



## Wonderful Wiggly Worms

Interactive Worm Activities

LandLearn  
Department of Primary Industries

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## A Sustainability Education program of the Department of Primary Industries.

This booklet was compiled by Jenny Pettenon, Education Officer LandLearn (2001), updated in 2007 with input from Emma Wood and Jennifer Bate of La Trobe University and by the LandLearn team (2008).

### LandLearn aims to:

- Engage students in active, experiential learning which can include on-going participation in community environmental management projects
- Encourage and support the incorporation of studies about sustainable agriculture and natural resources management into schools' curricula
- Provide support for teachers and school communities through professional development, current learning and teaching resources and student activities that make learning fun
- Promote partnerships between schools and community groups, such as Landcare, and between urban and rural school communities.

### Key messages

Caring for our land and its resources is a shared responsibility. Learning and action now is an investment in a future with:

- A sustainable environment
- Quality food and natural fibres produced by farmers using responsible practices
- Viable rural and regional communities
- Challenging, valued and purposeful careers and employment in agriculture-based industries.

### Support for schools

Visit the LandLearn website: [www.landlearn.net.au](http://www.landlearn.net.au)

As a provider of curriculum resources and support, LandLearn works in the context of a holistic, integrated approach to environment education. Schools can adapt the learning activities and teaching resources to suit their particular curriculum structure, pedagogical approach and learning themes. Sustainability and the environment, including sustainable agriculture as the source of food and natural fibre, can provide an integrating framework for the implementation of the Victorian Essential Learning Standards.

Principals, Curriculum and Professional Development Coordinators and teachers are invited to contact LandLearn to discuss the support LandLearn offers to schools, including professional development and fieldwork. Themes we can assist with include sustainable agriculture as the source of food and natural fibre, school gardens (especially edible ones) as learning environments, landcare, natural resource management, biodiversity in a range of landscapes, all underpinned by the principles of sustainability education.

LandLearn teaching and learning resources aim to support transformative learning that will empower students to take responsibility for their actions and for behaviour change to contribute to a sustainable future. The resources include activities to encourage students as individuals, and whole school communities to participate in local community action and projects to support relevant local and regional management plans.

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*This Educational Resource provides teachers with an opportunity to learn more about worms and integrate the topic of worms into the classroom. This resource is developed for upper to middle primary students, however can easily be adapted for lower levels*

# Introduction

Worms belong to a group of Invertebrates (animals without a back bone) called Annelids. Annelids are segmented animals, without a back bone. If you take a close look at earthworms you will notice hundreds of tiny rings which make up its body. These tiny sets of rings are called segments. An earthworm can have up to 200 segments on their bodies which grow up to around 10 cm in length.



Although both ends of worms appear to be the same, they do actually have a head and a tail. The head is characterised by its slight pointedness in comparison with the round tail. Though they do have a head and a tail, earthworms have no eyes, ears or noses. However, worms do have mouths, which they use to eat soil and other matter. Even though worms don't have eyes, they are extremely sensitive to light. They have light sensitive cells located near their head. Two or more hour's exposure to light will generally kill them. Worms often come up to the surface at night to mate, especially in spring and summer. The light sensitive cells enable worms to detect when it is night or day.

The band that covers several segments on the worm's body is called the clitellum (collar or saddle). It is slightly raised and paler in colour than the rest of the worm's body. The clitellum is also an indicator of which end is which, as it is closest to the head of the worm. This band is where the worm's reproductive organs are. Worms are hermaphrodites – they have both male and female reproductive organs – but have to mate with another worm to produce fertile eggs. The eggs are produced in a protective cocoon. Each cocoon can contain one or more eggs. In ideal conditions, a mature worm can produce up to 1500 young in a year.

Worms have two sets of muscles. Each segment contains a muscle which enables the worms to lengthen. The other muscle runs lengthways through the worm's body. The contraction and relaxation of these muscles enable the worm to move forward and burrow into the soil; creating the wiggling motion. Worms also have tiny bristles, called setae, on the outside of their bodies to help them move.

If you have ever touched a worm you would have noticed that they are slimy. The slime also helps worms to move through the soil easily. Slime also enables worms to breathe. Worms, just like humans, breathe oxygen; however, they don't have lungs. Worms breathe through their skin. Oxygen is absorbed through the moisture provided in the slime and then passes into the bloodstream and pumped around their body by five different hearts. If their skin gets dry they can't breathe and they die, which is why worms don't like dry soil or sun. The slime is produced by glands in their body. If you have ever been outside on a rainy day you may notice worms wriggling around on the surface. This is because when it rains, the tunnels the worms have made become filled with water, stopping the worms from getting any oxygen. They travel to the surface in order to breathe.

Worms are active animals that feed on organic material in the soil deposited by plants and other animals. They can eat half their body weight in food each day. Worms form burrows as they eat their way through the soil. The leaf litter and other materials that they digest are rich in minerals and nutrients such as calcium, nitrogen, potassium and phosphorus. Their droppings, called castings, are rich in these minerals and are mixed through the layers of soil as the worm eats releasing valuable nutrients for absorption by plants. Worms provide a rich and natural source of fertiliser for the soil. The burrowing earthworms not only mixes layers of soil, but it also helps to aerate the soil and provide valuable channels for rainwater to carry redeposited minerals to plant roots.

# Facts about worms

- Most of the earthworms found in gardens and farms are European and were introduced with potted plants in the early days of Australian white settlement.
- Native worms are found in natural bushland.
- Australia's longest worm is the Victorian Gippsland Giant worm, which is about 100cm long. It stretches to 2 metres long when it is relaxed. The garden worm is about 10cm long.
- Worms require air to live. They try to escape waterlogged soils (for example, after heavy rain) by going to the surface.
- Worms have both female and male parts – they are hermaphrodites.
- Worms possess two sets of muscles for moving and burrowing. One set of muscles is circular and wraps around the worm while the other set is horizontal and along the length of the worm. Contraction and relaxation of these muscles enable the worm to move forward or burrow into the soil.
- In Australia there are about 350 types of worms, around 270 of which are native to Australia.
- All worms feed on organic matter.
- Worms eat up to half their own body weight everyday.
- Worms will tolerate a range of temperature from 10° C to 30° C but prefer to be at or above room temperature.
- Food passes through worms in 24 hours and is digested into the form of castings.
- Under ideal conditions, one mature worm can produce up to 1500 young in a year.
- Worms normally live 2 to 3 years under favourable conditions, but healthy worms up to 15 years old have been recorded.
- Worms have been around for 600 million years.
- Worms detest light – two or more hours exposure to sunlight will generally kill them.

# What are worms good for?



Earthworms churn the soil, forming air pockets for plant roots.



Earthworms make mazes of tunnels which helps soils and plants to absorb water more easily.



Earthworms influence the soil pH.



Earthworms' waste is called worm castings, which contains lots of goodies for plants.



Earthworms enhance the growth of useful bacteria in the soil, which help plants grow.



Earthworms compost organic matter and turn it into food for plants.



Earthworms provide fisherman with free fishing bait.

## Acknowledgments

The activities in this booklet have been adapted or taken from the following sources:

- **Kids for Landcare.** Wormwatch, Education Department of South Australia (1992)
- **Let's Find Out** . Journal of the Science Teachers' Association of Victoria for Primary Teachers 17:(1,2,3) 2000
- **Our Land, Landcare Activities for Upper Primary.** Department of Natural Resources and Environment (1989)
- **Pride in Victorian Farming.** Department of Natural Resources and Environment
- **Soil Magic - Landcare Activities for Middle Primary.** Department of Natural Resources and Environment (1989)
- **The McGraw-Hill Big Book of Science Activities.** Robert W. Wood, McGraw-Hill (1999)

## Victorian Essential Learning Standards Curriculum Connections for Wonderful Wiggly Worms

Strand	Physical, Personal and Social Learning				Discipline-based Learning								Inter-disciplinary Learning			
	Health and Physical Education	Interpersonal Development	Personal Learning	Civics and Citizenship	The Arts	English	Humanities - Economics	Humanities - Geography	Humanities - History	LOTE	Mathematics	Science	Communication	Design, Creativity and Technology	Information and Communications Technology	Thinking Processes
<b>Activity 1 – Worm Maze</b> Students design, conduct and report on simple experiments investigating the ability of worms to navigate through a maze in search of a 'reward'.		2										2, 3	2	2		
<b>Activity 2 – Worm board game</b> Students design, create, evaluate and play a worm-themed board game.		2			2									2, 3		
<b>Activity 3 - Make your own worm</b> Students make a worm and then use it to illustrate facts about worms in a short dramatic presentation.					2								2, 3			
<b>Activity 4 – Building a worm farm</b> Students build a worm farm for the classroom.												1, 2				
<b>Activity 5 – Building a worm farm in a jar</b> Students build a worm farm in a jar to observe the role of worms in soil.												1, 2				

The most applicable Domains for each activity are indicated by the Levels.

	Strand	Physical, Personal and Social Learning				Discipline-based Learning							Inter-disciplinary Learning				
	Domain	Health and Physical Education	Interpersonal Development	Personal Learning	Civics and Citizenship	The Arts	English	Humanities - Economics	Humanities - Geography	Humanities - History	LOTE	Mathematics	Science	Communication	Design, Creativity and Technology	Information and Communications Technology	Thinking Processes
	<b>Activity 6 – Counting earthworms</b> Students count earthworms at different sites to see where earthworms prefer to live.											2, 3					
	<b>Activity 7 – Worm castings vs. Artificial fertilisers</b> Students investigate if worm castings make grass grow faster and healthier than artificial fertilisers do.											2, 3					
	<b>Activity 8 - Worm investigations</b> These simple worm investigations enable students to learn more about the wonderful world of worms!		2									2, 3, 4					
	<b>Activity 9 - Worm worksheets</b> Students extend and consolidate their understanding of worms					2					2						

The most applicable Domains for each activity are indicated by the Levels

## Victorian Essential Learning Standards

*Wonderful, Wiggly Worms* can be used to address a range of Victorian Essential Learning Standards at different levels. The following tables indicate the standards that each activity most addresses at each level. The activity to which each standard applies is represented by its activity number as shown below.

### Key to activity numbers

1. Worm Maze
2. Worm Board Game
3. Make Your Own Worm
4. Building A Worm Farm
5. Building A Worm Farm in a Jar
6. Counting Earthworms
7. Worm Castings vs. Artificial Fertilisers
8. Worm Investigations
9. Worm Worksheets

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### Standards addressed at Level 1

Strand	Domain	Dimension	Element of standard	Activity number
Discipline-based Learning	Science	<i>Learning focus*</i>	Students:	4,5
			<p><i>... use their senses to explore the world around them; for example living and non-living things ...</i></p> <p><i>... participate in very simple investigations involving observation and measurement (for example, measuring plant growth) and learn about basic procedures and processes, including collecting and recording data ...</i></p> <p><i>... display, and make generalisations from their data ..</i></p>	

\* *Learning focus* statements listed provide advice about learning experiences that will assist students to work towards the achievement of the standard when it is introduced.

## Standards addressed at Level 2

Strand	Domain	Dimension	Element of standard Students:	Activity number
Physical, Personal and Social Learning	Interpersonal Development	Working in teams	... cooperate with others in teams for agreed purposes, taking roles and following guidelines established within the task ...  ... describe and evaluate their own contributions and the team's progress towards the achievement of agreed goals ...	1, 2, 8
Discipline-based Learning	The Arts	Creating and Making	... create and present performing and visual arts works that communicate ideas, concepts, observations, feelings and/or experiences ...  ...select, arrange and make choices about expressive ways of using arts elements, principles and/or conventions ...  ... use a range of skills, techniques, processes, materials and equipment in art forms ...	2, 3
	English	Writing	... write texts that convey ideas and information to known audiences ...	9
		Speaking and Listening	... listen to spoken texts that deal with familiar ideas and information ...	9
	Science	<i>Learning focus*</i>	... observe, describe and begin to generate questions about situations and phenomena ...	1, 4,5,6, 7,8,9
Interdisciplinary Learning	Communication	<i>Learning focus*</i>	... make short oral presentations to small groups or the whole class on specified topics across the curriculum and on personal experiences beyond school ...  ... develop an understanding of basic communication conventions and practise strategies for improving their presentations with a particular focus on making themselves understood ...	1, 3,6
	Design, Creativity and Technology	<i>Learning focus*</i>	... play with and manipulate materials/ingredients, think about, discuss and describe their characteristics and properties ...  ... follow a set of instructions and may begin to contribute to planning the mains steps to make a product ...	1, 2

\**Learning focus* statements listed provide advice about learning experiences that will assist students to work towards the achievement of the standard when it is introduced.

## Standards addressed at Level 3

Strand	Domain	Dimension	Element of standard Students:	Activity number
Discipline-based Learning	Science	Science knowledge and understanding	... describe natural physical and biological conditions, and human influences in the environment, which affect the survival of living things ... ... describe the interactions between living things and their environment ...	1, 6, 7, 8
		Science at work	... collaboratively plan, design, conduct and report on experiments related to their questions about living and non-living things ...	1, 6, 7, 8
Interdisciplinary Learning	Design and creativity	Investigating and designing	... individually and in teams use words, labelled sketches and models to communicate the details of their designs ...	2
		Producing	... use list of steps and are able to choose appropriate tools, equipment and techniques ...	2
		Analysing and evaluating	... consider how well a design functions and how well it suits the intended purpose...	2
	Communication	<i>*learning focus</i>	...during both formal and informal presentations, explore the use of a range of verbal and non-verbal strategies, to enhance meaning and to engage their audience... ...experiment with various forms when developing formal presentations; for example, a dramatic performance and use of presentation software ...	3

\* *Learning focus* statements listed provide advice about learning experiences that will assist students to work towards the achievement of the standard when it is introduced.

## Standards addressed at Level 4

Strand	Domain	Dimension	Element of standard Students:	Activity number
Discipline-based Learning	Science	Science knowledge and understanding	... identify and explain the relationships that exist within and between food chains in the environment ...	8
		Science at work	... explain how sustainable practices have been developed and/or are applied in their local environment ... ... students design their own simple experiments to collect data and draw conclusions ... ... they describe the purpose of experiments they undertake, including a statement of ethical considerations, and relate this purpose to the nature of the data that is collected ... ... use the terms relationship and cause and effect when discussion and drawing conclusions from the data they collect ...	8



# Activity 1: Worm maze

## Curriculum connections

Use of this learning and teaching activity may contribute to achievement of elements of the Standards. Indications of relevant Domains and Levels in the *Victorian Essential Learning Standards* are provided to assist teachers to make decisions about the appropriateness of the activity for their students.

## Summary

This activity enables students to design, conduct and report on simple experiments investigating the ability of worms to navigate through a maze in search of a 'reward'.

### **Victorian Essential Learning Standards Domains and (Levels):**

Interpersonal Development (2)  
Science (2, 3)  
Communication (2)  
Design, Creativity and Technology (2)

**Duration:** 2 hours.

**Setting:** The classroom.

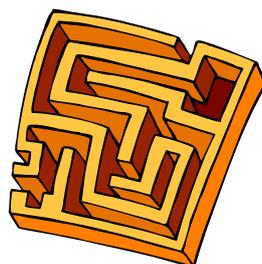
## Student outcomes

This activity will enable students to:

- Undertake simple experiments in small groups
- Investigate the ability of worms to navigate, and retrace a previous path, through a maze in search of a reward.

## The activity

- Working in small groups, ask students to build a simple maze inside a cardboard box (for example a shoebox) using pieces of cardboard placed vertically to create the paths.
- Put something attractive to worms at the end of the maze as a reward. Students will need to experiment to find out what would be attractive to the worms.
- Place ten worms at the start of the maze and time how long it takes the worms to get to the reward.
- Repeat the experiment several times, ensuring worms are kept moist and out of direct light. Record the results in the student worksheet 'Worm maze', and complete the 4 questions.
- In groups, ask students to prepare a short presentation of their findings. This may be in the form of a short story, talk, song or dance or picture book.



TRIAL NUMBER	1	2	3	4	5	6	7
TIME TAKEN							

1. Did the worms find the reward faster each time? If yes, by how much?

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2. Do you think the worms can remember the path they previously took? Why, why not?

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3. Did all of the worms find the reward?

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4. What happens when you put something unattractive in the maze (for example, onion or garlic)?

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## Activity 2: Worm board game

### Curriculum connections

Use of this learning and teaching activity may contribute to achievement of elements of the Standards. Indications of relevant Domains and Levels in the *Victorian Essential Learning Standards* are provided to assist teachers to make decisions about the appropriateness of the activity for their students.

#### **Victorian Essential Learning Standards Domains and (Levels):**

Interpersonal Development (2)  
The Arts (2)  
Design, Creativity and Technology (2,3)

**Duration:** 2 hours.

**Setting:** The classroom.

### Summary

In this activity students design, create, evaluate and play a worm-themed board game.

### Student outcomes

This activity will enable students to:

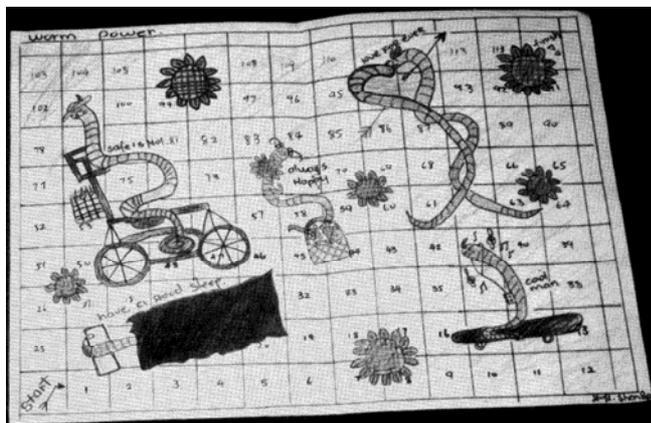
- Use the design, creativity and technology processes of investigating, designing, producing, analysing and evaluating to produce a worm board game
- Demonstrate their knowledge about worms during the construction of the game
- Play the game in small groups.

### The activity

- Divide the class into small groups (4 – 5 students).
- Provide a series of board games in a rotational activity for students to test – giving each group an opportunity to access each game. Students should record their likes/dislikes after each game and then share these likes/dislikes as a class.
- In their small groups, students should brainstorm ideas for a worm board game. Once they have decided on a concept, students should begin planning game layout and rules, and then construct the board game.
- When students have successfully designed and produced their board games, provide opportunity for a sharing of the games, and self and peer evaluation.

#### **An example: *Worms and ladders* board game**

- Take a piece of A4 or poster paper. Draw up a grid of 100 squares and number the grid neatly.
- Draw eight worms of various lengths and colours. Add faces to the worms and 'dress' them in hats etc.
- Draw six ladders of various lengths and colours. Make sure there is one long ladder for the lucky person that reaches the top quickly.
- Decorate the board.
- Use a dice and tokens such as buttons to play your game with up to four friends using the rules of snakes and ladders!





## Activity 3: Make your own worm

### Curriculum connections

Use of this learning and teaching activity may contribute to achievement of elements of the Standards. Indications of relevant Domains and Levels in the *Victorian Essential Learning Standards* are provided to assist teachers to make decisions about the appropriateness of the activity for their students.

### Summary

Students make a worm and then use it to illustrate facts about worms in a short dramatic presentation.

### **Victorian Essential Learning Standards Domains and (Levels):**

The Arts (2)  
Communication (2,3)

**Duration:** 1 hour per worm and 2 hrs for developing worm presentations and presenting them.

**Setting:** The classroom.

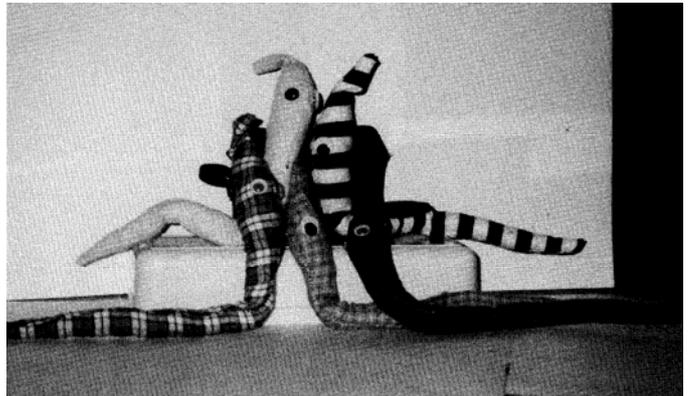
### Student outcomes

This activity will enable students to:

- Make a stuffed worm out of fabric (as a class)
- Create and perform a short presentation or play in small groups.

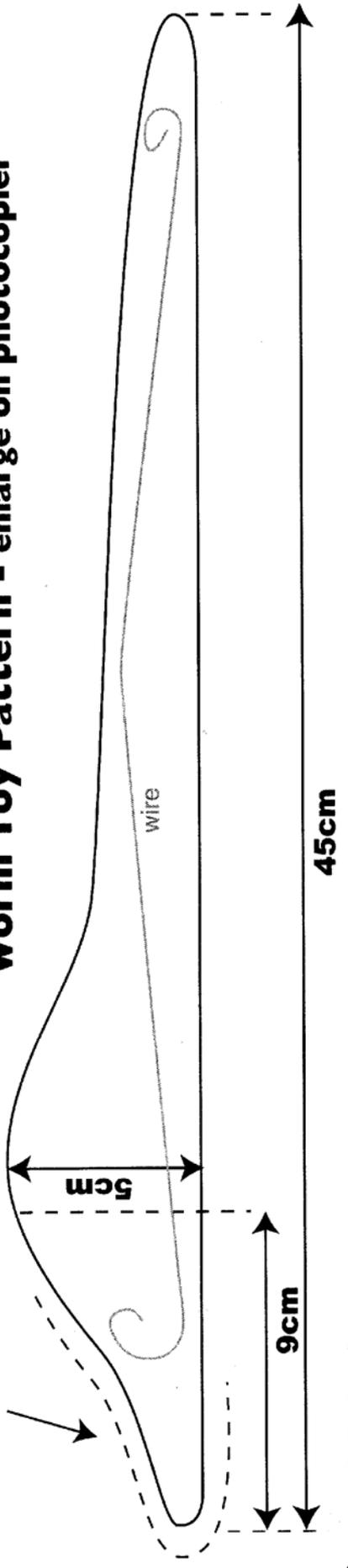
### The activity

- Select a piece of fabric that is flexible but not too thin. Cotton material would be ideal.
- Fold the material in half, making sure that the patterned sides of the material are back-to-back to each other.
- Using the Worm Toy Pattern provided, line the straight side along the fold and cut out the shape of the worm.
- Use pins to secure the folded material and sew (by hand or with a machine) along the edge of the shape. Leave an opening for the stuffing.
- Turn the fabric right side out.
- Cut a piece of wire about the length of the shape. Turn each end of the wire into a tight loop so that it won't push through the material. Insert the wire into the sewn up shape. The wire offers some support for the worm so that you can bend it to the shape that you want it to be when you are finished. (TAKE CARE WITH SHARP ENDS OF THE WIRE).
- Stuff the worm with stuffing and sew the opening to seal it.
- Using a glue gun, glue eyes to the worm. Draw in a mouth with a texta.
- Ask students to create and perform a short play using their stuffed worms which includes one or two facts about worms. You may wish to provide small groups of students with two dot points from the *Facts about worms* page.



# Worm Toy Pattern - enlarge on photocopier

leave a 1cm seam all around pattern of worm toy.





## Activity 4: Building a worm farm

### Curriculum connections

Use of this learning and teaching activity may contribute to achievement of elements of the Standards. Indications of relevant Domains and Levels in the *Victorian Essential Learning Standards* are provided to assist teachers to make decisions about the appropriateness of the activity for their students.

#### **Victorian Essential Learning Standards Domains and (Levels):**

Science (1,2)

**Duration:** 1 hour

**Setting:** The classroom.

### Summary

Students build a worm farm for the classroom.

### Student outcomes

This activity will enable students to:

- Follow instructions to build a worm farm for the classroom.

### The activity

Worm farms can be constructed out of a variety of containers such as old fish tanks, wooden boxes and Styrofoam boxes.

- Select a suitable container. Make sure it has plenty of holes to drain water and for ventilation.
- Place pebbles inside and cover the pebbles with a few centimetres of dry grass.
- Find some earthworms. Worms live in moist and shady areas such as along a riverbank where the soil is rich in humus. Find a suitable spot and push a shovel deep into the soil. Turn over the shovel. This should uncover the worms. July, August and September are the best times to find worms. Fill the box with soil from the site at which you have found the earthworms to within 2.5cm of the top. This is important because the worms will not survive in foreign soil.
- Mix into the soil a few handfuls of rotting leaves or any well-decaying vegetable matter. Place the worms you have found gently on top of the soil. They will soon burrow into the soil to escape the sunlight.
- Cover the box with shade cloth or any dark cloth. This will protect the worms from the sunlight and birds.
- Stand the box in a shady cool area with a piece of wood or rock under each corner to allow air to get into the bottom of the box. Placing the wood or rock in a dish will protect your worms from ants that will attack them.

The worm circulatory system is extremely fragile, so care should be taken when handling them. The soil must be kept moist but not wet (worms can drown!) Keep half an eggshell in the worm farm at all times. This helps balance the pH of the soil and avoid calcium deficiency in the worms. Chop food scraps into small pieces. This will allow worms to process food more quickly. Keep the farm covered with shade cloth. It only takes a few hours of direct sunlight to kill worms.

**Worms like:** Fruits, vegetables, bread scraps, tea leaves and bags, crushed eggshells, rice and pasta scraps, wheat and corn scraps, aged manure.

**Worms dislike:** Salty food, spicy food, onion and garlic, citrus fruits, meat and dairy scraps (makes farm smelly), chicken, dog and cat manure, acidy foods (eg. pineapple, tomatoes).





## Activity 5: Building a worm farm in a jar

### Curriculum connections

Use of this learning and teaching activity may contribute to achievement of elements of the Standards. Indications of relevant Domains and Levels in the *Victorian Essential Learning Standards* are provided to assist teachers to make decisions about the appropriateness of the activity for their students.

#### **Victorian Essential Learning Standards Domains and (Levels):**

Science (1,2)

**Duration:** 2 hours

**Setting:** The classroom.

### Summary

Students build a worm farm in jars to observe the role of worms in soil.

### Student outcomes

This activity will enable students to:

- Follow instructions to make a worm farm
- Observe the role of worms in mixing and aerating soil.

### Background notes for teachers

Earthworms live in soil that is rich in decaying plant or animal material. To collect worms and their soil, find a suitable spot and push the shovel deep into the soil. *Note:* July, August and September are the best times to find worms. Turn over the shovel. This should uncover the worms. Place the worms and some soil in the bucket. From the playground, collect sand and leaf mould in the buckets.

### Materials

- buckets
- shovel
- large wide mouth jar
- dark cloth
- earthworms
- water
- soil (garden soil, sand, leaf mould)
- food (vegetable leaves, oatmeal)

### The activity

#### **Making the worm farm**

Add different layers of soil as indicated (right) to the jar. Sprinkle each layer with water as you fill the jar. Place a thin layer of oatmeal on top of the last layer of soil, followed by a thin layer of vegetable leaves. Top with sand. Add the earthworms. Cover your new worm farm with the dark cloth. Place in a dark corner for one week.

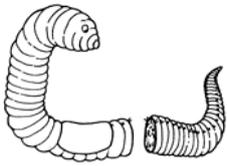
#### **After one week**

Remove the cloth. Discuss what the students can see. Draw a picture of the jar (the worms should have tunnelled near the sides of the jar). Release your worms back into the garden.

*Note:* a glass jar is not a good place for worms to live. To make a more permanent worm farm, use a Styrofoam box with small holes in the bottom (see Activity 4).

Sand
Soil
Leaf mould
Sand
Soil
Leaf mould

Layers of soil in the worm farm.



## Activity 6: Counting earthworms

### Curriculum connections

Use of this learning and teaching activity may contribute to achievement of elements of the Standards. Indications of relevant Domains and Levels in the *Victorian Essential Learning Standards* are provided to assist teachers to make decisions about the appropriateness of the activity for their students.

**Victorian Essential Learning Standards Domains and (Levels):**

Science (2,3)

**Duration:** 2 hours

**Setting:** The classroom and outdoors.

### Summary

Students count earthworms at different sites to see where earthworms prefer to live.

### Student outcomes

This activity will enable students to:

- Investigate the soil type and habitat preferred by worms
- Undertake simple field surveys in teams
- Prepare simple reports to communicate findings of the surveys.

### Background notes for teachers

Most earthworms hibernate deep in the soil during summer. They become active when the soil becomes wetter during autumn. They then move up to the topsoil where they find most of the organic matter - their food.

*Note:* The best time to do this activity is during late autumn and during winter/spring.

### Materials

- Shovel
- Worksheet 'Counting earthworms'.

### The activity

- Divide the class into small groups.
- Each group should choose at least three different sites to survey earthworms. They may choose a patch on an oval, a sandy area and a protected area in the garden.
- At each site, dig a hole about the size of a lunchbox with the shovel, and sort through the soil dug up.
- Separate out the worms carefully and count them. If you can't find any worms, choose another site.
- Repeat this two more times and then work out the average number of earthworms for that site.

$$\text{Average number of worms} = \frac{\text{total number of worms}}{3}$$

- Students should record their results in the 'Counting earthworms' student Worksheet and then prepare short presentations to the class to communicate their results.

Choose three different sites to survey earthworms eg. the oval, a sandy area and a protected area in the garden.

For each site:

- Dig a hole about the size of a lunchbox at the first site and sort through the soil you dig up. Carefully separate out worms from the soil worms and count them. If you can't find any worms, choose another site.
- Dig holes at the other sites and count the earthworms present. Work out the average number of earthworms for that site.

$$\text{Average number of worms} = \frac{\text{total number of worms}}{3}$$

- Record your results in the table below.
- Replace soil and worms carefully.

Site location	Describe the site	Average number of earthworms found	Worm habitat rating (poor, moderate, good)
1.			
2.			
3.			

Where were the most earthworms found? Why do you think they were found here?

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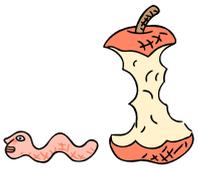


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# Activity 7: Worm casting vs. artificial fertiliser

## Curriculum connections

Use of this learning and teaching activity may contribute to achievement of elements of the Standards. Indications of relevant Domains and Levels in the *Victorian Essential Learning Standards* are provided to assist teachers to make decisions about the appropriateness of the activity for their students.

### **Victorian Essential Learning Standards Domains and (Levels):**

Science (2,3)

**Duration:** 2 hours

**Setting:** The classroom.

## Summary

Students investigate if worm castings make grass grow faster and healthier than artificial fertilisers.

## Student outcomes

This activity will enable students to:

- Understand the important role of worms in adding nutrients to soil
- Investigate the growth of plants in different types of fertiliser
- Undertake simple scientific investigations.

## Background notes for teachers

Worm castings, or worm poo, contain many 'goodies' for plants. Just as humans need vitamins and minerals for the proper working of our body, plants need certain minerals for healthy growth. Worm castings are a natural fertiliser and contain just as many minerals (or more) than artificial fertilisers.

## Materials

- 3 yoghurt tubs (ensure there are a few small holes at the bottom of the tubs)
- permanent pens
- garden soil
- grass seeds (or whatever seeds are available)
- grass fertiliser
- worm castings (from your worm farm)
- plastic teaspoon and tablespoon.

## The activity

- Fill each tub with garden soil.
- Label them **Tub 1 (Worm castings)**, **Tub 2 (Fertiliser)** and **Tub 3 (No fertiliser, no worm castings)**.
- In Tub 1, mix the soil with one tablespoon of worm castings.
- For Tub 2, read the instructions on the pack of grass fertiliser and work out roughly how much to add to the soil in the yoghurt tub. Mix the fertiliser into the soil.
- Tub 3 is the control tub and will have no fertiliser or worm castings.
- In each tub, spread the top of the soil with half a teaspoon of grass seeds and press seeds into the soil a little.
- Water the soil with three tablespoons of water (more water is needed if soil is dry).
- Place the tubs next to the window or a place where there is sunshine.
- Water the soil everyday with 1-2 tablespoons of water. If the soil looks very dry, add more water.
- Keep the experiment going for 3-4 weeks and record observations on the student Worksheet: 'Worm castings vs. artificial fertiliser'.

# Worksheet Worm castings vs. artificial fertiliser

Name: \_\_\_\_\_

Tub number	Observations			
	Week 1	Week 2	Week 3	Week 4
<b>Tub 1 (Worm castings)</b>	No. of seeds sprouted: Grass length: Other comments:  Drawing:			
<b>Tub 2 (Fertiliser)</b>	No. of seeds sprouted: Grass length: Other comments:  Drawing:			
<b>Tub 3 (No fertiliser, no worm castings)</b>	No. of seeds sprouted: Grass length: Other comments:  Drawing:			

In which tub did the grass:

- sprout first? \_\_\_\_\_
- grow the longest? \_\_\_\_\_
- look the healthiest? \_\_\_\_\_



What conclusion can you draw from this? \_\_\_\_\_

\_\_\_\_\_



## Activity 8: Worm investigations

### Curriculum connections

Use of these learning and teaching activities may contribute to achievement of elements of the Standards. Indications of relevant Domains and Levels in the *Victorian Essential Learning Standards* are provided to assist teachers to make decisions about the appropriateness of these activities for their students.

#### **Victorian Essential Learning Standards Domains and (Levels):**

Interpersonal Development (2)  
Science (2,3,4)

**Duration:** 2 hours

**Setting:** The classroom.

### Summary

These simple worm investigations enable students to learn more about the wonderful world of worms!

### Student outcomes

These activities will enable students to:

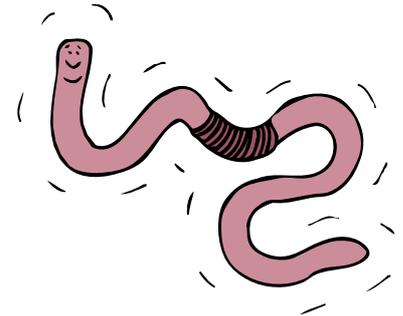
- Observe the characteristic of worms
- Investigate the ability of worms to smell, and observe their sensitivity to light and heat
- Discover how worms move
- Identify what worms prefer to eat.

### Part A: Looking at worms

Divide the class into small working groups of two or three students.

Ask students to use a magnifying glass to observe and discover the following:

- Distinguishing features of worms
- The number of segments worms have and whether all worms have the same number of segments
- The location of the worms clitellum (collar or saddle)
- Differences in worm colour
- How worms move



Each group should decide how to organise the information collected by designing a recording sheet. This may be in the form of a learning log, pictures and labels, written descriptions, notes or sketches.

As a class, discuss observations, recording methods and plan further investigations.

## Part B: Can worms smell?

As a class, discuss how you can answer the question 'Can worms smell?' Brainstorm the materials you will need for your investigation eg. worms, cotton buds, smell test liquids (vinegar, oil of cloves, lemon essence, pepper, chilli sauce, water etc).

Working in small groups, students should:

- Dip a cotton bud into one of the smell test liquids and place the cotton bud at a distance of about 2cm in front of the worm's head. (Note: the dampened cotton bud shouldn't touch the worm's body because a different question would then need to be investigated).
- Note the worm's reactions in the table below.
- Use the same procedure at the worm's tail end and record the worm's reaction.
- Continue the experiment with each of the test liquids.
- As a class, share findings and produce illustrations to communicate what was learned about earthworms and their sense of smell. Students may add captions to describe their illustrations eg. My worm knotted itself up when it didn't like the smell.

Note: Be patient – reactions can take a while to occur.

Use active worms to begin with. Ensure they are not exposed to strong light during the experiment.

Worms will 'play dead' when you pick them up, so be careful not to disturb them unnecessarily.

PRODUCT	Head - reaction			Tail - reaction		
	No reaction	Moved toward	Moved back	No reaction	Moved toward	Moved back
<i>For example</i> Pepper			✓			
Oil of cloves						
Disinfectant						
Nail polish remover						
Peppermint						
Vinegar						
Chilli sauce						
Water						

## Part C: Worms, light and heat

Worms live mainly in soil and decaying plant remains. Worms must keep their skin surface moist in their environment. Worms breathe through their skin, therefore protection from heat and bright light is necessary.

- As a class, make predictions about worms' sensitivity to light and darkness, taking into consideration their habitat eg. predict a worm's movement to light and darkness.
- Predict what a worm may be experiencing when exposed to extremely bright situations and totally dark situations.

- Cut out a cardboard box so as to obtain the darkest possible spot for worm observation. Cover a torch with cardboard, leaving only a small hole to let light through. Direct this beam of light onto the worm's body and record the worm's reactions.
- In a darkened room, keep a torch shining on a worm for a few minutes. Wait until the worm is still and cut off the light by passing something in front of the torch. Observe and record what happens. Hypothesise how this response would help the worm (eg. it could aid the worm's survival).

### Part D: How do worms move?

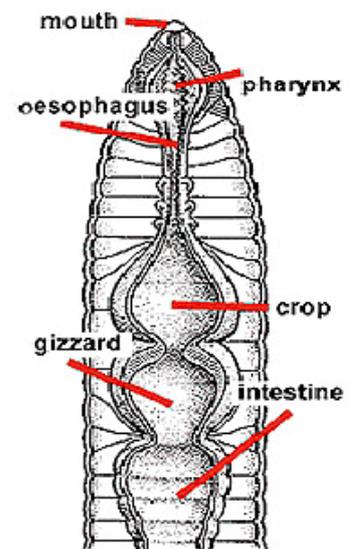
A worm's shape and mucus help it slide and move. To move up tunnels, worms' segments lengthen and shorten at different rates using their longitudinal and visible circular muscles.

An important feature, which assists a worm's movement, is the series of tiny bristles (setae) which are arranged in a line around each segment. As well as helping worms to move across the ground, they are important to assist movements up and down burrows, and provide the means for the worm to cling to a vertical surface.

- As a class, explore and observe worm movement using a flour/water paste spread very thinly on a hard surface or paper to track the worm's movement. Watch what happens as they move (*worms can move forwards and backwards!*) Ask students to write a short story describing what worm tracks and their actual movement looks like.
- Ask students to estimate how far a worm will move in a minute. To test this, working in small groups, place a worm on damp paper. Mark where it begins and where it ends up after one minute. Measure how far the worm moved, and as a class, compare results and find the average distance travelled.

### Part E: What do worms eat?

- As a class, brainstorm a list of possible things worms might eat.
- Choose five things that worms might eat and place these on the surface of a worm farm or Worm Farm Jar.
- Check the worm farm twice a week, noting what has been eaten. Remember to keep the worm farm moist.
- Continue observations for two weeks and record results.



### Part F: How do worms eat?

When earthworms eat, the **pharynx** (throat) is pushed out of their mouth and collects leaves and other deposits. The food then travels down the **oesophagus** into the crop. The **crop** provides storage for food. Food then passes into the **gizzard** where strong muscles grind up the food into small particles. Small stones swallowed by the worm also aid this digestive process. The small particles then travel to the **intestine** where digestive juices break them down further into usable vitamins and minerals, which are then dissolved into the worm's **bloodstream**. Unused and unwanted materials are then passed through the **anus** in the form of castings.

- Discuss as a class how worms might eat. To investigate this, place a worm on a glass plate and hold the plate above a strong light, so as to see through the worm's body. Remember to keep the worm moist and not near the light for too long).
- Try to follow the passage of food and soil through the worm's gut using a magnifying glass or a stereo microscope.



## Activity 9: Worm worksheets

### Curriculum connections

Use of these learning and teaching activities may contribute to achievement of elements of the Standards. Indications of relevant Domains and Levels in the *Victorian Essential Learning Standards* are provided to assist teachers to make decisions about the appropriateness of these activities for their students.

#### **Victorian Essential Learning Standards Domains and (Levels):**

English (2)  
Science (2)

**Duration:** 15 - 30 minutes each

**Setting:** The classroom.

### Summary

These worksheets allow students to extend and consolidate their understanding of worms.

### Worksheet answers

#### The hungry worm

- organic
- mix
- soil
- nutrients
- penetrate
- water
- structure

#### Worm crossword

##### Across

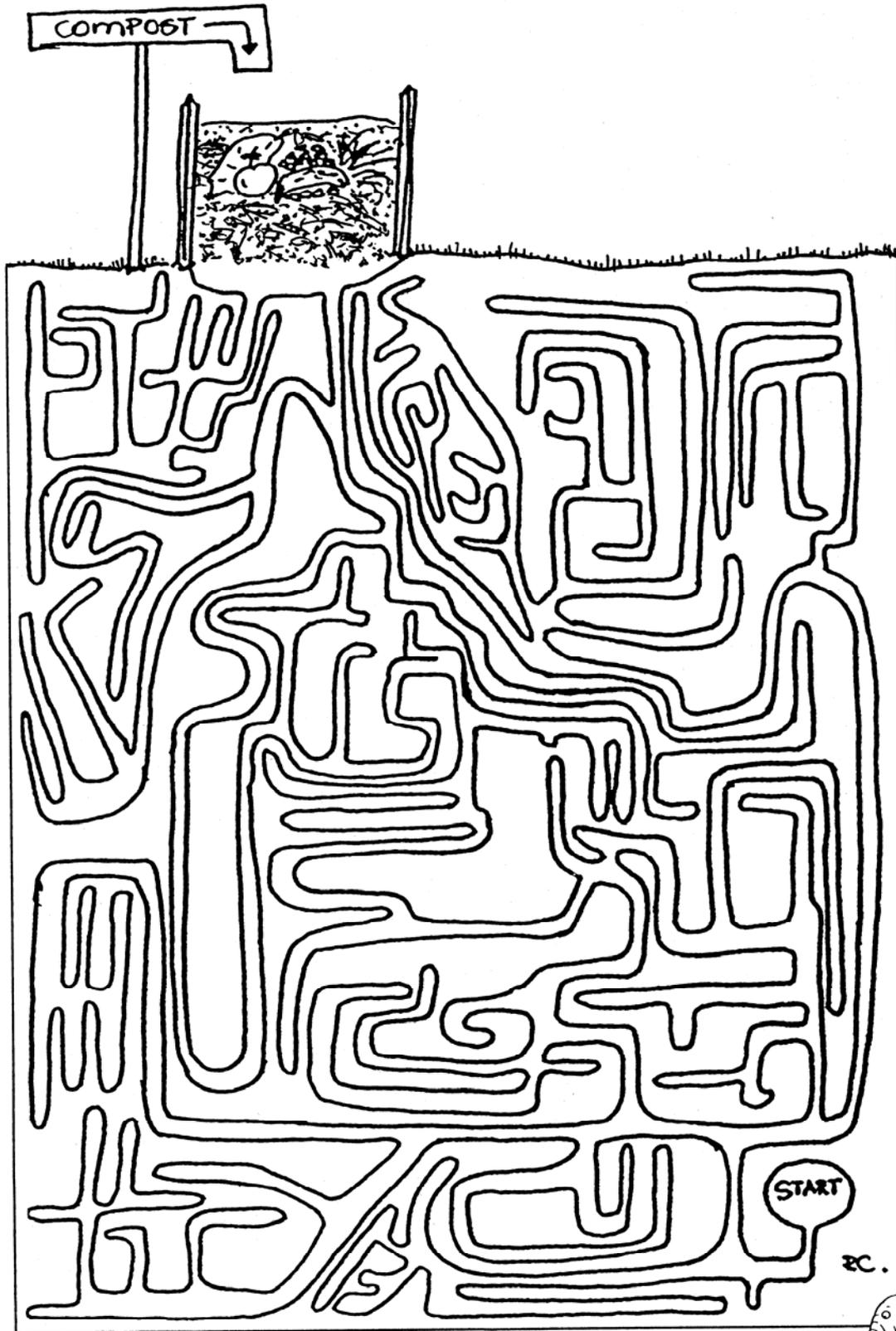
1. invertebrates
2. annelids
3. calcium
4. nutrients
5. oxygen
6. hearts
7. ten
8. skin
9. clitellum

##### Down

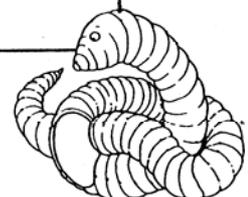
1. cocoon
2. contract
3. fertiliser
4. hermaphrodites
5. soil
6. half
7. castings
8. sunlight



# Burrow maze



Find Wild Red's way to the compost.



## Worm word search

e a r t h s o i l m i n e r a l s  
 i k n e w l z r e v l l l o c a r  
 l c l w o n u t r i e n t s s m y  
 z l p w r i g g l e t u n n e l s  
 f l g n m a t t o e c d c u l y d  
 e e r a e a l d a n o r c o r e d  
 t s e f r d w o m t m e t e p e d  
 d e c a y e d k e h p n u u l l l  
 b a n w l c m a r o o a e r a t e  
 r a l s e o h s a m s o s a j e t  
 i s t m e m u c u s t m u n t k a  
 s a e o p p m a z e o r g a n i c  
 t r n i h o u s o g b u r r o w s  
 l o l s g s s t e m l t t e z y g  
 e s e t a e n i f e r t i l i t y  
 s r a u r l e n e n g g l r b a l  
 c h r r b l s g v t e r t a n g e  
 e r y e a l l s r e c y c l e r s  
 m u c h g r t v o d i m p r o v e  
 r o b e e s t r u c t u r e r o b

Try and find these worm related words.

There are 27 words to find. They may be vertical or horizontal.

worm  
 aerate  
 soil  
 compost  
 organic  
 humus  
 castings  
 bristles  
 setae

segmented  
 fertility  
 structure  
 earth  
 wormery  
 loam  
 minerals  
 wriggle  
 moisture

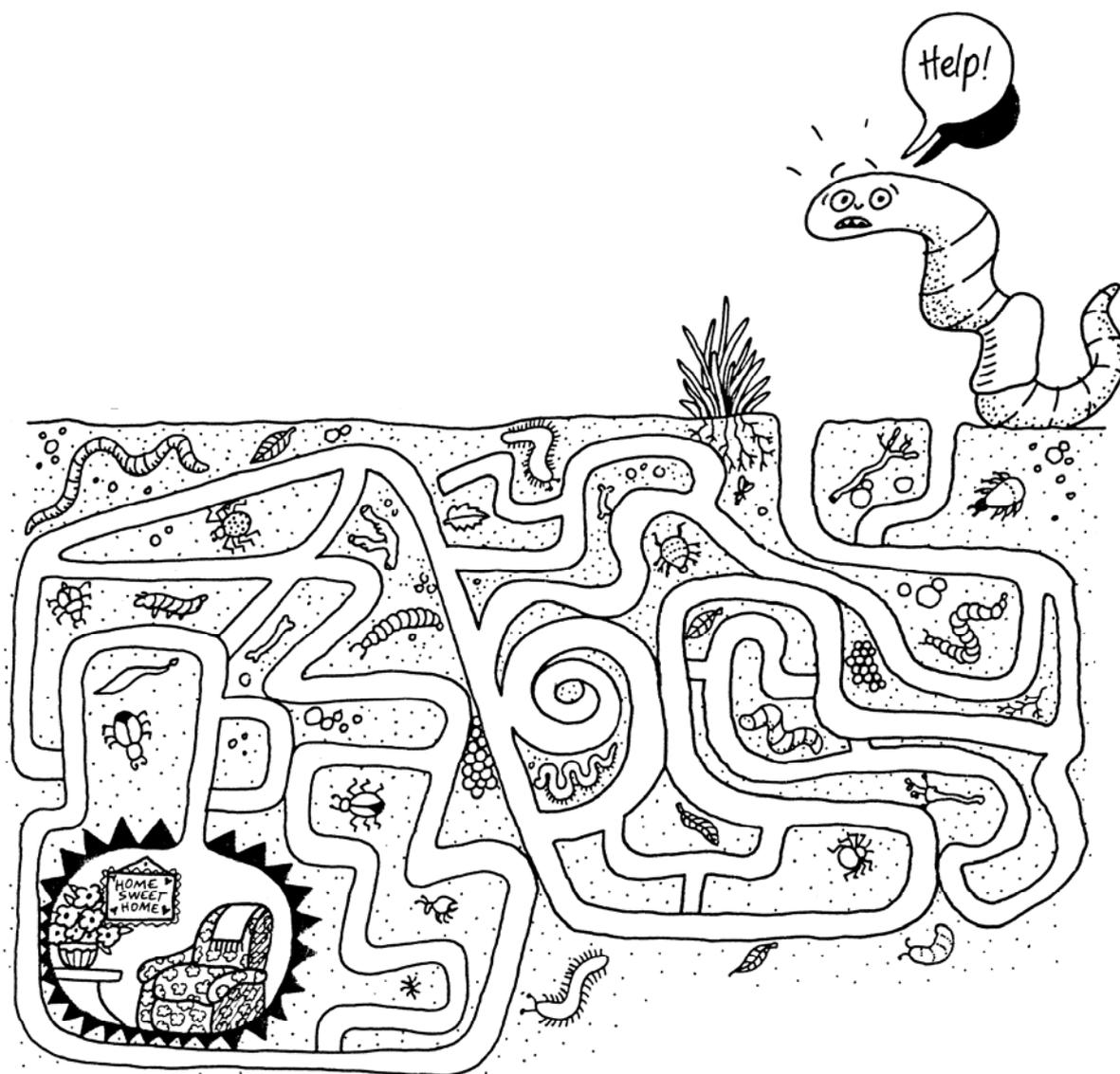
nutrients  
 mucus  
 tunnels  
 burrows  
 decayed  
 decompose  
 garbage  
 recyclers  
 improve

## Swiss cheese

Do you know what Swiss cheese looks like? Good soil should look a little bit like Swiss cheese. This is because good soil contains thousands and thousands of small animals such as worms, beetles, ants and spiders as well as many tiny animals that we cannot even see. All these animals work very hard making burrows, holes, tunnels and pathways which help plant roots to grow deep into the soil. Water and air can also enter the soil through these pathways.

The picture below shows some of these small animals living in the soil.

- Draw another plant. Show the roots growing deep into the soil.
- With a blue pencil, show how water drops can seep into the soil through the holes in the ground
- Using a red pencil, help the worm find its way back home
- Find out what worms like to eat. How does this help the soil?



# The hungry worm

Earthworms are the best creatures to have in our garden and farm soils. This is because they work very hard putting life into the soil. They do this by eating and eating. In fact they eat so much that they are able to work through the soil, mixing in the organic matter and making millions of tiny burrows as they go. One way of seeing if a soil is healthy is to check for earthworms. If there are lots of worms then you can be fairly sure that the soil will be able to support good plant growth.

Below is a list of statements concerning the effects of earth worms on soils. Choose from the words below to fill in the blanks in each statement.

Earthworms are good for soils because they :

- Break up \_\_\_\_\_ materials.
- \_\_\_\_\_ these organic materials into the \_\_\_\_\_
- Help plants to grow by increasing the \_\_\_\_\_ available to them.
- Allow better \_\_\_\_\_ of plant roots, oxygen and water into soils.
- Increase the amount of \_\_\_\_\_ that can be held by soils.
- Improve the \_\_\_\_\_ of soils.

structure

water

mix

soil

organic

penetration

nutrients

## Research

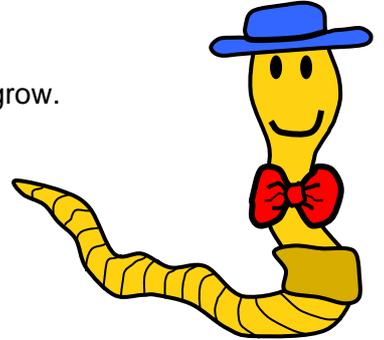
Find out the likes and dislikes of worms including soil type, food, temperature and other conditions. How can people help to create the right sort of environment which will support a healthy worm population?

# Worm crossword

Read through the Wiggly worms. Introduction page to answer the following questions.

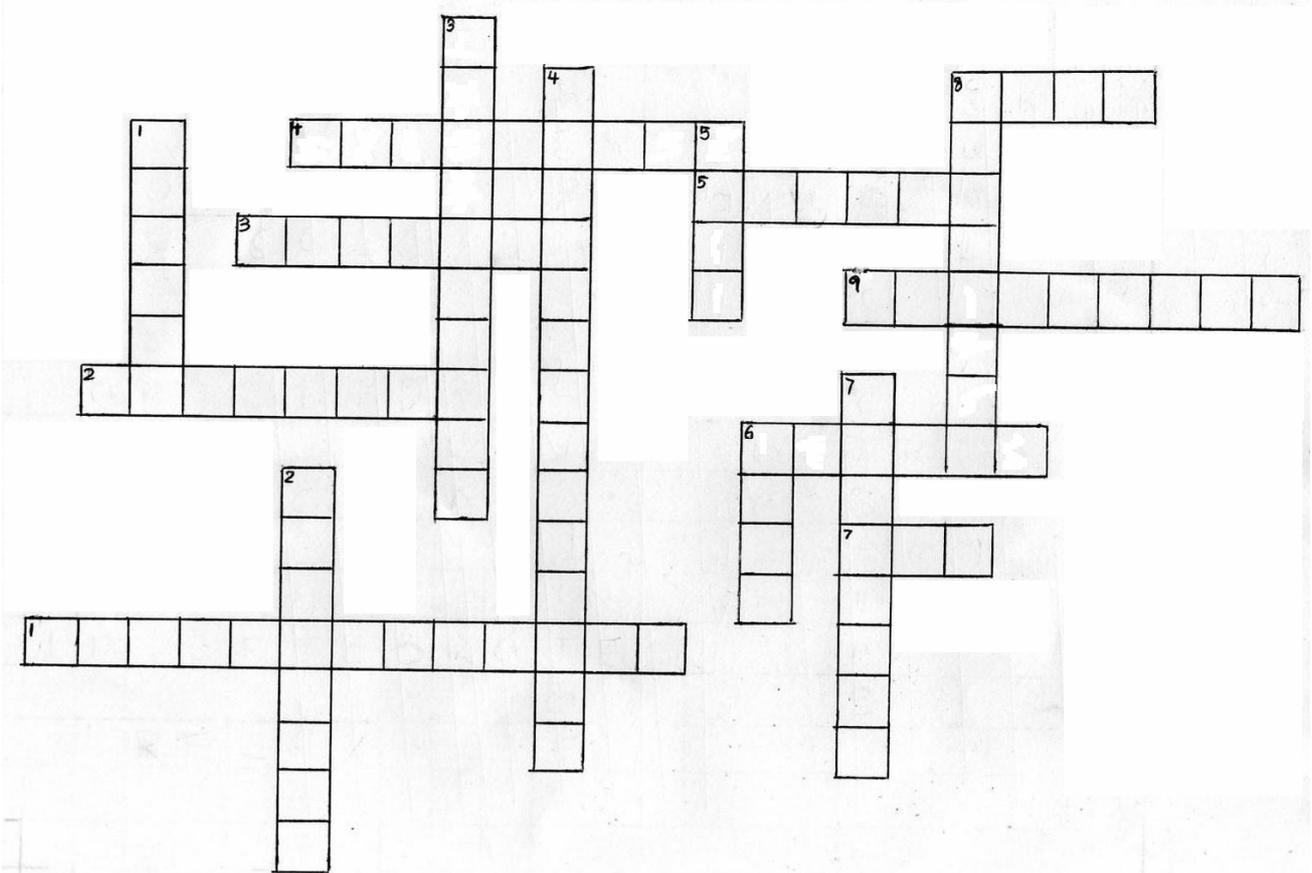
**CLUES - Across:**

1. Animals without a backbone are called \_\_\_\_\_.
2. Segmented animals without a backbone are called \_\_\_\_\_.
3. Worm droppings are rich in nitrogen, phosphorous, potassium and \_\_\_\_\_.
4. Worm droppings provide plants with valuable \_\_\_\_\_ which help them to grow.
5. Worms breathe this.
6. Worms have five of these.
7. A garden worm usually grows to about \_\_\_\_\_cm.
8. Worms breathe through their \_\_\_\_\_.
9. A worm's reproductive organs are found here.



**Clues - Down:**

1. Worms produce eggs in a \_\_\_\_\_.
2. Movement is produced when a worm's two sets muscles \_\_\_\_\_ and relax.
3. Worms produce a rich and natural \_\_\_\_\_ for humans.
4. Animals with both sets of reproductive organs are called \_\_\_\_\_.
5. Worms eat and live in this.
6. Worms eat \_\_\_\_\_ their own body weight in food each day.
7. Worm droppings are known as \_\_\_\_\_.
8. Worms are extremely sensitive to \_\_\_\_\_.



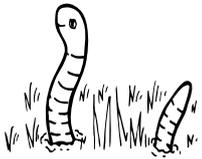
## Even more worm activity ideas



**Read the books:**

**How To Eat Fried Worms.** Thomas Rockwell, Piccolo (1933)

**The Adventures of Ernie Wiggles Earthworm Extraordinaire.** Alan Windust, Allscape (1998) ISBN 0 9586163 0 2 - Try out some of the accompanying activities (based on this book) in the LandLearn ***Environmental Education Activities Based on Fact and Fiction Books*** booklet on the *LandLearn Resources CD*.



**Observe worms** on a wet day as they escape the waterlogged soil. How many worms can you count on a square of pavement?



Send in photographs of students' artwork to the LandLearn team – we may be able to feature it in one of the program Newsletters.



Write a class story of the adventures of students' worms.

# Resources

The activities contained in this booklet have been adapted from the following sources:

**Kids for Landcare Wormwatch**, Education Department of South Australia (1992)

**Let's Find Out** Journal of the Science Teachers' Association of Victoria for Primary Teachers  
Volume 17:(1,2,3) 2000.

**Soil Magic: Landcare Activities for Middle Primary.** Department of Natural Resources and Environment (1989)

**Our Land: Landcare Activities for Upper Primary.** Department of Natural Resources and Environment (1989)

**Pride in Victorian Farming.** Department of Natural Resources and Environment (1996)

**The McGraw-Hill Big Book of Science Activities.** Robert W. Wood, McGraw-Hill (1999)

Information Victoria holds a large range of Government publications relevant to the themes addressed in this curriculum booklet.

Information Victoria  
505 Little Collins Street  
Melbourne 3000  
phone 1300 366 356 or 9603 8806 or for online ordering visit [www.bookshop.vic.gov.au](http://www.bookshop.vic.gov.au).

Alternatively regional DPI offices may also stock some of these publications. Call the Information Centre on 136 186 for a DPI office near you.

For LandLearn publications email: [landlearn.program@dpi.vic.gov.au](mailto:landlearn.program@dpi.vic.gov.au)

## Websites

[www.sustainability.vic.gov.au](http://www.sustainability.vic.gov.au) > our programs > waste wise

[www.ento.csiro.au/education/allies/annelida.html](http://www.ento.csiro.au/education/allies/annelida.html)

[www.kenningtonps.vic.edu.au/rrr\\_gang/vermiculture/wormsindex.htm](http://www.kenningtonps.vic.edu.au/rrr_gang/vermiculture/wormsindex.htm)

