

Terrariums

Grade Level: 4-8

Lesson Overview

Students will be able to observe the water cycle and how different types of seeds germinate and grow.

Student Objectives

1. Compare a small ecosystem to the Earth's ecosystem.
2. Observe condensation and compare to the Earth's water cycle.
3. Recognize different plants as they emerge from the soil.
4. Observe germination rates of seedlings.

Materials

- ✓ 2-3 cups of potting mix
- ✓ pinch of grass seeds (at least 10 seeds)
- ✓ 3 bush green bean seeds
- ✓ 3 corn seeds
- ✓ clear packaging tape to reseal bottles
- ✓ ruler with centimeter markings
- ✓ Terrarium Observations Student worksheet
- ✓ 1 clear 2-liter plastic soft drink bottle (Note: In advance, ask the students to bring these in. While this container is preferred, the following will also work: juice bottles, smaller soft drink bottles, milk jugs, or green soft drink bottles. 32 ounce deli containers with lids is another option. You may be able to get them from a local deli.)

For the entire class you will need:

- ✓ utility knife or scissors
- ✓ water
- ✓ permanent marker

Vocabulary

- **condensation** - water changing from a gas to a liquid.
- **ecosystem** - all the living and nonliving parts of a particular environment.
- **evaporation** - the process in which water forms a vapor.
- **germination** - the process in which seeds sprout or begin to grow and develop.

- **infiltration** - water that passes through small gaps to soak into the soil.
- **photosynthesis** - the process by which plants make food.
- **precipitation** - a depositing of rain, snow, or sleet.
- **terrarium** - an enclosure for raising plants indoors.
- **transpiration** - the process in which plants release water to the atmosphere.
- **water cycle** - the path water takes through its various states - vapor, liquid and solid - as it moves throughout earth's systems (oceans, atmosphere, ground water, streams, etc.) Also known as the hydrologic cycle.

Background Information

The oceans cover 70% of the earth's surface and contain 97% of the water on earth. This water is too salty for use for drinking, for agriculture, or for industry. This leaves only 3% fresh water on earth and most of that is in glaciers and polar ice caps. Much of the remaining water is beneath the earth's surface. Less than 1 percent of the earth's water is in lakes, rivers, and other above ground reservoirs.

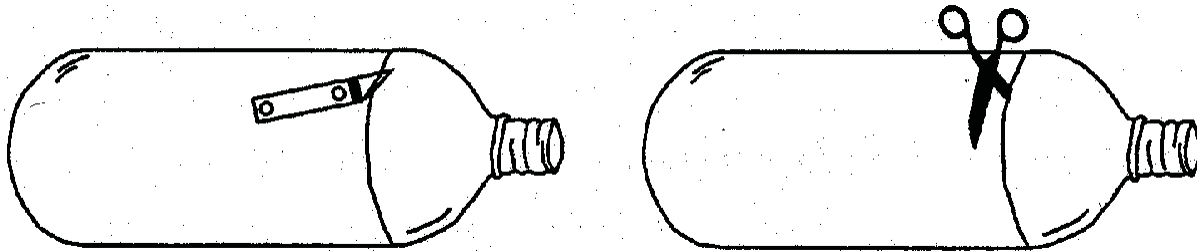
The air holds a great deal of moisture in the form of water vapor. Roughly 85% of the water vapor comes from the oceans by evaporation, but plants also breathe out water vapor by a process called transpiration. A mature birch tree, for example, will give off 70 gallons of water a day. Corn will give off about 4000 gallons of water per acre per day. An illustration showing the earth's water cycle is included for this unit. Students should be encouraged to make their own water cycle drawing. A crossword puzzle has been developed and may be used as an evaluation tool.

Encourage the students to identify the plants as they emerge from the soil. The grass seed should come first. The corn and bush bean seeds should follow soon after. The students should see moisture condensing on the inside of the terrarium. Check to see that this is part of the students' observation process. Informally ask them from where this moisture comes. Explain that the terrarium is a small ecosystem consisting of all the living and nonliving parts contained in the plastic bottle. This will give you an opportunity to talk about the earth's water cycle and the fact that there is as much water on earth today as there ever was or ever will be. Water only changes in form and moves around. The water you took a bath in last night may have been drunk by dinosaurs when they roamed the earth.

Procedure

Setting up the Experiment

1. In advance, ask students to bring in clear 2-liter plastic soft drink bottles. The teacher should use a utility knife or scissors to cut the top of the bottle before class. Do not cut the top completely off. Leave about 1 inch uncut. This way the top will simply fold back. See illustration below.



Another option is to cut the top completely off. Then in step #6, cover the top with a piece of plastic wrap secured with a rubber band.

2. Before class, it is helpful to moisten the potting mix. This will save time later.
3. Have each student place 2-3 cups of potting mix in the bottle by tipping the top of the bottle back.
4. With the bottle standing upright, the students can then carefully plant the 3 bush green bean seeds and 3 corn seeds at a depth of 2-3 centimeters. They should be sure to cover the seeds up. It is helpful for students to measure how long 2-3cm is on their finger first. (For instance, it may reach their first or second knuckle.) Students may want to plant one of each of the seeds next to the side of the bottle in order to watch the growing process.
5. Each student should sprinkle the grass seeds on the surface. Add just enough potting mix to lightly cover the grass seed. Do not pack down.
6. Assist the students with sealing their bottles. The top of the bottle should be held back in place. Then place a piece of clear packaging tape around it to seal. Make sure the cap is in place or cover with another small piece of tape.
7. Using a permanent marker, each student should label the bottle with his/her name.
8. Place bottles somewhere in the room where they will not be disturbed but will receive some light. It does not have to be near a window. Most classroom lights are sufficient. The terrariums may not need any additional water over the next 2

weeks since the potting mix was moist and the bottle is sealed. If no condensation appears on the sides of the bottle and it appears dry, a small amount of water may be added by removing the cap. If too much moisture is in the bottle and the sides seem to completely fog up, the cap may be removed to let some drier air in and some of the moisture evaporate.

9. Students should make careful written observations for a 2-week period on the Terrarium Observation Sheet Student Worksheet. You may even ask them to predict which of the seeds will grow first, second and third. Encourage them to use descriptive words. They may want to draw pictures.

They should measure the height of each plant's growth. Using a ruler, students should measure from the outside of the bottle. Measure only the tallest of each type of plant. Measurements should be made from the potting mix surface to the top of the plants. This data could be used on the Plant Growth Graph. Use different colors to chart each species of plant.

The first entry should be made today to record when the experiment began.

Example: day - 1

date 00/00/00

observation - I planted my seeds today.

height - Record prediction of which seed will grow 1st, 2nd, 3rd or
leave blank

Questions to assist students in making their observations:

- Which plant emerged first?
- How many days did it take for each plant to appear?
- Do all plants grow at the same rate?
- Did you notice the moisture inside the terrarium? Where did it come from?
- Is there any way for the moisture to escape?
- Is the amount of moisture inside the terrarium always the same?

This would be a good time to compare this small ecosystem to the Earth's ecosystem including the water cycle.

- Where does the moisture that falls to the Earth as rain and snow come from initially?
- Is the total amount of moisture around the Earth constant as it is in the terrarium?
- What keeps the moisture from escaping the Earth's atmosphere?
- Show the diagram of the water cycle.
- Transpiration may be a new concept for the students. The following simple demonstration can illustrate this. On a sunny day, take a resealable bag outside and place it over a green leaf on a plant. (The leaf must still be attached.) Seal the bag as much as possible. Leave the bag in place for at least 30 minutes (depends on how sunny it is).

- When you return with the students, ask them to observe what has happened. The bag should be filled with moisture droplets. Please be sure not to leave the bag on for an extended period of time to prevent any major harm to the plant.

Water Cycle Crossword Puzzle Student Worksheet may be used at the teacher's discretion or as an extension activity.

Extension Activities

1. Water Cycle in a Bag activity
<http://www.agintheclassroom.org/TeacherResources/Lesson%20Booklets/Top%2040%20Hits%20of%20PlanetEarth.pdf>
2. Incredible Journey
<http://www.agintheclassroom.org/TeacherResources/Lesson%20Booklets/Top%2040%20Hits%20of%20PlanetEarth.pdf>
3. Water Cycle Bracelet
<http://www.agintheclassroom.org/TeacherResources/InterestApproaches/WATER%20CYCLE%20BRACELET.pdf>

Additional Resources

- <http://www.agintheclassroom.org/TeacherResources/TeacherResources.shtml>
Illinois Agriculture in the Classroom interactive Water Ag Mag & Reader
- There are many songs and videos online that discuss the water cycle.
- Water Dance by Thomas Locker ISBN-13: 978-0152163969

Standards

Illinois Science Standards

MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

Illinois English Language Arts Standard

RST1 Cite specific textual evidence to support analysis of science and technical texts

The **M**ultidisciplinary **A**gricultural Integrated Curriculum (mAGic) was created in 2004 under the leadership of the Illinois State Board of Education (ISBE) and the Facilitating Coordination in Agricultural Education Project (FCAE). Funding was made available through the FCAE grant budget from the agricultural education line item of the ISBE budget. This revision, as printed, was developed in April 2021.



These mAGic lessons are designed to bring agriculture to life in your classroom. They address the Illinois Learning Standards in math, science, English language arts and social studies.

Plant mAGic project update writers/reviewers: Rhodora Collins – Dekalb County; Suzi Myers – Kane County; Connie Niemann – Montgomery County; Debbie Ruff – Livingston County; Jennifer Waters – Sangamon County; and Dawn Weinberg – Hancock County.

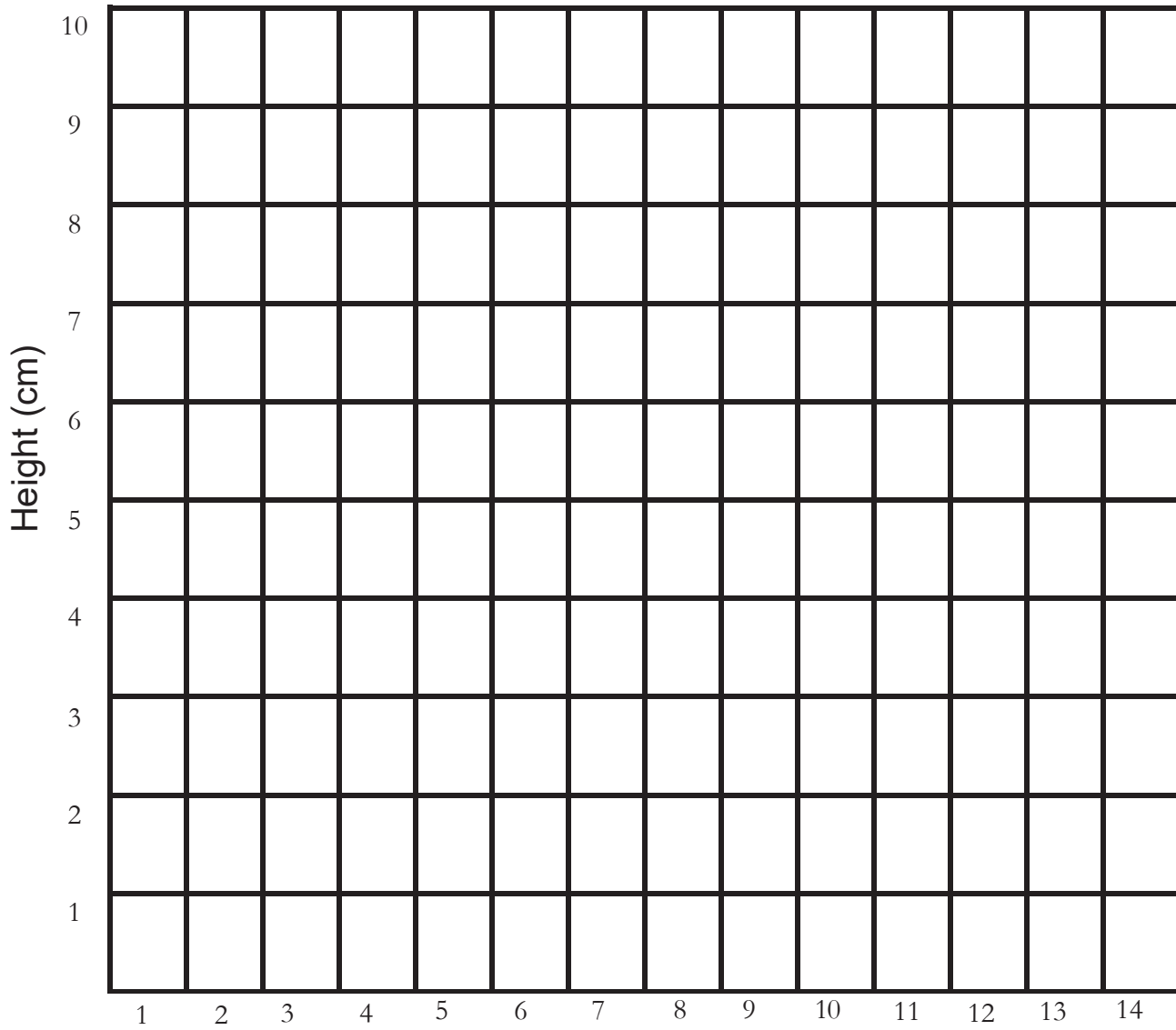
Name _____

Terrarium Observations

Day/Date	Observation	Height
Day: Date:		Predict the order seeds will sprout – label 1st, 2nd, 3rd Bean _____ Corn _____ Grass _____
Day: Date:		Measure height Bean _____ cm Corn _____ cm Grass _____ cm
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Name _____

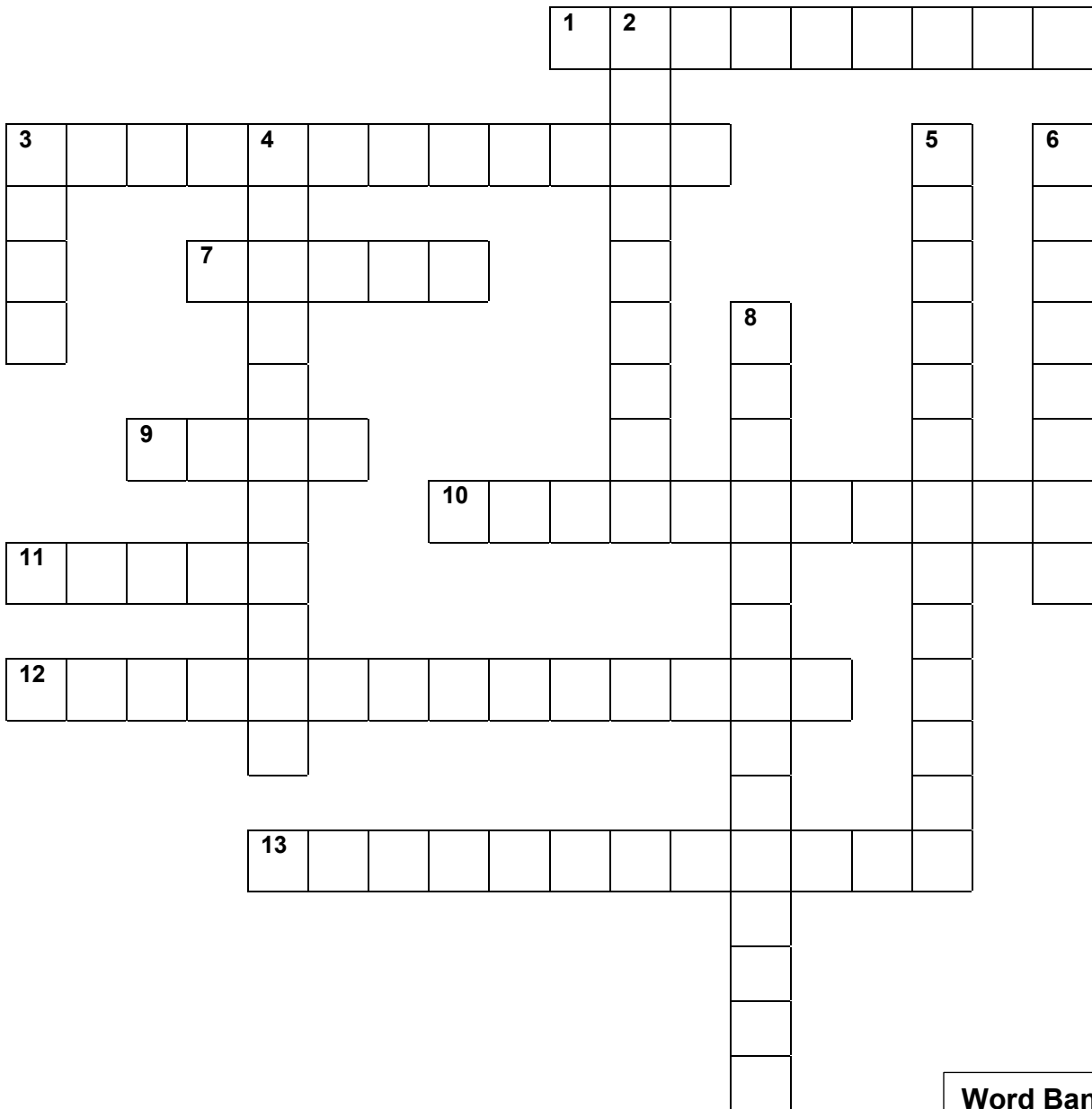
Plant Growth Graph



Time (days)

Terrariums and the Water Cycle

Name _____



Across

- 1 An enclosure for raising plants indoors.
- 3 When water changes from a gas to a liquid.
- 7 Basic need of all plants.
- 9 Land used for production agriculture.
- 10 The process in which seeds sprout or begin to grow and develop.
- 11 What plants need from the sun to grow.
- 12 The process by which plants make food.
- 13 Water that passes through small gaps to soak into the soil.

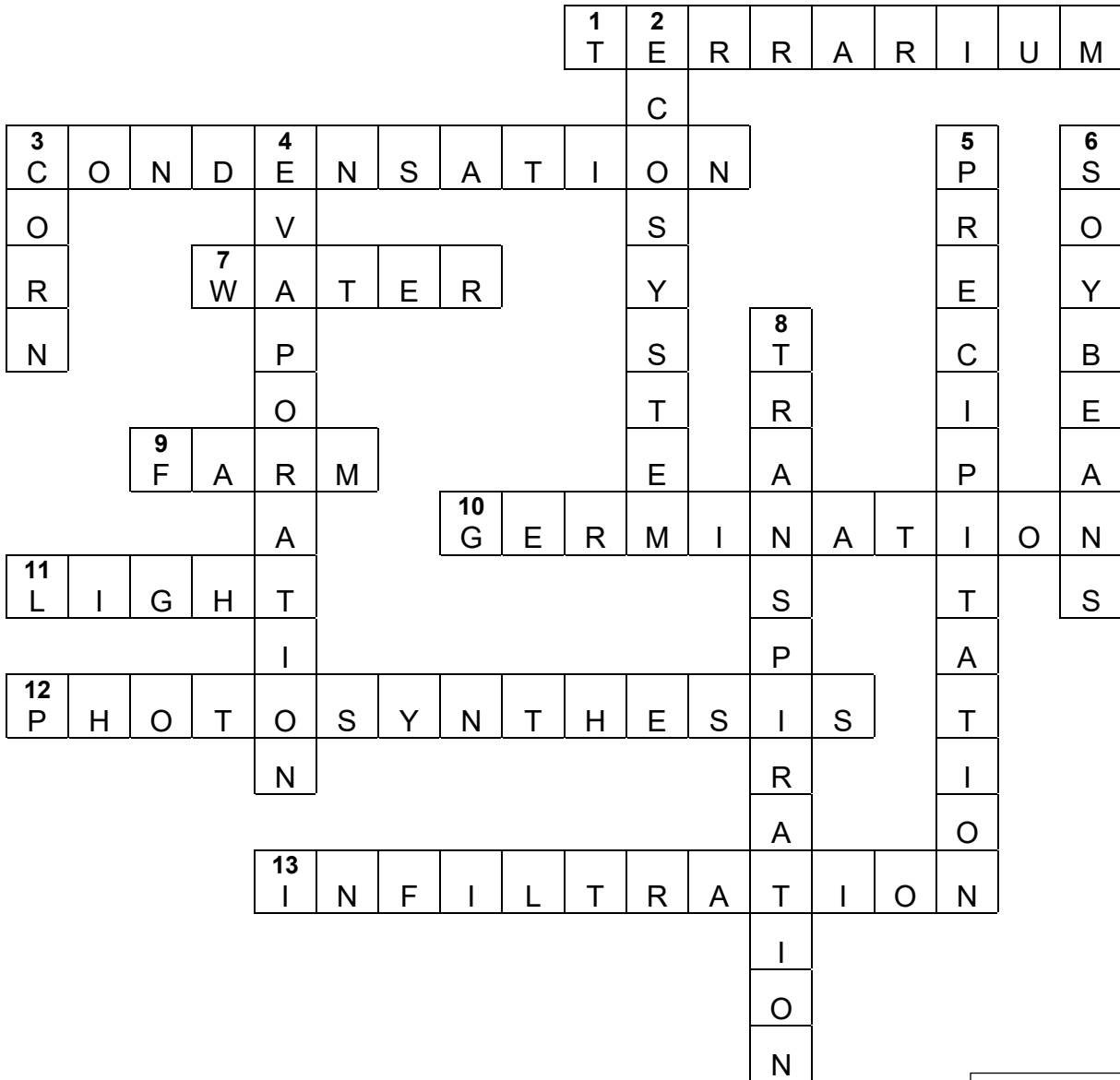
Down

- 2 All the living and nonliving parts of a particular environment.
- 3 A major farm crop grown in Illinois that grows tall and its seeds are on a cob.
- 4 The process in which water forms a vapor.
- 5 A depositing of rain, snow, or sleet.
- 6 A major farm crop grown in Illinois and its seeds are in a pod.
- 8 The process in which plants release water to the atmosphere.

Word Bank

condensation
 corn
 ecosystem
 evaporation
 farm
 germination
 infiltration
 light
 photosynthesis
 precipitation
 soybeans
 terrarium
 transpiration
 water

Terrariums and the Water Cycle ANSWER KEY



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condensation
corn
ecosystem
evaporation
farm
germination
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light
photosynthesis
precipitation
soybeans
terrarium
transpiration
water

Water Cycle

