Gull are some common species. When full the lake also supports 14 different fish species.

There are many environmental threats to Lake Cowal and through careful management, strict guidelines and sustainable farming practices these threats can be minimised. Dryland salinity, loss of habitat and biodiversity, reduced water quality, increasing soil acidity, soil structure decline, soil erosion (water & wind), declining productivity, weeds & pests (Lippia & European Carp), mining (although strict controls are in place).

Task

The Lake Cowal Foundation is endeavouring to map and collect data to assess the current health of the ecosystem of Lake Cowal. Your task is to collect vital data which will form baseline information for the Lake Cowal Foundation to ascertain the current state of the ecosystem as well as evaluate the impact of future rehabilitation work.

It is critical that all fieldwork is done to the best of your ability with the highest degree of accuracy possible as this information will be used for years to come. You must complete all activities in the booklet to be able to gain a fair assessment of the area and then answer the questions to build your analysis. It is suggested you support your analysis with photographic evidence. This fieldwork study is a compulsory component of the preliminary biology course.

Identifying OH&S issues and risks

Investigate OH&S issues to identify potential sources of physical, chemical and biological risk before undertaking an investigation of a local terrestrial or aquatic environment. Discuss actions you can put in place to address the identified risks for your fieldwork.

PHYSICAL:

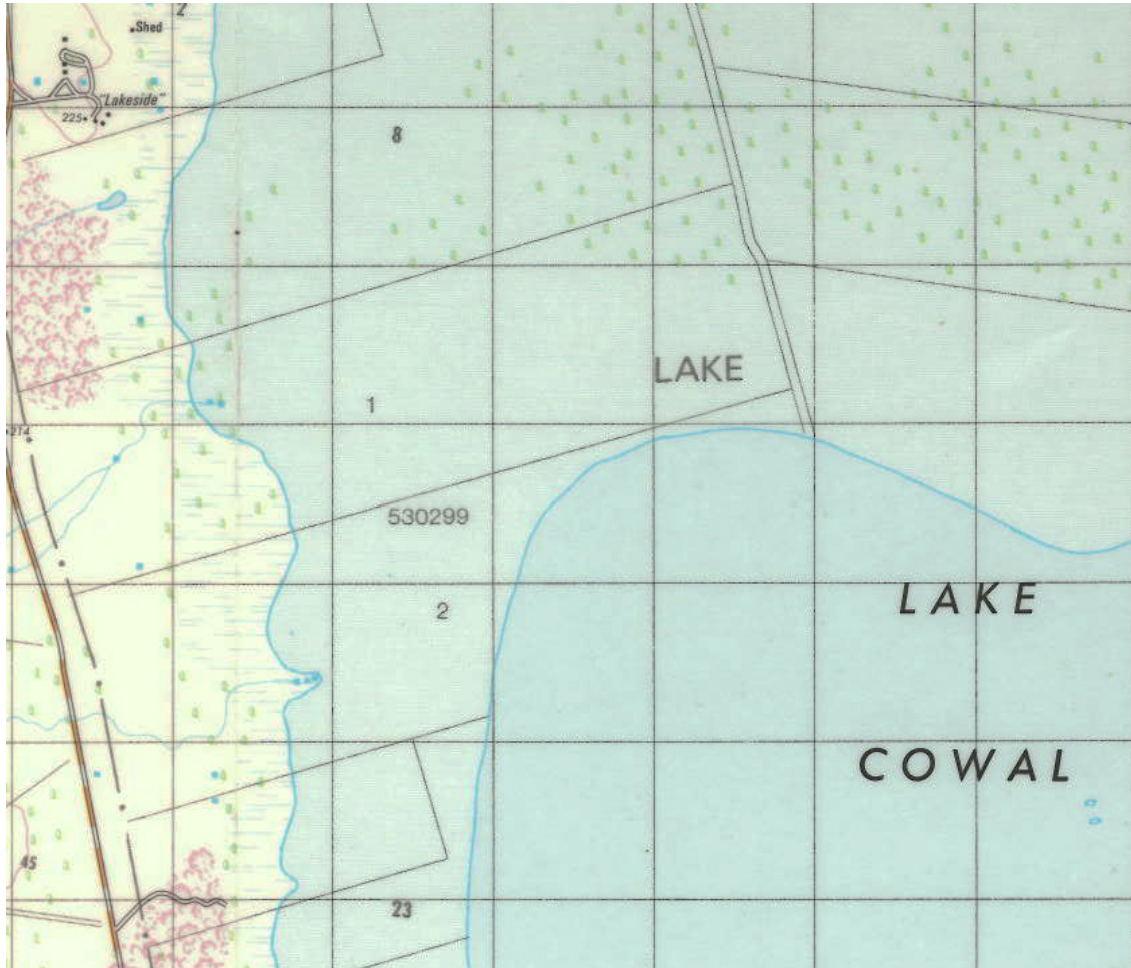
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BIOLOGICAL:

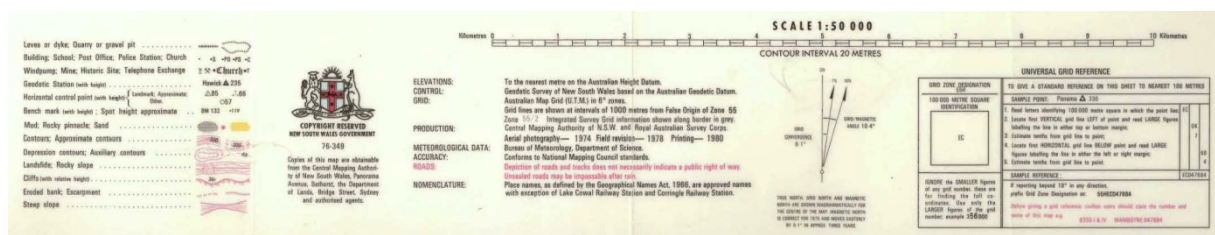
Location – Topographic Maps and Global Positioning System (GPS)

For fieldwork to be accurate correct scientific method must apply to all techniques used in the field. Scientific method dictates that experiments and fieldwork must be systematic and able to be repeated to observe and study any changes, including changes in variables, over time.

When conducting fieldwork, the location is one of the most important or dependent variables involved. It will be important that you use both a topographic map and a GPS to determine the exact location of your site study. This information will allow information to be made known about the exact site studied as well as for the site to be revisited and your experiments repeated to observe changes over time.



Source: New South Wales Australia 1:50 000 topographic series. Wamboynne 8330-I and IV Map [cartographic material] / Published by the Central Mapping Authority of New South Wales (1980)



Extracts from Wamboynne 8330 - I & IV Topographic Map 1:50,000

On the map mark the location of your transect (remember that each box on the map represents 1km x 1km). **Global Positioning Systems (GPS)** are used to identify and locate an exact position. Record the latitude and longitude of your transect site using a GPS and points of reference on the map. Note also the altitude (provided by contour lines).

Latitude: _____ (don't forget to include the unit of measurement).

Longitude: _____ (don't forget to include the unit of measurement).

Elevation: _____ (don't forget to include the unit of measurement).

Worksheet 1: Graph of Transect Data

On the graph below, record the major trees, shrubs & grasses, their height and location along transect. Use a key to identify all major species that were found.

Height (m)

30

20

10

0

10

20

30

Slope: Base
Fieldwork Site 1

Mid-slope

Top
Fieldwork Site 2

Key:

Worksheet 2: Quadrat Data Recording

At two random locations at the bottom (Fieldwork Site 1) and top (Fieldwork Site 2) of the transect area mark out a 10m x 10m large quadrat using the tape measure provided. Within each of these locations you will identify the major plant species, draw a diagram of the distribution of these species, perform three 1m x 1m random quadrat throws and make note of evidence of animal species.

A. Identify and record each major plant species - you need to identify and record the number you found in your quadrat on the recording tables following. For groundcover on the large quadrat, a percentage estimate will be more appropriate. *Remember to include introduced species such as weeds.*

B. Create a diagram of the distribution of plant species - mark the dominant plant species for the two sites on the diagrams on page 6 & 8. Using your table as a base, develop a key for this diagram which includes representations for each plant species. For groundcover it may be more appropriate to estimate the percentage (provide this percentage in the key next to the species).

C. Perform three random quadrat throws – using the 1m x 1 m quadrat square throw it randomly within the larger 10m x 10m quadrat and note all ground cover species found and their numbers. Repeat the 1m x1m quadrat throwing a total of 3 times.

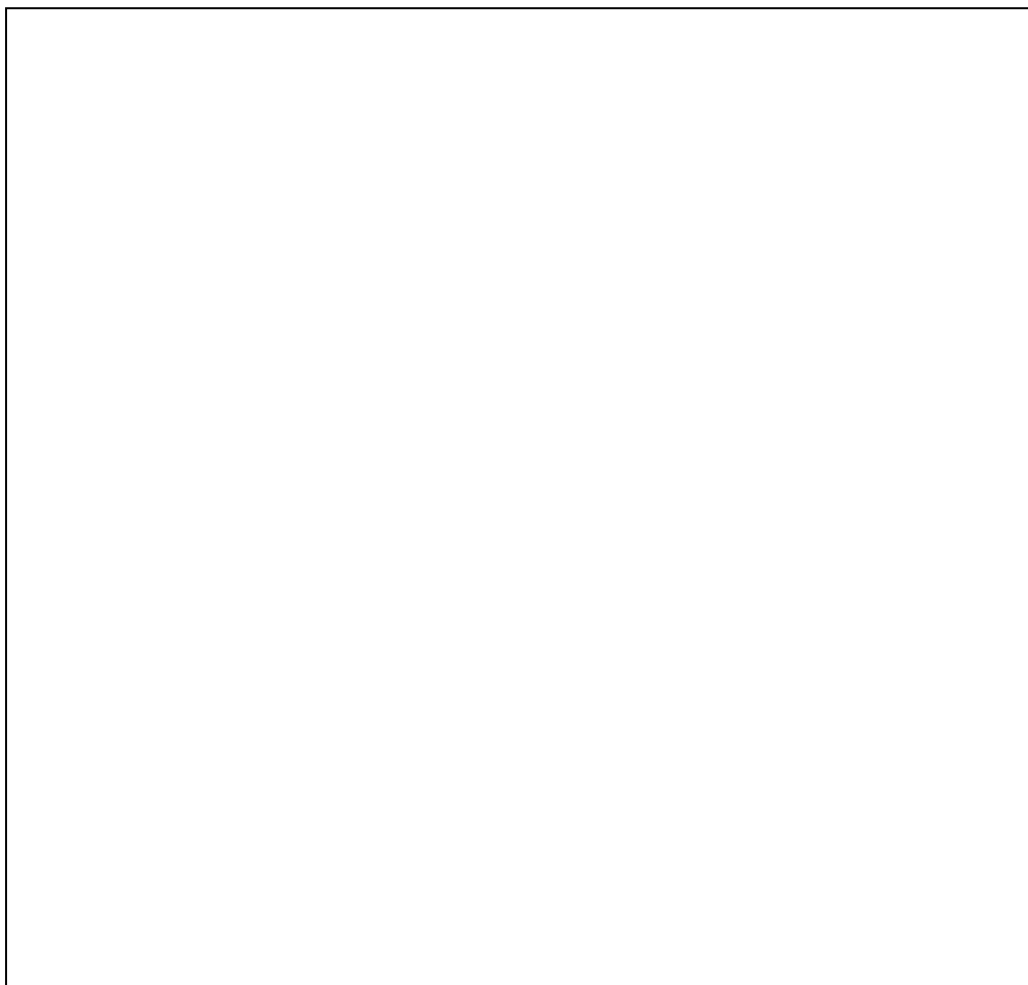
D. Record evidence of animal species or significant discoveries within each large quadrat
The Lake Cowal Foundation also needs to record any animal species or evidence of species within the area. In both of the quadrats you will need to record evidence of fauna (such as nests, hollows, scats, tracks and visible sightings) and the animal(s) which you expect to be associated with this evidence. In your observations be as specific as possible – name the species of animal as well as using adjectives to describe the evidence (i.e. deep scratch at chest height on River Red Gum Tree – Brush-Tail Possum)

Fieldwork Site1 – Base of Slope

A. Identify and record each major plant species - large quadrat recording table

Large Quadrat (10m x 10m)	Plant species	Number in Quadrat
Base of Slope GPS Coordinates		

B. Create a diagram of the distribution of plant species



KEY:

C. Perform three random quadrat throws - recording table

Quadrat Square (1m x 1m)	Plant species	Number in Quadrat
Base of slope quadrat - Throw 1		
Base of slope quadrat - Throw 2		
Base of slope quadrat - Throw 3		

D. Record evidence of animal species or significant discoveries within the large quadrat

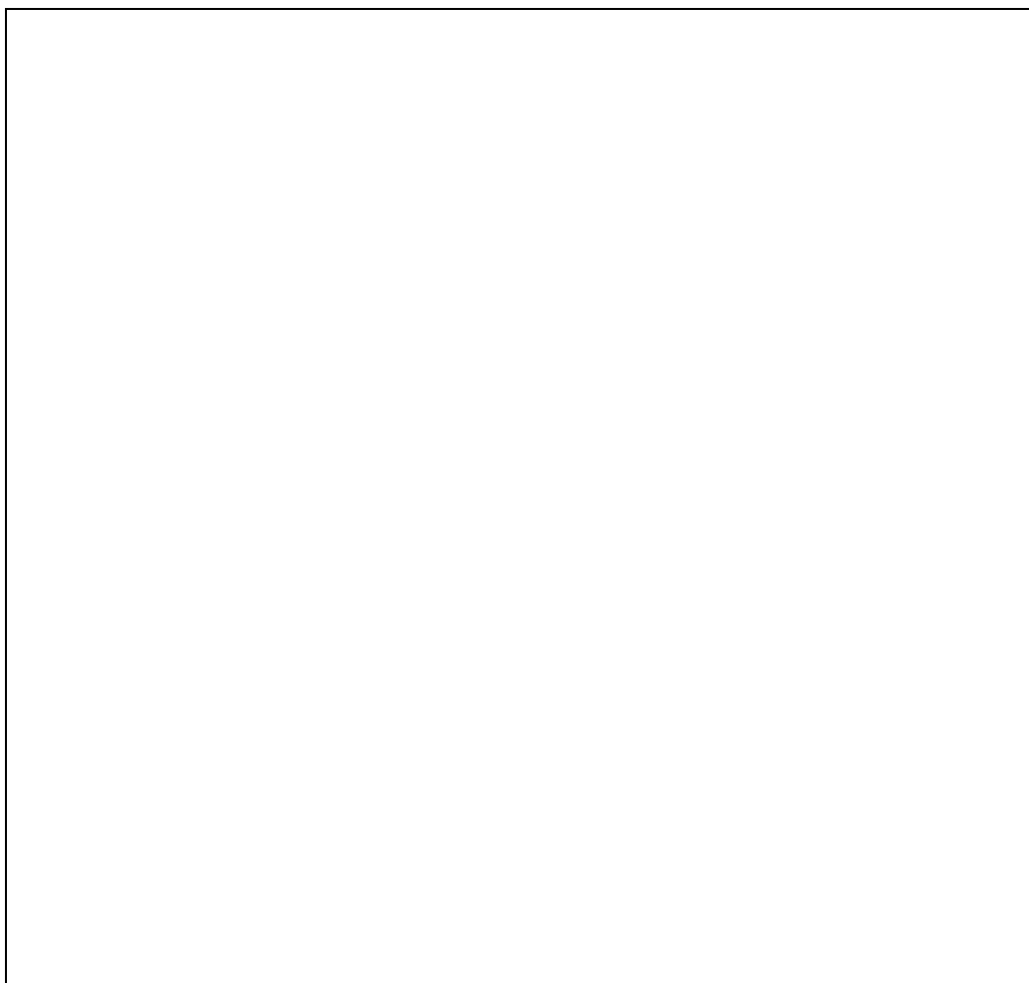
Type of evidence of animal species	Associated animal (s)

Fieldwork Site 2 – Top of Slope

A. Identify and record each major plant species - large quadrat recording table

Large Quadrat (10m x 10m)	Plant species	Number in Quadrat
Top of Slope GPS Coordinates		

B. Create a diagram of the distribution of plant species



KEY:

C. Perform three random quadrat throws - recording table

Quadrat Square (1m x 1m)	Plant species	Number in Quadrat
Top of slope quadrat - Throw 1		
Top of slope quadrat - Throw 2		
Top of slope quadrat - Throw 3		

D. Record evidence of animal species or significant discoveries within the large quadrat

Type of evidence of animal species	Associated animal (s)

Worksheet 3: Abiotic Data Recording

Environment Features	Fieldwork Site 1 Bottom of Slope	Fieldwork Site 2 Top of Slope
Air Temperature (°C)		
Soil Temperature (°C)		
Air Humidity (%)		
Soil pH		
Soil Texture		
Soil Colour		
Light Intensity (lux)		
Slope of Hill (deg)		
Wind Strength (km/hr)		
Wind Direction		

Identify any problems or flaws in the fieldwork methods.

Worksheet 4: Biotic and Abiotic Features

List all of the biotic and abiotic features you have observed in the environment at Lake Cowal.

ABIOTIC FEATURES	BIOTIC FEATURES

Worksheet 5 - Adaptations of plants and animals

Describe 2 animals and 2 plants from the study area and describe the adaptations they have to their environment.

Plant/ Animal Species	Adaptation	Quick notes/sketch

Worksheet 6: Food Chains and Webs

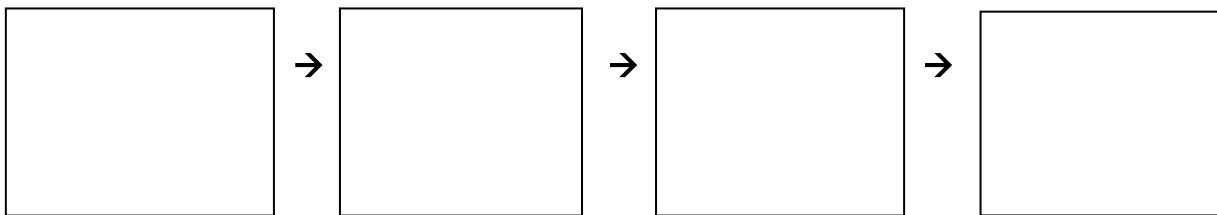
Herbivory of Leaves

Collect 10 leaves (random sample) and calculate the average percentage of leaf area damaged by herbivores.

What percentage of leaf energy follows the traditional food chain of plant – herbivore - carnivore?
Where does the rest of the energy in this ecosystem go?

Food Chains

Make an observation and then draw a food chain to show the flow of energy through the ecosystem in the boxes below.



Food Webs

Draw a food web of observed interactions in the box below. (To be completed back in the classroom).

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graph TD; subgraph FoodWebBox [ ] end
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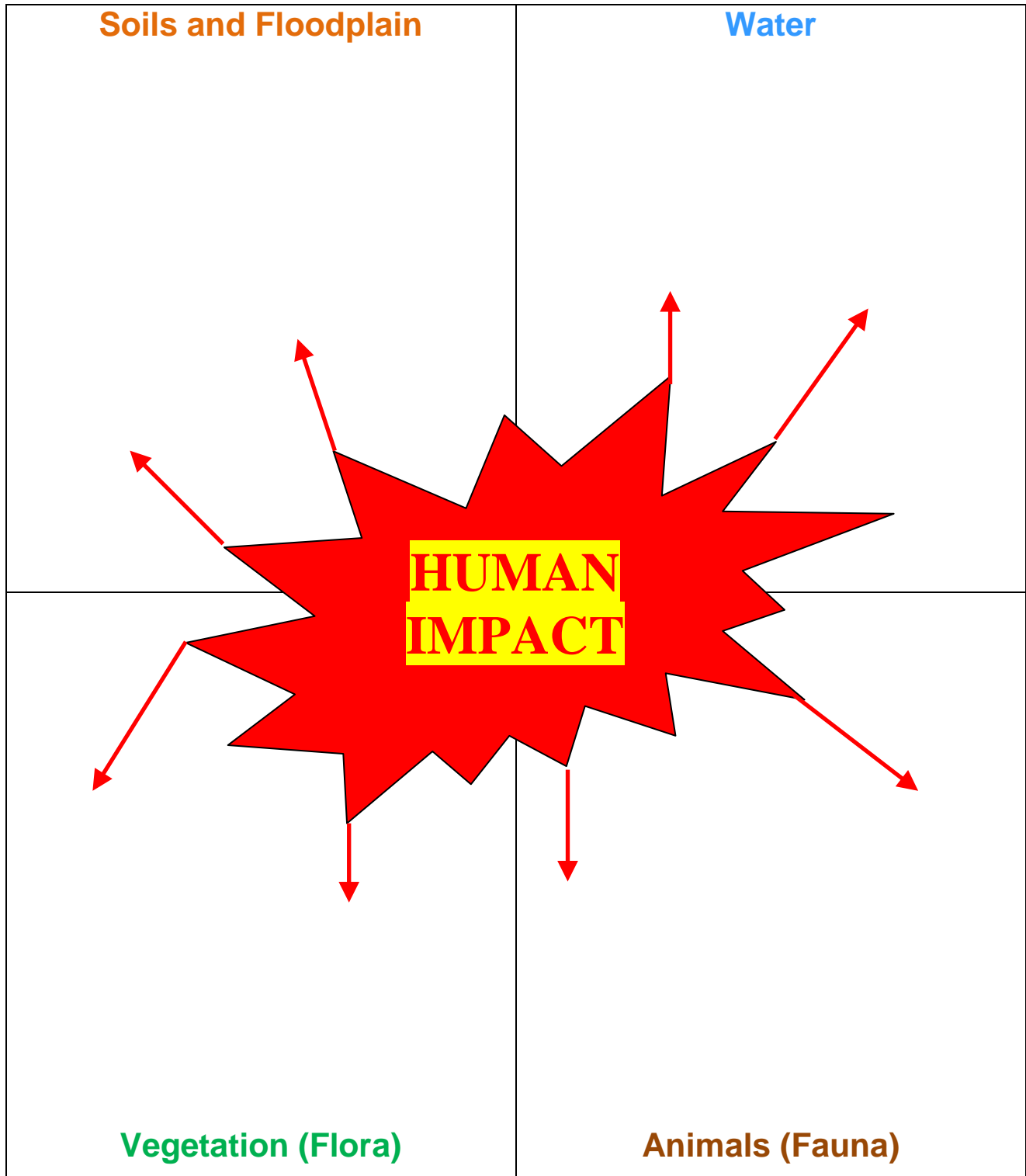
Worksheet 7: Organism Relationships

Complete the table below to identify any relationships found between organisms in the environment.

Relationship	Species	Description
Mutualism An interaction where both organisms benefit.		
Commensalism An interaction where one organism benefits and the other is unharmed or unaffected.		
Parasitism An interaction where one organism benefits and the other is affected in a negative way.		
Allelopathy A biological phenomenon by which an organism produces one or more biochemicals that influence the growth, survival and reproduction of other organisms.		
Predation An interaction where the predator feed on its prey.		
Competition A contest between organisms for location, resources leadership and mates.		

Worksheet 8: Impact of Humans on the Environment

Make observations of your surroundings and identify any way that humans have interfered with the Lake Cowal environment.

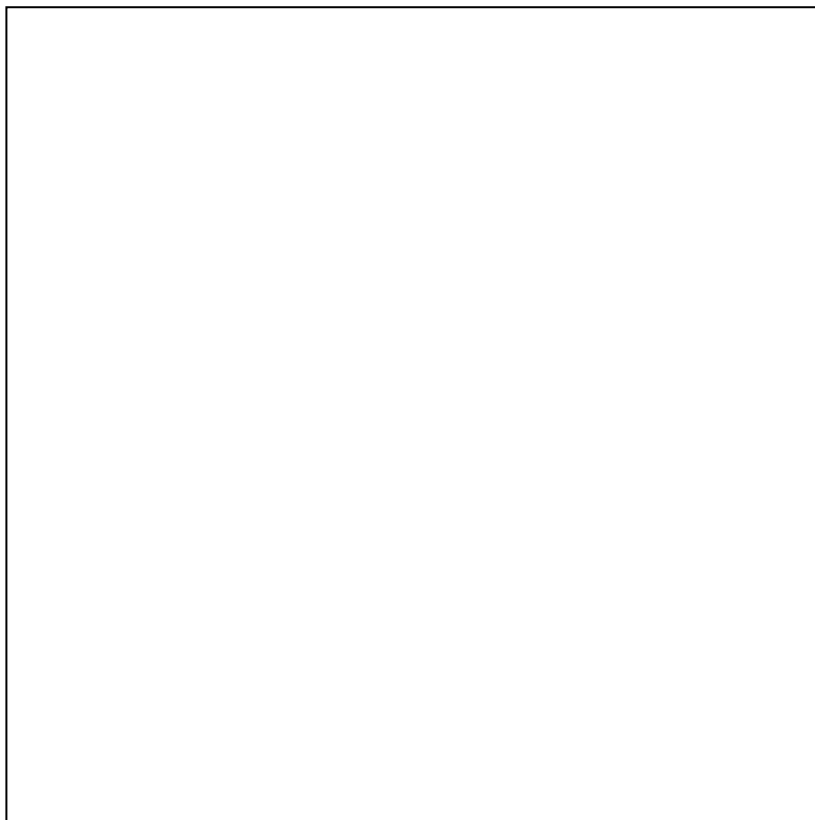


Biomass Quadrats

Plant biomass (dry weight) indicates the amount of food and energy provided by the producer organisms (plants) which is available to support the animals in the ecosystem. A large plant biomass can support more animals.

Mark out a 20m X 20m quadrat and measure the circumference of each tree at a height of 130cm from the ground (DBH). Indicate the location of each tree in the quadrat and write the circumference beside it.

Within the larger quadrat randomly select 5 smaller quadrats 25cm x 25cm. Scrape up the leaf litter into a plastic bag and weigh on the spring balances.



Biomass calculation to do later using the Excel spreadsheet biomass calculator

<http://www.reec.nsw.edu.au/2002/teachers/texttch/teatpsg1.htm>

Tree circumference @ 130cm	Biomass kg	Carbon kg

Calculate the average biomass per square metre: _____

World biomass averages: tropical rainforest 45kg/m²; woodland 6 kg/m²; alpine 0.6 kg/m²; cave 0.002 kg/m²

Leaf Litter

Leaf litter biomass results (g/25cm ²)						Avg.
Leaf litter biomass g/m ² (X 16)						

FIELD STUDY NOTES