Make a Catchment Model

This activity introduces the concept of catchments to students through basic modelling. Using the maps of East or West Gippsland in the front of the resource as a guide a 3-D model catchment is developed. This activity can be done as a class or in smaller groups.

Materials

- *Make a Catchment Model Worksheet,* page 98
- Play dough or modelling clay. Note: If using modelling clay it will dry hard after 24 hours
- Map from front of resource manual
- Plastic items for catchment features such as animals, houses, trees, etc.
- Heavy duty foil
- Water

Extension activities

- Using the individual catchment maps from pages 88 to 94 as a guide mark on the smaller catchment area in which you live.
- Construct the other Gippsland map and discuss the differences of the two regions.
- Purchase a topographic map of the area (available from DSE/DPI offices) and choose features such as mountains to construct to scale by following contour lines.
- West Gippsland Waterwatch conduct a demonstration with a large fibreglass catchment model. Contact the Regional Coordinator for details.
- *A Day in the Gippsland Lakes Catchment*, page 104.

Make a Catchment Model Worksheet

Learning methodology

1. Photocopy or print from the CD, the appropriate map in the front of the resource manual, increasing it's size to A3. The map can be laminated if desired.
2. Using play dough or modelling clay shape the land formations including mountains, lowlands, rivers, lakes and towns. You can use the map as a reference guide or shape directly on top of the paper.
3. Different coloured dough can be used for rivers, towns etc or plastic features can be placed on top of the model. Some examples might include plastic farm animals to represent agricultural areas, toothpicks for trees, monopoly houses for towns and so on.
4. Bodies of water can be shaped and lined with heavy duty foil so that water flow can be demonstrated.

Questions

1. Follow the path of the water from the upper to lower catchment areas. What land forms are typical in the upper area of the catchment? What about the middle and lower areas?
2. What types of land use are present?
3. What kind of scale is your model in? How big is the actual area?
4. How many people live in the catchment area?
5. How many smaller catchments from different rivers can you locate on the model?

Mini Water Cycle

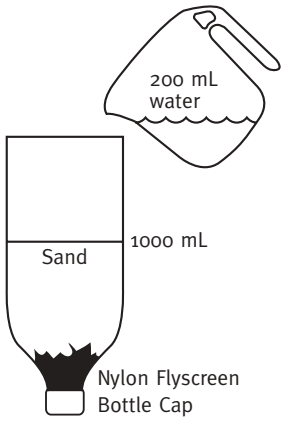
This activity is designed to simulate and observe the processes involved in the hydrological cycle.

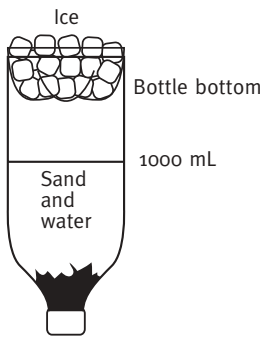
Materials

- Clear plastic 1.25 litre soft drink bottle (with cap)
- 1 litre measuring jug or beaker
- Permanent marker
- Scissors
- 10 cm square of nylon flyscreen
- Sand
- Water
- Crushed ice
- Food dye
- Ring stand

Learning methodology

1. Remove the label from the bottle.
2. Cut the bottom off the bottle, 5 cm up from the base.
3. Wad up the nylon flyscreen and insert it in the neck of the bottle.
4. Put the bottle cap back on tightly.
5. Place the bottle in the ring stand and pour in 1000ml of water.
6. Mark the level the water comes to on the side of the bottle with permanent marker.
7. Pour out the water and replace it with sand to the 1,000 ml mark.
8. Add 2 drops of food dye to 200 ml of water, pour into the bottle and allow to settle.
9. Insert the cut-out bottle base upside down into the bottom of the bottle.
10. Fill the bottle base with crushed ice.
11. Set the bottle in a ring stand in sunlight or beside a strong lamp.
12. Observe what happens as the ice melts.
13. Label the following on the bottle:
    - Ground water
    - Surface water
    - Evaporation
    - Condensation
    - Precipitation
14. Draw a diagram of your experiment, including the labels you marked on the bottle.
15. Write a description of what you observed happening.





Questions

1. Write an explanation for your observations.
2. Draw a labelled diagram of the water cycle.
3. What human activities can impact upon the water cycle?

Our River

Contact your local waterwatch facilitator to organise a field trip in your catchment.
Field trips can be tailored to suit many topics.
www.vic.waterwatch.org.au

Level 4

This activity is designed to back up a Waterwatch activity to your local river or catchment. It is to be used with Gippsland's River Systems Information Sheets for upper Primary School levels to record Waterwatch activities, and extend knowledge of your catchment and its environmental issues.

Materials

- *Our River Worksheet,* page 101
- *Gippsland's River Systems Information Sheets,* page 85
- Local map showing the creek or river closest to the school
- Pencils
- Pens
- Eraser

Extension activities

- A Day in the Gippsland Lakes Catchment
- Make a Catchment Model

Level 5

This activity is designed to back up a Waterwatch activity.
This activity uses existing data to develop skills in interpreting water testing results.

Materials

- *Gippsland's River Systems Information Sheet – Thomson/Macalister,* page 89
- *Our River Sample Data Sheet,* page 102
- *Waterwatch Analysis Chart,* page 103
- Pencils
- Paper
- Graph paper

Extension activities

- A Day in the Gippsland Lakes Catchment
- Make a Catchment Model

Our River Worksheet

River study questions

1. Your name:
2. Where do you live?
3. What catchment is this in?
4. What is the nearest river to your house?
5. Using a map, how far and in what direction is the river from your house?
6. What is the nearest river to your school?
7. What catchment is this in?
8. Using a map, how far and in what direction is the river from your school?
9. What does Waterwatch test?
10. What may be affecting the water quality of your river?
11. What can you do to help our water quality?
12. Where does your river end?
13. How might this area be affected by the water quality in your river?

Waterwatch field trip results

Name: Date:

Site location: Time:

Parameter	Unit	Result
Air temperature		
Water temperature		
pH		
Turbidity		
Electrical conductivity		
Reactive phosphorus		
Dissolved oxygen		

Macroinvertebrates

1. Using the pictures provided (see Our Biodiversity Food Web: Species Cards), cut out the macroinvertebrates you saw, and paste onto the back of this sheet.
2. What do these macroinvertebrates tell us about our rivers water quality?

STUDENT ACTIVITY

Our River
Sample Data Sheet

The Thomson River's water quality varies greatly over the year depending on rainfall and temperature, so will your Waterwatch monitoring sites. This is an activity to help you question what your water testing results might mean.

Using the Waterwatch Analysis Chart

Rate the following results in terms of their quality.

Summer Water Quality Results	Thomson River at the narrows	Thomson River at Coopers Creek	Thomson River at u/s of Cowwarr Weir	Waterwatch Rating
Position in the Catchment	**Below Dam**	**Upper**	**Middle**	
Dissolved oxygen mg/l	8.8	9	8.4	
Electrical conductivity uS/cm	53	64	67	
Total phosphorus mg/l	0.006	0.007	0.12	
pH	7.2	6.9	7.7	
Temperature °C	21.5	18	21	
Turbidity NTU	1.7	2.7	1.5	

Source: Vic Waterdata Warehouse

Winter Water Quality Results	Thomson River at the narrows	Thomson River at Coopers Creek	Thomson River at u/s of Cowwarr Weir	Waterwatch Rating
Position in the Catchment	**Below Dam**	**Upper**	**Middle**	
Dissolved oxygen mg/l	10.9	11.3	12.1	
Electrical conductivity uS/cm	68	77	71	
Total phosphorus mg/l	0.06	0.08	0.02	
pH	7.3	6.3	7.2	
Temperature °C	8.5	7.5	6.5	
Turbidity NTU	1.5	7.9	1.7	

Source: Vic Waterdata Warehouse

Extra water quality data collected can be viewed online at the Vic Waterdata Warehouse.
www.vicwaterdata.net

Activities

Graph the data for winter and summer on the same sheet using different colours.

Questions

1. What parameters show the biggest differences between winter and summer?
2. Why might different temperatures be recorded at these three sites?
3. What causes rivers to be turbid?
4. Where can phosphorus come from?
5. Why do we record dissolved oxygen?
6. What is pH and how can it change overtime?

Waterwatch Analysis Chart

Analysis	Meaning of these results			Date	Date	Date	Date
Reactive phosphorous (mg/l)	Reactive phosphorus is the soluble form of phosphate that is readily available. Poor results increase the likelihood of algal blooms. Likely sources of high phosphorus are sewage and industrial effluent, fertiliser, urban and agricultural runoff especially after high rainfall.	<0.008	Excellent				
		<0.020	Good				
		<0.040	Moderate				
		<0.080	Poor				
		>0.080	Degraded				
Turbidity (NTU)	Turbidity is the cloudiness of the water and is the result of suspended material, e.g. soil particles and organic matter including algae. High turbidity values limit both plant growth and fish and invertebrate food sources. Poor turbidity often indicates erosion and soil loss.	<15	Excellent				
		<17.5	Good				
		<20	Moderate				
		<30	Poor				
		>30	Degraded				
Electrical conductivity (uS/cm)	Electrical conductivity can tell us the amount of dissolved salts in the water. A poor rating may indicate potential salinity problems and possibly rising water tables. This only applies to freshwater not estuary conditions.	0–249	Excellent				
		250–600	Good				
		<600	Moderate				
		<1200	Poor				
		>2500	Degraded				
pH (0–14)	The pH rating determines the acidity or alkalinity of the water. The pH scale is logarithmic meaning that a 1 unit change in pH represents a tenfold increase in acidity. Geology and land use can influence pH.	0–6	Acidic				
		7	Neutral				
		8–14	Alkaline				
Water temperature (°C)	Temperature will vary over seasons it will also vary due to bed and bank vegetation and the amount of sunlight able to warm a river or stream. High turbidity can also contribute to temperature rise.						

STUDENT ACTIVITY

A Day in the Gippsland Lakes Catchment

This activity is designed to increase awareness of human environmental impacts on waterways and lakes.
It is a useful introductory lesson to tune students into exploring their ecological footprint on the Earth.
It is designed as a classroom activity for teachers of upper primary and lower secondary students.
This activity is best undertaken with a Waterwatch facilitator.

Materials

Level 4 & 5

- *A Day in the Gippsland Lakes Catchment Participants,* page 105
- *A Day in the Gippsland Lakes Catchment Story,* page 106
- A glass aquarium or similar
- 30 (minimum 24) small film canisters
- Various materials to represent pollution as outlined in the list attached
- Two large glasses

Level 5 extension activity

- Paper towels
- Filters
- Scoops
- Strainers
- Milk cartons with soil to ensure correct disposal of polluted water and clean up

Preparation

1. Label each of the plastic tubs with a character's name from the story. Duplicate containers can be prepared to cater for all of the members in the group if necessary.
2. Place or pour the appropriate materials into each tub in accordance with the list.
3. Distribute the labelled tubs to people in the demonstration. Request that they be careful and keep the container closed until they are told to open it.
4. Fill the aquarium with clear, clean water and place in a prominent, visible and accessible position.
5. Introduce the Catchment Story.
6. Fill one large glass with water out of the aquarium, demonstrate its cleanliness and properties by pouring from one glass to another. Leave the glass aside for comparison at the end of the story.

Acknowledgements

Variations of this activity exist everywhere. This is adapted from a concept by Jane Tinnion and Colin Mondy: www.lwa.gov.au/downloads/edu/catchment_story.doc

Extension activities

Test the water quality with a Waterwatch kit before and after.

Level 5 Treating Waste water.

- How are you going to clean up the water?
- Letting the students know what the pollutants were, discuss the concepts of physical and chemical change.
- Strain and filter the solids. These Items have not caused any chemical change to the water.
- Oil and water don't mix! Remove the oils from the surface by decanting and then absorbing with paper towels or use a milk carton filled with sawdust.
- Pour the water onto the compost heap and let the biological activity or organisms consume the waste.
- To remove the rest of the wastes, try using the solar distiller or dispose of the water to the sewer in order to minimise harm to the environment.

A Day in the Gippsland Lakes Catchment Participants

	Name	Land Use	Substance	Amount
1	Gumboot Farmer	Dairy shed	Green water	1/2 canister
2	Willow Woods	Reserves	Leaves	1/2 canister
3	Lazy Labourer	Forester	Thick muddy water	1/2 teaspoon
4	Barren Barry	Farmer	Salty water	1 tsp salt/ full water
5	Ima Miner	Quarry	Vinegar	1/2 canister
6	Absent Often	Hobby farm	Toilet paper & yellow water	Canister of toilet paper & yellow water
7	Oily Leaker	Recreational boater	Vegetable oil	1/2 canister
8	Sally Skier	Recreation	Cigarette butts	2 in canister plus plastic e.g. bread ties
9	Lazy Litterbug	Tourist	Litter	Ring pulls plastic
10	Bob Builder	Developer	Soil	1/2 canister
11	Steam Turbine	Electricity generation	Hot water	1 canister
12	Joe Homeowner	Home owner	Soil	1/2 canister
13	Lucy Lead-Foot	Motorist	Vegetable oil	1/2 canister
14	Peter Polluter	Industry	Detergent	1 drop in full canister

A Day in the Gippsland Lakes Catchment Story

Introduction

This story is to show how everyone in Gippsland impacts upon the health of our rivers, the Gippsland Lakes and the Coast.

The tank represents the Gippsland Lakes. As the Thomson, Latrobe, Tambo, Macalister, Avon, Mitchell and Nicholson Rivers travel through the catchment, they collect water from rainfall, stormwater, irrigation and industry.
This ultimately ends up in the lakes.

Does everyone know what a catchment is?

Everyone lives in a catchment. It includes all the land drained by these rivers, creeks and streams. Even if you can't see a river near where you live, you are still all linked in a catchment.

Each of you have been given a canister with a name on it. When that name is mentioned in the story you are to empty your container into the lake.

Can anyone tell me some ways that the water we use in our homes returns to our rivers and streams?

In our homes we use water from tanks and reservoirs. Grey water is wastewater we have used to wash our clothes and ourselves. It could be easily used to water our gardens. Mostly it passes into the sewer systems with black water from our toilets and kitchen sinks, which needs bacterial treatment to be safe. All this water ends up at ocean outfalls when we are connected to the sewage systems in towns and cities. Some areas have septic tanks, which can overflow into river systems.

(Take out one glass of water from the container to leave aside for the end of the story.)

Our river begins way up in the hills and mountains; areas like Mt Baw Baw and the Strzelecki Ranges.
It flows down and around hills, places like Noojee and Neerim, Dargo and Heyfield, Maffra and Bruthen, through farms, small urban areas and the big country towns.

We will follow raindrops as they fall from the sky and enter fern covered clean mountain streams and down our rivers, until they enter the lakes. As the water goes down the slopes it gathers speed and enters into farming districts such as Glenaladale and Boolarra. Most of the farmers are trying hard to practice landcare principles. There are some farmers who aren't trying hard enough though. A little stream flows past Gumboot Farmer's **(1)** dairy farm.

Gumboot washes down the dairy yard after milking. Instead of catching the manure in an effluent pond like his neighbours, he lets it run down the hill into the creek.

His neighbour Willow Woods **(2)** looks after the reserve next door. On the banks of her river are Willow Trees. These have all just dropped their leaves, adding lots of nutrients to the water when the leaves decay. Work has been done to remove some of these willows, but there are still many more. These added organisms use up the oxygen in the water, making it difficult for macroinvertebrates to survive. The willows have also changed the river channel shape.

In another part of the catchment, a clear mountain stream gathers momentum as the rain falls heavily. Water pours across the recently opened logging coupe. Lazy Labourer **(3)** didn't pay attention to the Code of Forest Practices and has poorly constructed the drainage on this site. Muddy water from access tracks flows down the slope and stains the water orange with clay sediments.

As the water passes Barren Barry's **(4)** farm, salt enters the river. This is because trees have been removed and they no longer intercept ground water. The water table has risen close to the surface. It has brought up salt from old marine rocks below.
Salt makes it difficult for plants to grow, leaving exposed soil, so some more sediments wash in too. His next-door neighbour has planted lots of trees and the problem isn't half as bad.

Ima Miner **(5)** mines for sand up the hill from here. The mine pumps water out of the river to clean the sand and the equipment. It then drains back to the river. This waste includes acids, which all drain back into the river.

Slowly the river starts to wind its way through the outskirts of a major town, like Warragul. Out here there are a number of weekenders. People like Absent Often **(6)** come to stay out in the country on the weekend to get away from the hustle and bustle of the city. Their holiday houses on these farms are not connected to the sewerage system; they have septic tanks. The septic system sometimes overflows and raw sewage enters the river.

Up on the river some people are boating.
Oily Leaker **(7)** has not looked after her boat.
Oil is leaking from the engine directly into the river.
Sally Skier **(8)** has thrown her cigarette butt in the water before she sets off for another ski. Not only is this harmful to the animals, but what do you think about the appearance of the water?

A Day in the Gippsland Lakes Catchment

Down the near the Tambo Mouth tourists are on a river tour. Lunch is provided and people like Lazy Litterbug **(9)** don't see the need for bins. She is just throwing empty drink cans overboard, and watching them float away.

The river is now passing by the urban areas of the bigger country towns like Bairnsdale, Sale and Traralgon. Bob Builder **(10)** is busy putting in new subdivisions to catch the recent property boom. The development of housing has removed the protective vegetation from the soil.
More sediment enters the river.

All these extra homes need electricity. Steam Turbine **(11)** and his team at the power station boil the water, the steam turns the turbines to generate electricity. The water is cooled in big cooling towers, but enters the river at a warmer temperature. This lowers the oxygen level, making it hard for fish to breathe.

In the newly finished subdivision down the road, Joe Homeowner **(12)** has not yet started his garden. The original trees have been removed and when it rains the top layer of soil is eroded, and adds to silting up the river. He also walks his dog. When it rains, the poo is washed off the footpath into the stormwater drain and into the river.

People like Lucy Lead-Foot **(13)** are heading home to the suburbs. Oil drips out of Lucy's engine, and her excessive speed and constant breaking leaves rubber on the roads. Oil and rubber are washed off our streets into stormwater drains and then into the river as pollutants, all reducing our water quality.

Our poor water is really starting to look very sick now!

But it hasn't reached the lakes yet!

Out of Traralgon are some industrial areas.
Peter Polluter **(14)** is one of the industry owners that uses detergents to keep equipment clean. He sometimes hoses out the factory, allowing the water and detergent to wash into the stormwater system. In this industrial detergent are phosphates, which can cause algal blooms in the river. Blue Green Algae is poisonous to humans and other animals.

Now the rivers are entering the lakes. (Using a glass, pretend to drink the water). Compare it to the original water in the glass, and ask the students which they would rather drink. Look at what we have done to the water in our river. Look at how dirty it looks and it doesn't smell too good either. Could you imagine being a fish and living in that water or a plant trying to grow?

(If possible give people a closer look.)

Conclusion

Ask students how we can reduce our impact on the Gippsland Lakes?

Here are some suggestions:

- Use compost as a mulch to reduce watering, and as a fertiliser for plants
- If you have to use chemicals, use less toxic ones and dispose of them safely
- Don't put items down the toilet or down the sink, as it can clog up the sewerage system
- Wash dishes in the sink rather than in the dishwasher. It uses less water, energy and detergents
- Take a plastic bag when you are walking your dog
- Keep waste out of the stormwater drain, e.g. litter, grass clippings
- Join a community group. Plant trees along the riverbanks to reduce the amount of soil being washed into the river
- Don't litter, and pick up rubbish when you see it so that it doesn't go down the stormwater drain and into the river
- Plant native trees and shrubs to enhance suburban and rural biodiversity
- Try companion planting to deter pests. Most insects, however, are helpful to the plants

There are so many things we can do to reduce the pollution in our rivers and streams and improve the health of the Gippsland Lakes.

Features of Our Estuaries

This aim of this exercise is to introduce the features of estuaries and the measurable physical parameters of water.

Materials

- Thermometer
- Measuring stick
- Secchi disk or weighted object on string
- Paper
- Pens

Precautions

Only undertake this activity at safe depths, and beware of changing tides when entering estuaries. Refer to OH&S page for further safety advice.

Learning methodology

Mapping

1. Students should create a sketch map of the creek, estuary, and the river mouth using approximate scales and direction. The map should note any obvious features such as steep sides of the creek, sand dunes and deep and shallow water
2. The map should also show the sites that will be tested, and could also include any obvious changes in coastal vegetation. What might influence the changes in plants?
3. If possible, using the measuring stick, have children walk across the estuary, measuring the depth changes. This activity can be done twice, once near the river mouth and further in the estuary. This data can be transferred to graph paper. What contributes to the shape of an estuary?

Temperature

1. Using the thermometer, compare the temperature of the water at three sites, one upstream one in the estuary and also the temperature of seawater. These sites could also be tested for salt levels.
2. In the estuary, compare the temperature at three different depths. What may contribute to different temperatures?

Turbidity

1. At the three different sites, use the secchi disk or weighted object to record the depth at which it disappears from view. Which site has the clearest water, what could contribute to the differences?

Extension activities

- An electrical conductivity (EC) meter could also be used to look at the changes in salinity across the same sight

Investigating Rock Pools

This aim of this exercise is to investigate the features of cunjevoi (sea squirt) to determine if they are living or non-living, plant or animal.

Materials

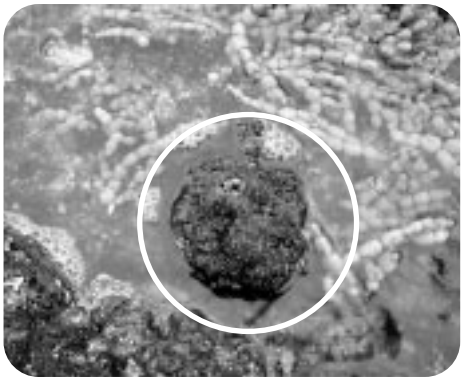
- Paper
- Pens
- Stopwatch

Precautions

Only undertake this activity at safe depths, and beware of changing tides when entering estuaries. Refer to OH&S page for further safety advice.

Learning methodology

1. Locate a rock pool containing cunjevoi.
2. In a group no greater than five, sit the students around the pool pointing out the cunjevoi.
3. Ask the following questions, encouraging discussion:
   a. Is it alive or dead?
   b. Is it a plant or animal?
   c. How is attached to the rock?
   d. Is it one animal or many?
   e. How does it eat?
   f. Is it a predator?
   g. Is it a scavenger?
4. Watch to identify the behaviour of the cunjevoi.
   a. If it is spitting, why is it doing this; for protection, to attack, to attract food?
   b. Time the cunjevoi, how often does is spit?



Extension activities

- The Marine Education Website has a fact sheet on cunjevois for further information: www.mesa.edu.au/friends/seashores/p_stolonifera.html

Word Find

Circle each letter of the words from the word list below. Don't forget to cross words off as you find them!
Remember, words may be found horizontally, vertically, diagonally or even backwards!

To answer the question below, start in the top left corner of the grid.
Working left to right, and top to bottom, list all uncircled letters in the space below.

As you find each word, define its meaning on a separate sheet.

B	E	I	S	T	N	E	I	R	T	U	N	E	L	Y
T	L	N	N	W	A	T	E	R	M	E	N	A	R	M
R	A	U	I	L	O	N	I	T	P	I	K	A	M	A
E	M	R	E	R	E	O	R	A	L	E	U	L	E	C
T	A	W	W	G	A	T	C	A	W	T	A	L	G	A
A	N	T	E	I	R	M	S	E	S	R	Q	A	A	L
W	G	U	A	L	N	E	L	E	I	T	Y	F	L	I
M	R	A	N	D	T	L	E	R	H	E	H	N	I	S
R	O	E	A	H	I	P	L	N	E	L	T	I	T	T
O	V	H	C	N	O	O	F	A	A	F	O	A	R	E
T	E	A	G	W	U	R	G	R	T	L	I	R	E	R
S	E	T	L	E	A	T	W	A	T	R	G	U	E	R
B	O	E	B	U	N	E	R	O	N	G	O	A	Q	W
N	T	P	R	O	M	O	N	T	O	R	Y	B	E	A
T	F	L	O	O	D	P	L	A	I	N	A	Y	E	S

AQUIFER
BEACH
BLUE GREEN ALGAE
BUNERONG
CAPE
ESTUARY
FLOODPLAIN
INLET
LAKE WELLINGTON
LATROBE
MACALISTER
MANGROVE
MEGALITRE
MARINE
NUTRIENTS
POWLETT
PROMONTORY
RAINFALL
SALINE
STORMWATER
TARWIN
WATER

Question: What do waterwatch volunteers do?

Answer: Monitor water quality and the health of our great waterways