STAGE 4 GEOGRAPHY

Platypus Creek

FOCUS AREA - Water in the World

Outcomes explored

A student:

- Explains how interactions and connections between people, places and environments result in change GE4-3
- discusses management of places and environments for their sustainability GE4-5
- acquires and processes geographical information by selecting and using geographical tools for inquiry GE4-7

Key inquiry question

- Why does the spatial distribution of water resources vary globally and within the countries?
- How do natural and human processes influence the distribution and availability of water as a resource?
- What effect does the uneven distribution of water resources have on people, places and environments?
- What approaches can be used to sustainably manage water resources and reduce water scarcity?

Content focus

Students:

- Examine water as a resource and the factors influencing water flows and availability of water resources in different places
- Investigate the nature of water scarcity and assess ways of overcoming it.
- Discuss variations in people's perceptions about the value of water and the need for sustainable water management

Content:

- Water Resources
- Australia's water resources
- Water scarcity and water management

Australian Syllabus Links:

- ACHGK037
- ACHGK039
- ACHGK040

Platypus

PLATYPUS CREEK ESTATE ACTIVITY

Congratulations, you have inherited a local hobby farm on the Central Coast with a 15-acre vegetable plot from a long lost relative along with $150,000! The property has a small creek called Platypus Creek running on its boundary that provides habitat to some local species of fish, amphibians and birds.

Some important facts about the property and the region:

- The property is relatively flat with some trees along the creek bank and a few small shrubs and grass over-growing on the farm.
- The average rainfall in the area is 700mm a year with temperatures that can range from 10 °C in the winter to 40°C in the summer.
- Platypus Creek is a slow running creek that is one meter wide and one meter deep when full. Over the past five months the water level has dropped by 20% due to lack of rain.
- Currently the region is entering drought with only 60mm of rain falling over the last five months and summer is fast approaching.
- The property has no running water since it has been abandoned for over 50 years. Town water has never been connected to this property.
- This region in NSW is known for a loamy soil - great for growing vegetables!

Your goal is to turn this property back into a functioning hobby farm growing your choice of vegetables. A map of your property has been supplied to you along with a hydrological map to show you any aquifers that reside within your 15 acres. The property has obtained a water access license from NSW State Government that allows extraction of water from streams, creeks and underground aquifers. The money you inherited will allow you to invest in a water supply system and irrigation. The aim is to make this farm water secure for the future.

The Central Coast faces similar situations with water being sourced from:

- Woy Woy Borefield (during drought conditions)
- Wyong River
- Mooney Mooney Creek
- Ourimbah Creek

This activity will provide some insight on the complexity of water accessibility and the effect it can have on the community if not properly managed.

Step 1 Choose which vegetable type you plan on growing. The profits are based on the total cost of planting, maintenance, harvesting and yield per acre.

Step 2 Choose which water supply system you want to purchase.

Step 3 Choose which irrigation method you think is best.

Step 4 Purchase a water storage unit if you think it will be advantageous to your farm.

It is up to you if you want to have a mixture of different systems. You must stay within your $150,000 budget and need to hit your water requirements for your vegetable.

1. Choose Your Vegetable

Vegetable	Water requirements for five months grow time	Profit after harvest
Onion	10 megalitres (ML)	$4,200
Capsicum	6 ML	$3,500
Zucchini	8 ML	$7,000
Sweet Corn	12 ML	$8,500

2. Choose Your Water Supply

Water Supply Options	Supplier of Water	Cost Installation	Water Available/ storage	Cost of Water Per Mega litre
Bore	NSW Gov	$6,000	1.2 ML/day	$9
Rain tanks (storage)	Free	$22,000	0.35 ML holding tank	$ 0
Turbine pump (stream)	NSW Gov	$6,000	0.5 ML/day	$9
Town water (Treated)	Central Coast Council	$10,000	0.1 ML/day	$2,290

3. Choose Your Irrigation

Irrigation type	Cost/ Installation	Water total output
Pivot sprinklers (70% efficient)	$8,000	1 ML/day
Surface irrigation (80% efficient)	$22,000	16 ML/day
Drip (90% efficient)	$25,000	1 ML/day

4. Choose Your Water Storage

Storage Size In ML	Cost/ Installation
16 ML	$10,000
25 ML	$16,000
35 ML	$22,000

Purchase Log

Irrigation Type & ML	x	5 months (~150 days)	=	Total ML	Irrigation Cost
	x	150	=		
				+	+
	x	150	=		
				+	+
	x	150	=		
				Total	Total

Water Supply	x	5 months (~150 days)	=	Total ML	Water Supply Cost
	x	150	=		
				+	+
	x	150	=		
				+	+
	x	150	=		
				Total	Total

Water Storage	x	Number of Tanks purchased	=	Total ML	Water Storage Cost
	x	150	=		
				+	+
	x	150	=		
				+	+
	x	150	=		
				Total	Total

Terms	Description
Bore	To access underground water in an aquifer a bore is drilled. The water is then pumped to the surface for use.
Rain Tanks	Large tanks that collect the rain water from roofs of buildings.
Turbine pump (stream)	This is a pump that is commonly used in rivers and streams to pump water out to homes or businesses.
Town Water (Treated)	Water that has been through the full treatment process and is considered "potable" or drinkable once it arrives at your home.
Pivot sprinklers	Sprinklers attached to a pivot point where they go around in a circle using sprinklers to spray out water.
Surface irrigation	Water is pumped into channels between the crops allowing water flow through the field.
Drip irrigation	Is a process where pipes with small holes have been laid throughout the field so that water can slowly drip out and be absorbed into the ground.
Megalitre (ML)	A Megalitre is equivalent to one million litres. It is expressed as (ML)

PLATYPUS CREEK ESTATE ACTIVITY

Teacher Debrief Q&A Ideas

1. Each group should explain to the class which crop they chose, which type of water sources they used and why, along with the irrigation type selected.
2. Collect all the individual maps from the students (after the presentation about their property). On the whiteboard place the properties in the correct order to make one long map showing the stream and aquifer that is passing through all the properties.
3. The connection to other properties should be used to drive conversation about how resources will be affected when everyone shares and utilises the same water supplies. The below questions can be used to structure this class discussion.

- **What type of water source was the most used? Why?**

  This question pertains to the entire 8 maps joined together to create a holistic view of which types of water sources were used. Get one answer from each group to compare their reasoning.

- **What were the reasons for choosing the water sources on your property?**

  Student's decision-making process on what water sources they chose is the focal point. Inquire if was money, location of water source, sanitation etc.

- **How can your neighbour's water use affect your farm in the future?**

  After looking at the combined map of all the properties, ask the students their concerns now on water security for their property.

- **How did the prices for irrigation affect your decision?**

  Was money a concern when choosing an irrigation option or did the student look at what you believed was the most efficient delivery method of water to their crops?

- **How do you think your farm will survive over the next 10 years if there is no change in how others use water?**

  This question is to have the students look at the long-term impacts of their water usage and the community around their property.

- **At an instant the stream contains approximately 0.66ML for all eight properties bordering it. What could happen if everyone uses the stream as their primary water source?**

  Lowering the water level in the creek too much can change the ecosystem. Local plants, fish, mammals and insects that also utilise the creek may not have enough water to survive. Further down the creek other people may also rely on this water.

- **Currently on the Central Coast water is a very valuable resource. What water sources are currently being used to meet the needs of the community?**

  Currently Water is being harvested from the Wyong River, Ourimbah Creek, Mooney Mooney Creek and Mangrove Creek. Water is being stored at Mangrove Dam, Mardi Dam and Mooney Mooney Dam before being treated at either Mardi Water Treatment plant or Somersby Treatment Plant. Woy Woy bore fields are the main borefields used to access underground aquifers (during drought only).

- **Why is it important to have rules and regulations on how much water is harvested?**

  A lack of regulations on water harvesting could result in extreme water shortages, especially during drought. Other impacts include ecological damage, economic collapse, increase cost of food and displacement of communities.

Extension Questions

1. **What are some of the factors that determine how long it takes for an aquifer to replenish itself?**

   Aquifers replenish at different rates due to soil types, gradient of the land, rainfall, recharge areas and location. There are lots of variables. One-way scientists determine how water flows underground is by placing sampling bores in the area. This website is a good link to learn more about aquifers: https://www.usgs.gov/special-topic/water-science-school/science/aquifers-and-groundwater?qt-science_center_objects=0#qt-science_center_objects

2. **Pumping water from streams and creeks can change the ecosystem for fish, birds, amphibians, insects and plants. Investigate the concerns for over harvesting water from streams.**
   This topic will require some extension research due to the complexities.

   This is a good link to Water Quality and River Flow Objectives for healthy rivers in NSW: http://www.water.nsw.gov.au/__data/assets/pdf_file/0003/548076/policy_advice_11-waterqualitymanagement.pdf

Teachers Notes:

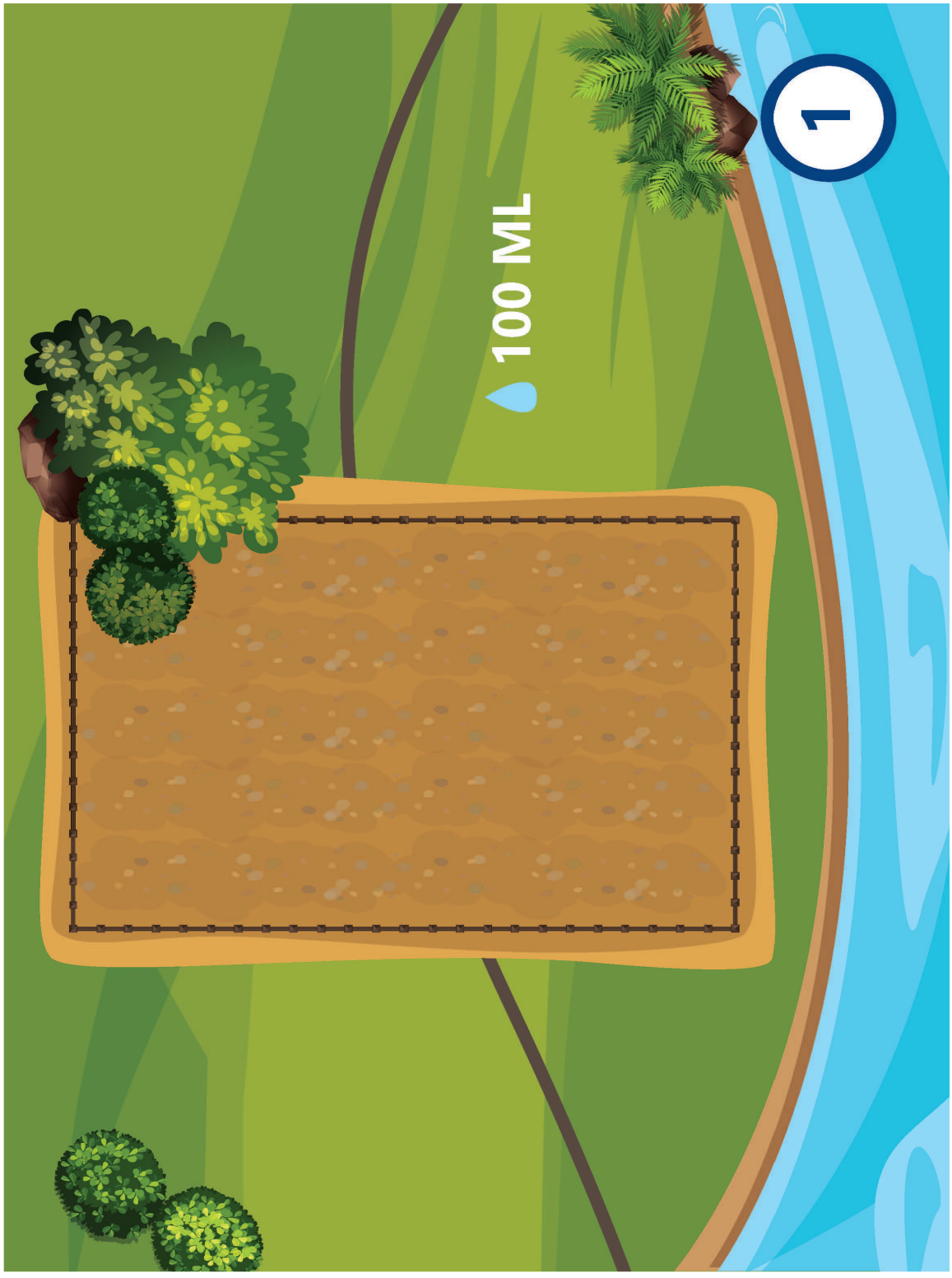
Central Coast Council responsibility: The water supply on the Central Coast is managed in three parts. Long term planning and water strategy for the Central Coast; operation and maintenance of the dams and weirs; and treatment plants. Council also manages the day to day delivery of water and sewerage services in the local government area.

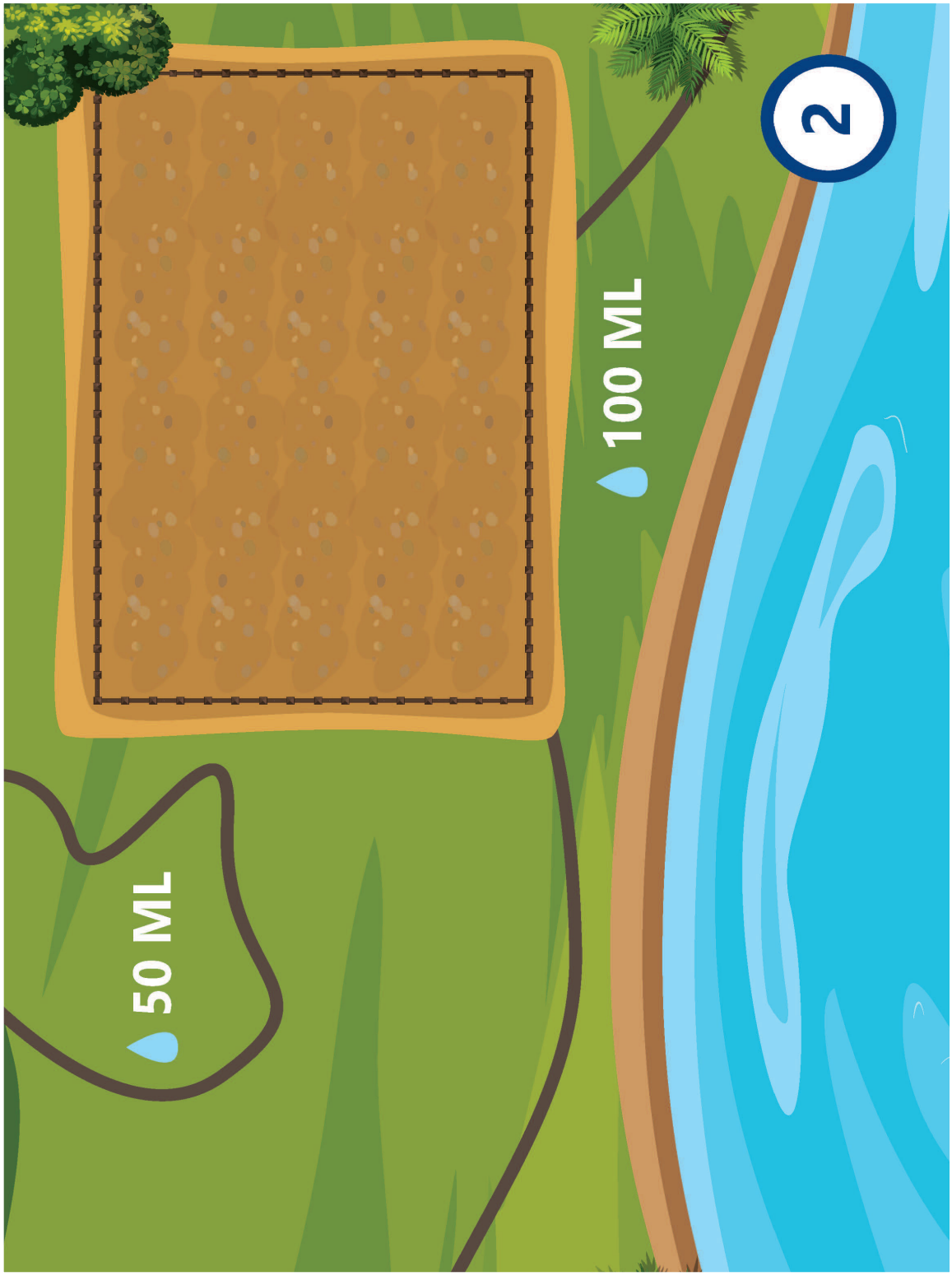
NSW State Government responsibility: Department of Industry is responsible for surface and groundwater management including ensuring water security for NSW. They ensure the equitable sharing of surface and groundwater resources and that water entitlements and allocations are secure and tradeable. They manage NSW water resources through planning, policy and regulation. Department of Industry also leads negotiations with the Commonwealth, including the Murray-Darling Basin Authority and other jurisdictions.

Mangrove Mountain Dam wall

PLATYPUS CREEK ESTATE

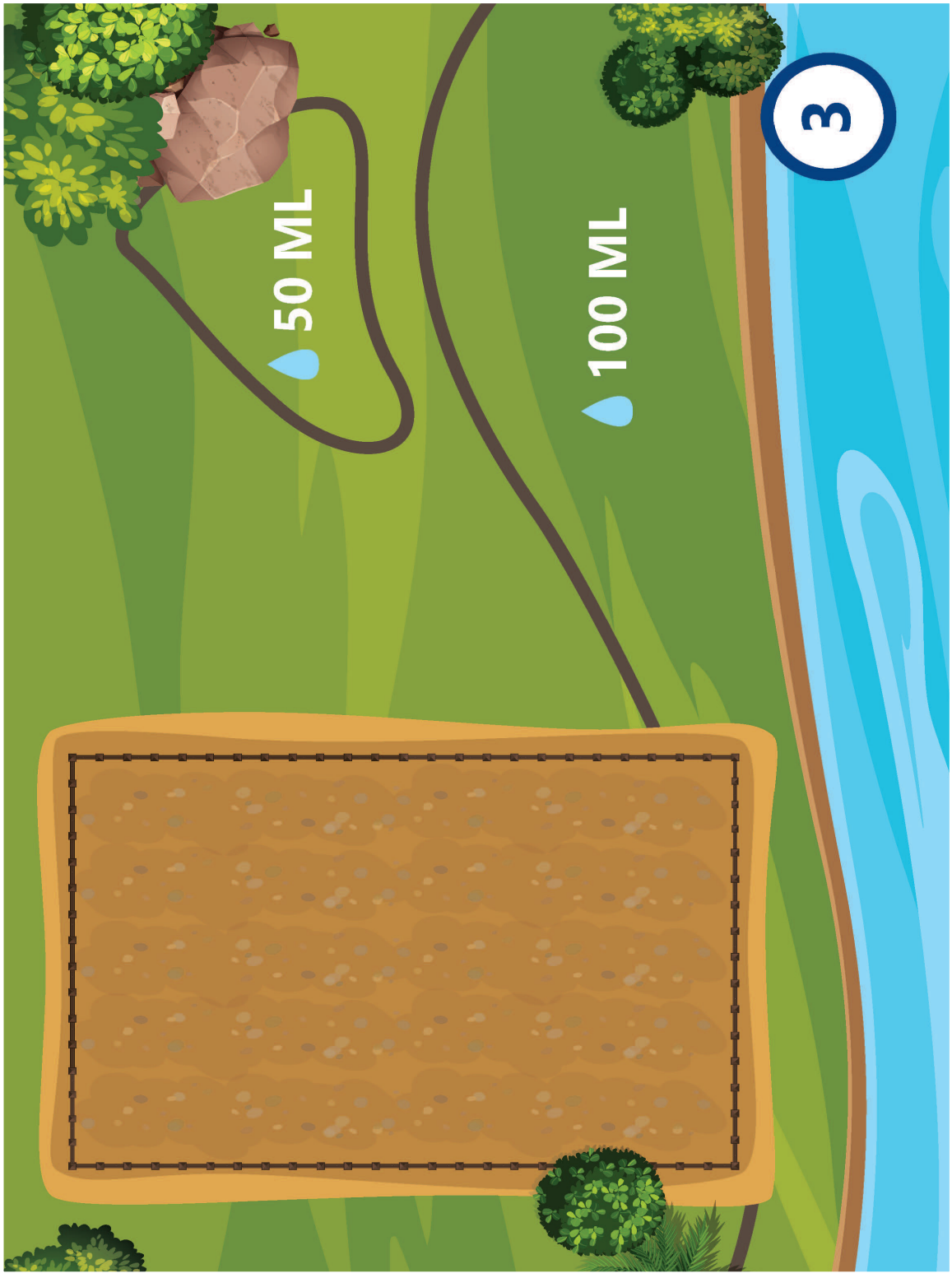
ACTIVITY

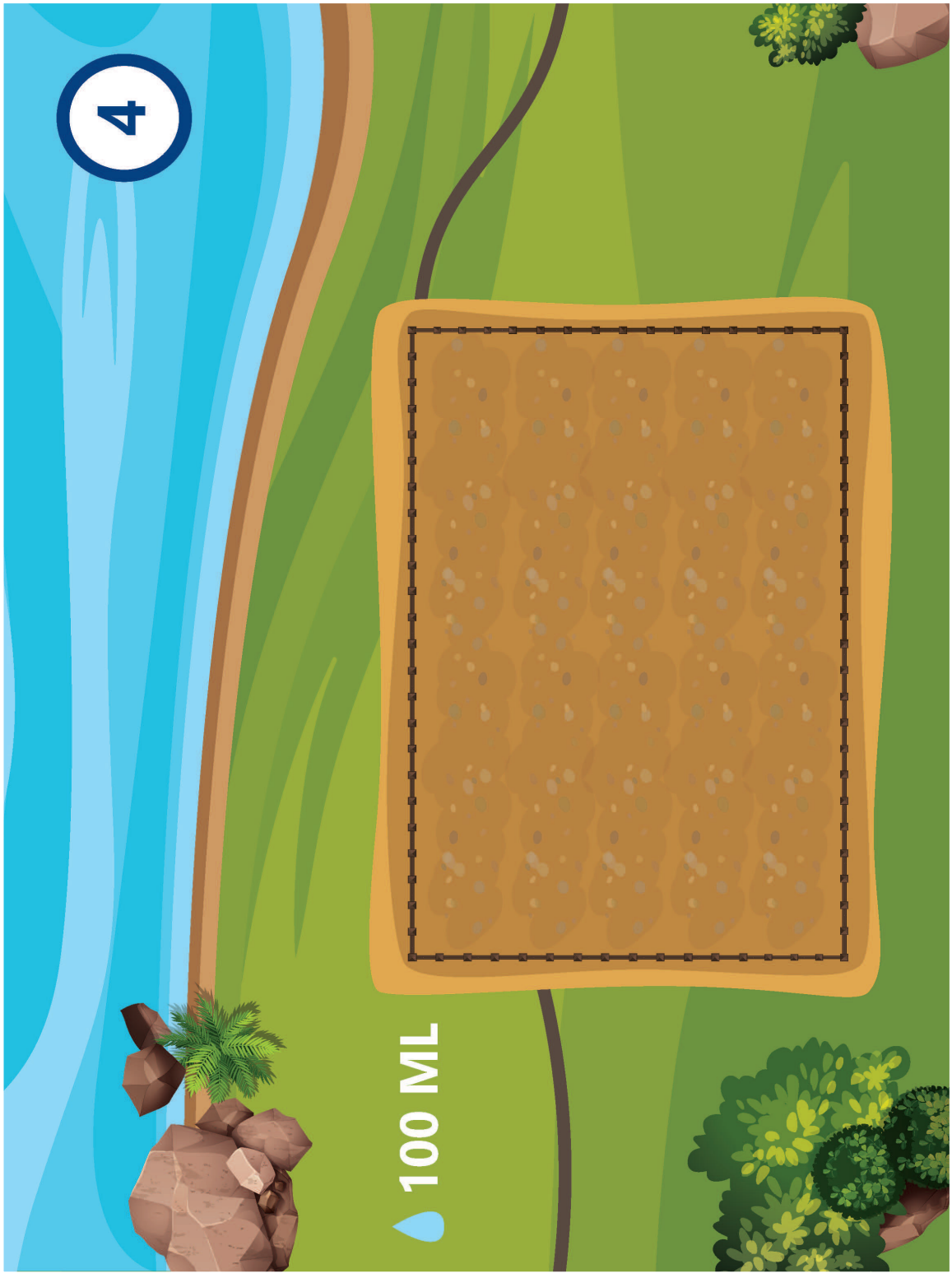



2
100 ML
50 ML

PLATYPUS CREEK ESTATE

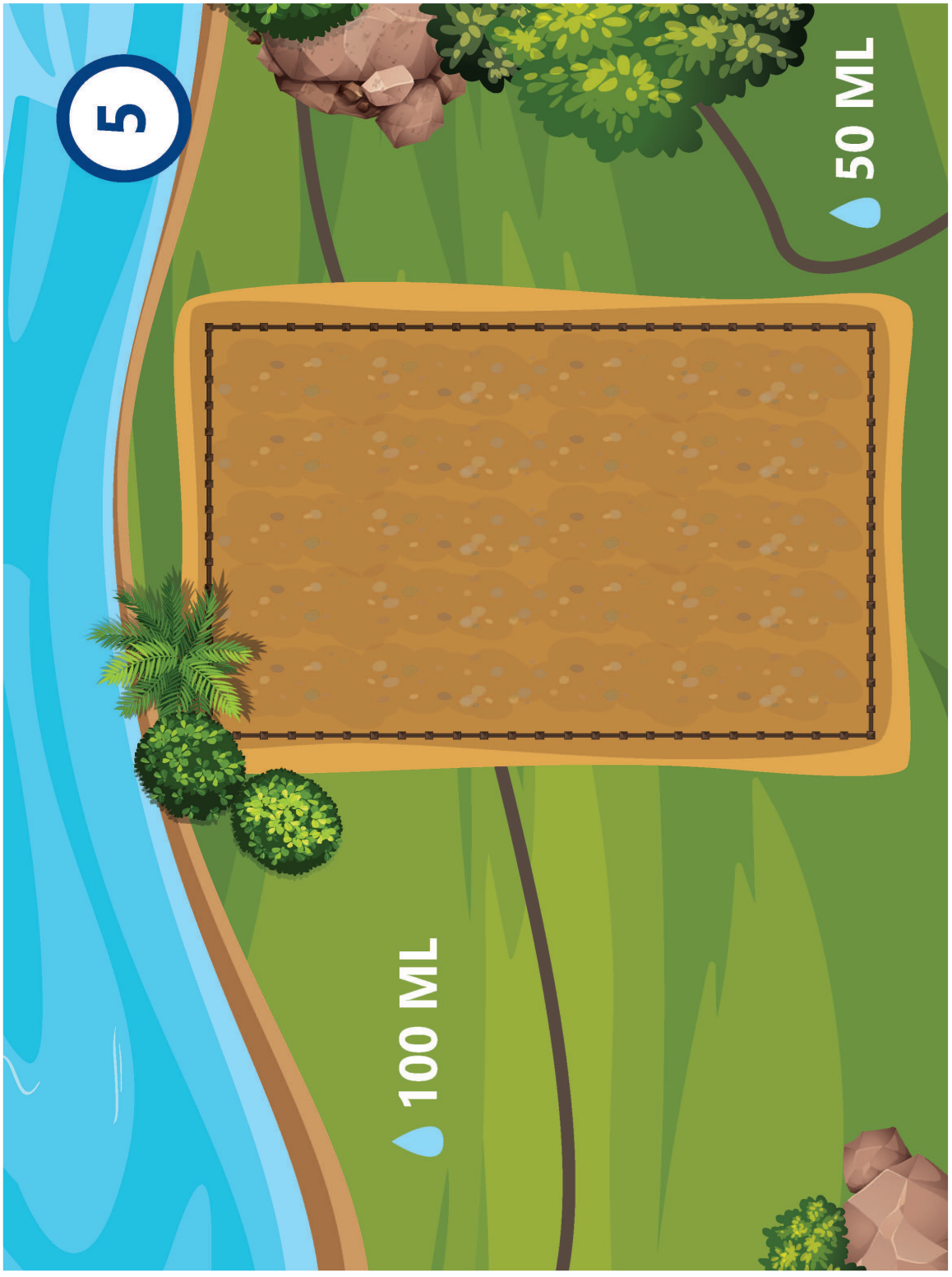
ACTIVITY

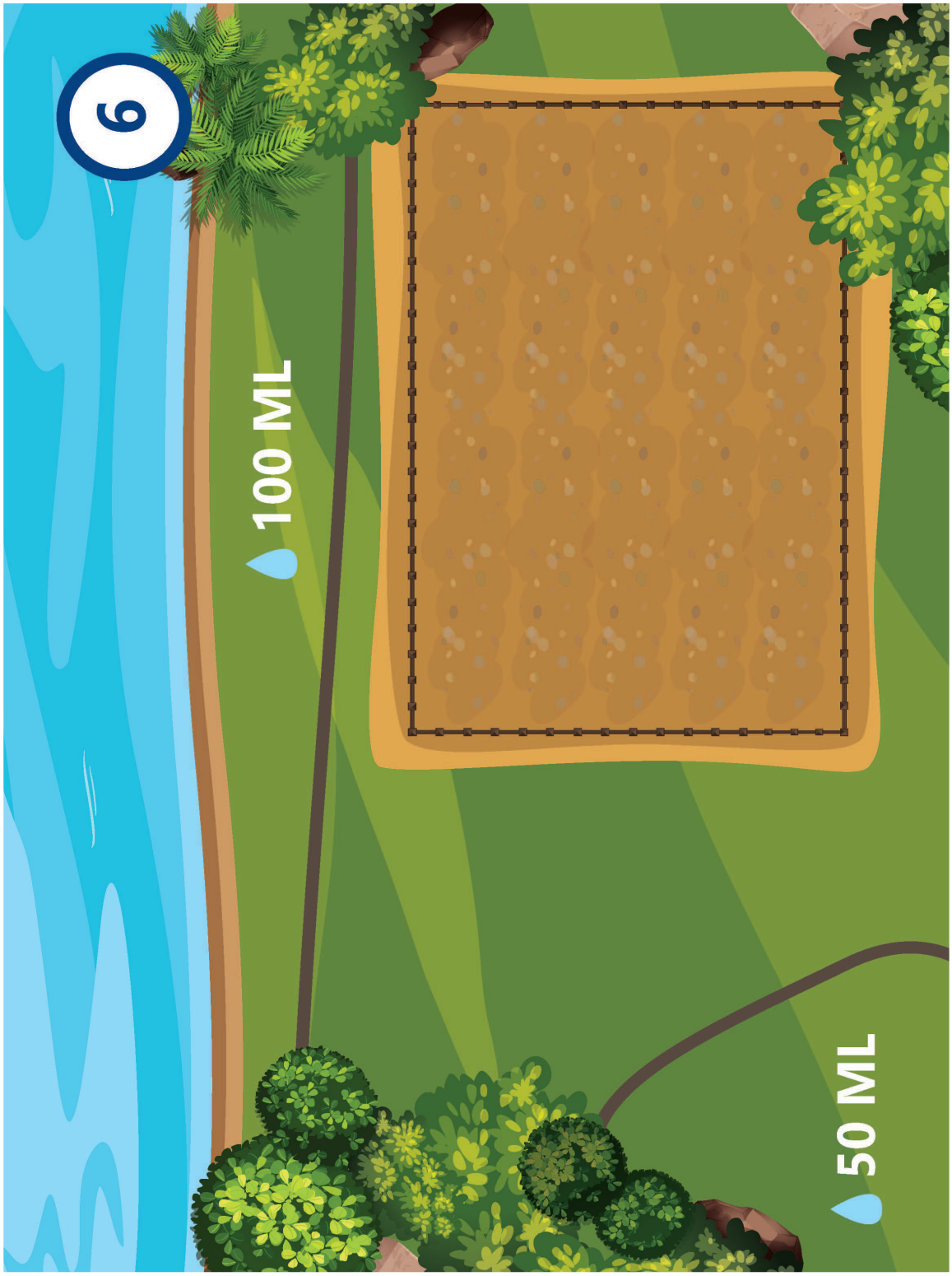



4
100 ML

PLATYPUS CREEK ESTATE

ACTIVITY




6
100 ML
50 ML

Vegetables
Surface Irrigation
Pivot Sprinklers
Drip Irrigation
Town Water
Bore
Turbine Pump
Rain Tank
Aquifer (MegaLitres)

PLATYPUS CREEK ESTATE MAP

Teacher Key