Anchored Science

by Mi-STAR

THE WATER CYCLE

Water On The Move

PRINT SAMPLER

STUDENT EDITION

Kendall Hunt

Anchored Science by Mi-STAR

UNIT 6.1
Water on the Move: The Water Cycle

Michigan Technological University 1885

Kendall Hunt publishing company

Student Contents

Student Workbook

PRINT SAMPLER

Lessons 1 and 2

Name _____ Date _____ Section _____

Unit 6.1 Unit Challenge Scenario

At the edge of our community used to be a forested park with a stream that was home to all kinds of wildlife. Locals and tourists would visit the park to enjoy all the trails throughout the forest and along the stream.

After a day of hiking, people would visit our downtown area where the stream that flowed through the park also flowed through downtown. This benefited the community because our downtown brought in a lot of money from tourism.

Then the forested park was replaced with a factory with a parking lot. The factory eventually shut down and was torn down. Now a concrete parking lot and an empty field is all that is left.

Along with losing the forested park, the community started having a problem with the stream sometime after the factory was built. After rainstorms the stream would flood the downtown area! Even after the factory was torn down, the flooding continued. It is so bad that flooding happens after almost every storm. The only time downtown does not flood is during winter.

The flooding is bad for the community because it has reduced the number of people who spend time downtown and shop at the local businesses. For example, the flooding forced a popular bike path in downtown to close. The local businesses are worried because fewer people are coming to shop, and a local environmental group is concerned about all the damage that the flooding is causing in the downtown area.

Unfortunately, the planning committee does not know what causes the stream to flood downtown. There have not been changes in the amount of rain and snow over the years. Since the flooding started after the factory was built, the planning committee thinks that this problem has something to do with how the land changed. The owner of the land where the factory used to be is willing to donate the land to the town, but only if the town's planning committee can convince the owner that the town will make changes to the empty land to help people, businesses, and the environment thrive.

Name _____ Date _____ Section _____

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The planning committee is so excited about building on the empty land that they already came up with a large list of ideas. Their list includes ideas like a rain garden, skate park, or even an indoor waterpark! They need you to identify which solutions on the list could improve community well-being and which ones will not. They will take your improved list of ideas and use it to help convince the owner to donate the land!

Name _____ Date _____ Section _____

Defining the Problem

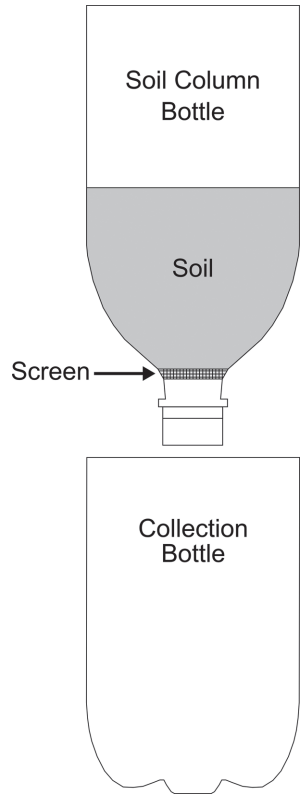
Who am I helping?	
What's the problem?	
What's my role?	
What do I have to do?	

Name _____ Date _____ Section _____

Lesson 2

Uncover Investigation

Station A: Soil Column Model



Set Up (to be completed by student groups or the teacher)

1. Cut off the top of one bottle.
2. Cut off the bottom of the other bottle.
3. Place the screen inside the opening of the "Bottom Missing" bottle to keep the soil from falling out.
4. Fill the "Bottom Missing" bottle halfway with soil.
5. Place the bottle filled with soil into the "Top Missing" bottle.
6. The model should look similar to the image to the right.

Directions: Pour water onto a soil surface that represents the ground.

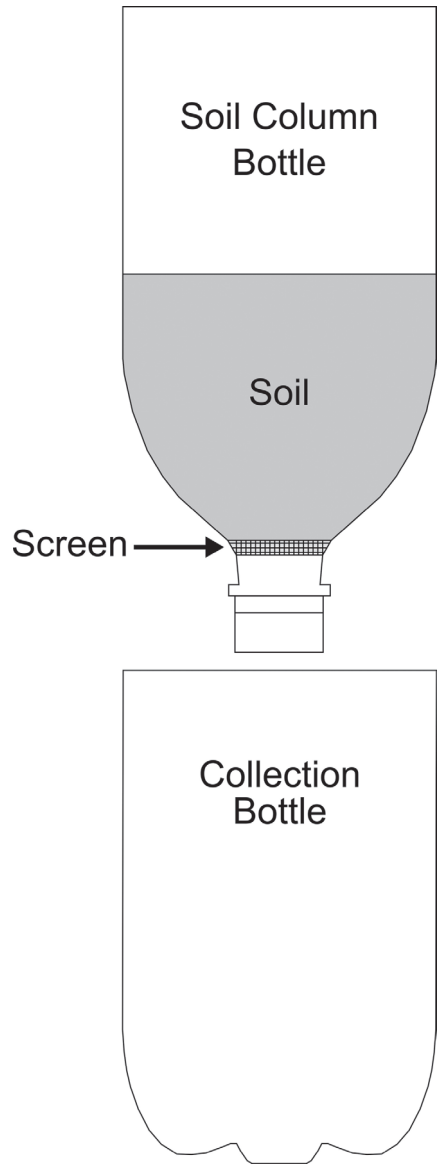
Make a prediction

What will happen when water is poured on the soil? Describe your thinking.

Observations

1. Set a timer for one minute.
2. Add 200 mL of water into the soil column bottle.
3. After one minute, use the soil column to answer the following questions.
4. What happened to the water that you poured into the soil column bottle? Complete the model on the next page to show what you observed. Make sure to include where water was located and use arrows to indicate the movement of water.

Name _____ Date _____ Section _____



5. What pathway did the water take?

_____

_____

_____

_____

Name _____ Date _____ Section _____

6. Does this evidence support your prediction? Why or why not?

7. How does this model relate to the real world?

Name _____ Date _____ Section _____

Station B: Land Cover Model

Set Up (to be completed by student groups or the teacher)

1. Cut a rectangular window along the side of the bottle.
2. Lay the bottle on its side, window facing up.
3. Add the soil to the cut bottle, spreading it out evenly.
4. Move the cut bottle to the edge of the table, with the opening hanging over the edge.
5. Use blocks or books to hold up the back of the bottle 5-10 cm, so that water will flow toward the opening.
6. Slowly add water until the model just begins to drip, this will keep water from getting trapped in the bottle. (See set up drawing on the next page.)

Directions: Pour water onto a soil surface that represents the ground.

Make a prediction

What would happen if water falls on the soil? Describe your thinking.

_____

_____

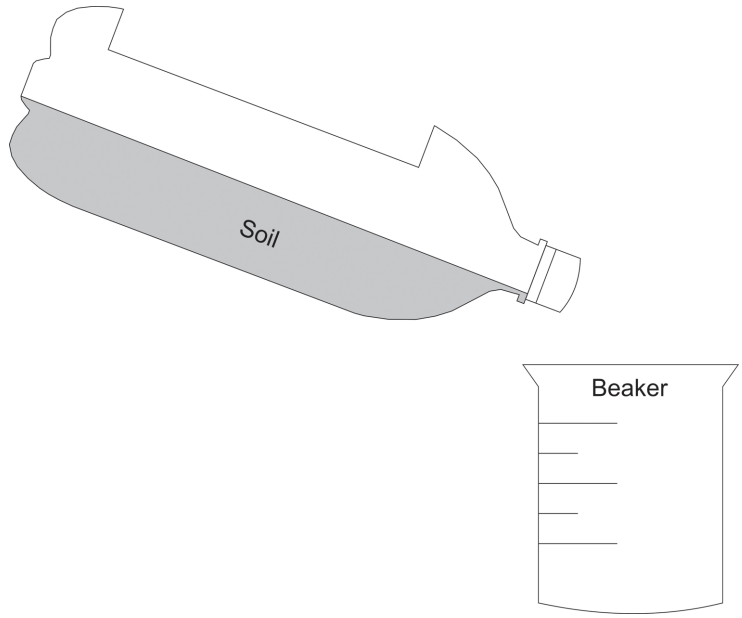
_____

_____

Observations

1. Set a timer for 30 seconds.
2. Place a cup underneath the bottle opening hanging over the edge.
3. Add 200 mL of water to the uphill side of the cut bottle, make sure to catch any water that leaves the bottle.
4. Let water flow through for 30 seconds.
5. Remove the cup with water and lay the Land Cover Model flat on the desk so that no more water leaks out.
6. What happened to the water that you poured into the bottle? Complete the model below to show what you observed. Make sure to include where water was located and use arrows to indicate the movement of water.

Name _____ Date _____ Section _____



7. What pathway did the water take?

8. Does this evidence support your prediction? Why or why not?

Name _____ Date _____ Section _____

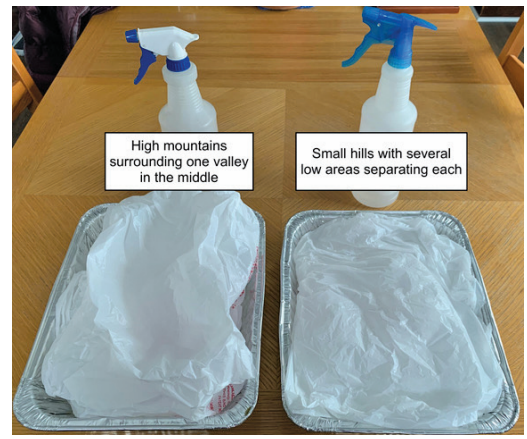
9. How does this model relate to the real world?

Name _____ Date _____ Section _____

Station C: Landform Tarp Model

Set Up (to be completed by student groups or the teacher)

1. Model 1: Arrange crumples of paper in one pan to represent higher elevation like a mountain range.
2. Model 2: Arrange crumples of paper in the other pan to represent landforms like a plain with small hills separated by small valleys.
3. For both models: Place one piece of plastic wrap over each pan, tucking in the corners. Press the plastic wrap into the landforms to take the same shape. If you are not using food coloring to help see the water, dust each model with chalk, clay dust, flour, or another appropriate substance.



Directions: You will spray water on surfaces that represent two different landscapes—a mountainous region and a hills/plains region.

Make a prediction

1. What will happen when water is poured onto the surface? Describe your thinking.

_____

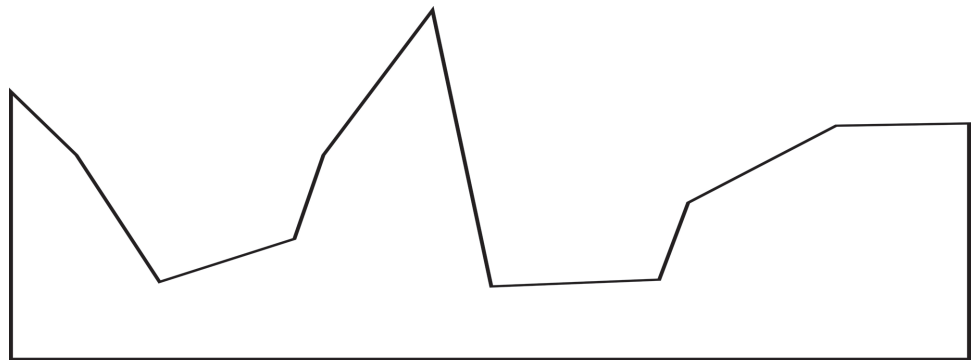
_____

Name _____ Date _____ Section _____

Observations

Model 1: Mountains

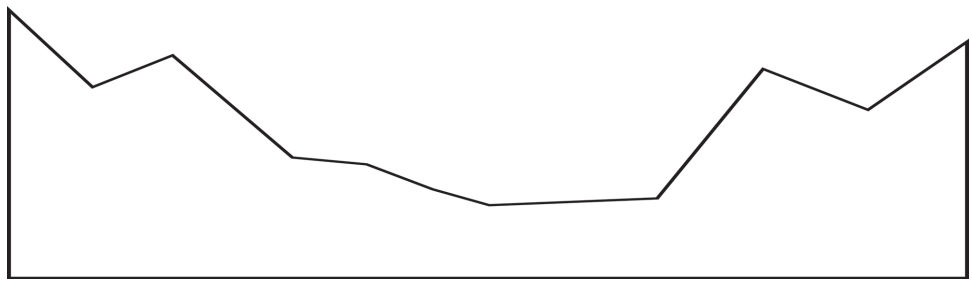
1. Use a spray bottle to simulate rainfall over the pan with the mountain range. Spray approximately 70 times.
2. Describe and draw what happens to the water below. Use arrows to show the movement of the water



Model 2: Hills/Plains

3. Use a spray bottle to simulate rainfall on the pan with the lower hills and valleys. Again, spray approximately 70 times.
4. Describe and draw what happens to the water below. Use arrows to show the movement of water.

Name _____ Date _____ Section _____



5. Does this evidence support your prediction? Why or why not?

6. Why did the water move? How do you know?

7. What will happen as more rain occurs?

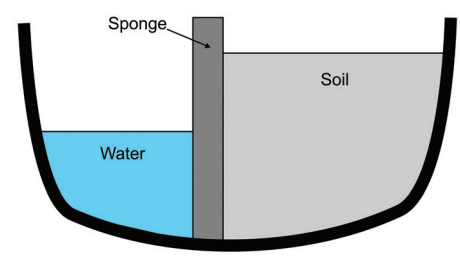
Name _____ Date _____ Section _____

8. How are these models different when it rains?

9. What real-world Earth components do each of the parts of the model represent?

Station D: Groundwater Model

Directions: You will watch a video of water flowing through sand.



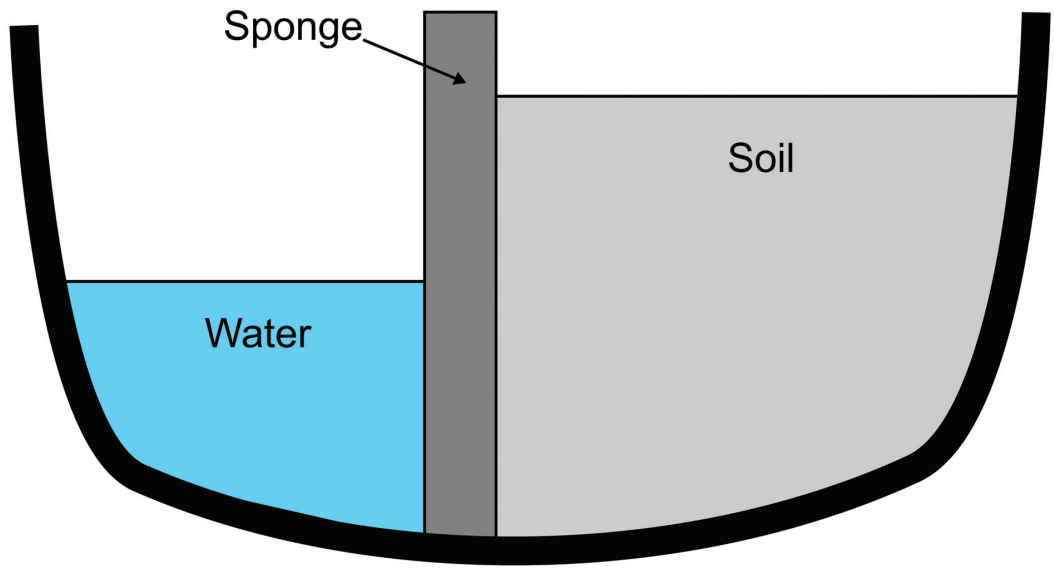
Make a Prediction

1. What will happen when water is poured onto the surface? Describe your thinking.

Name _____ Date _____ Section _____

Observations

1. Create a model showing what you observed in the video. Use arrows to show the movement of water.



2. Does this evidence support your prediction? Why or Why not?

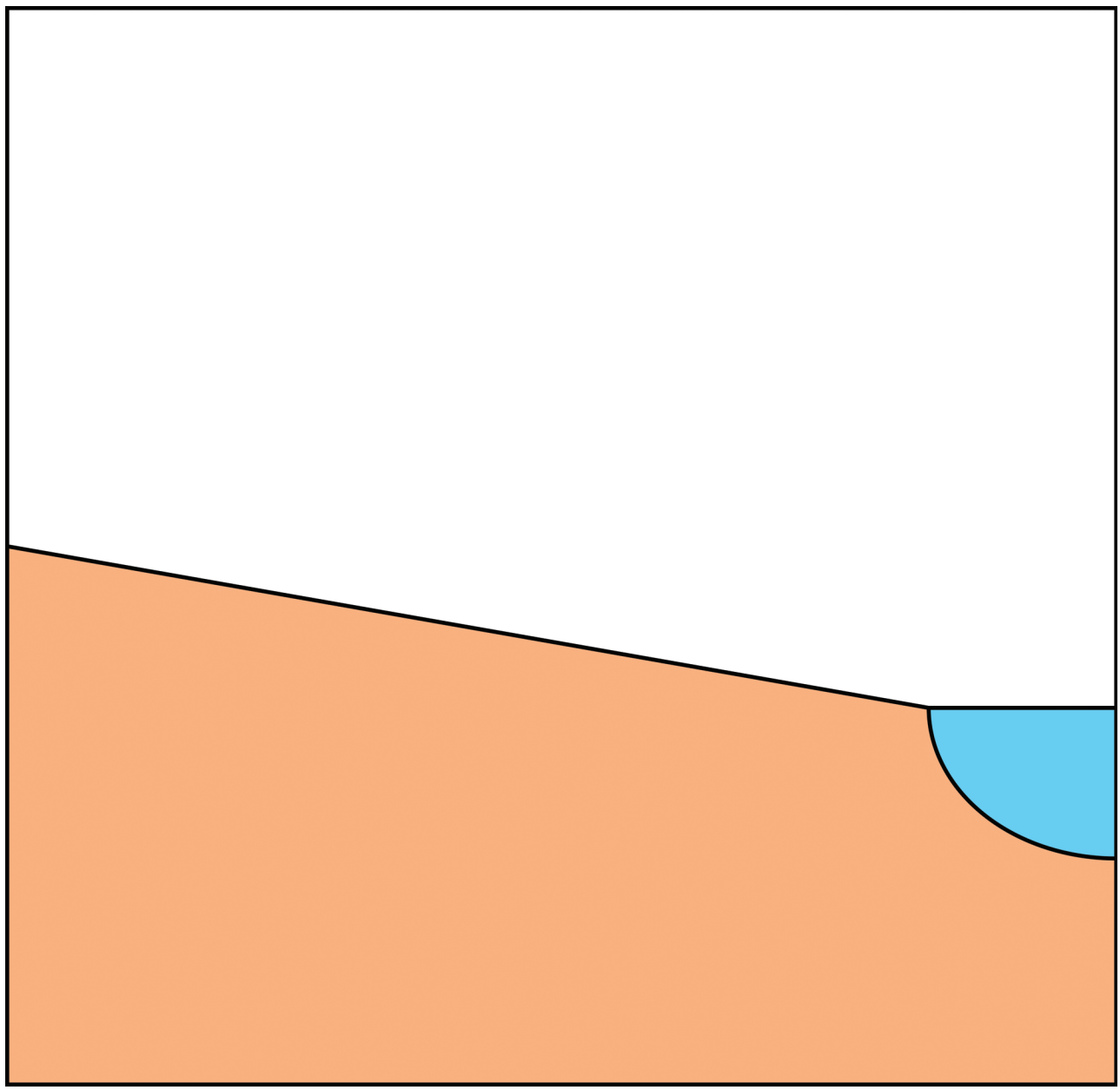
3. How does this model relate to the real world?

Name _____ Date _____ Section _____

Put It All Together

Directions: The model below represents a cross-section of a landscape with a lake/river on the right side.

1. Add the four (4) pathways that water took at each of the stations to the model.
2. Use arrows to show the direction of water movement and label each arrow appropriately.



Name _____ Date _____ Section _____

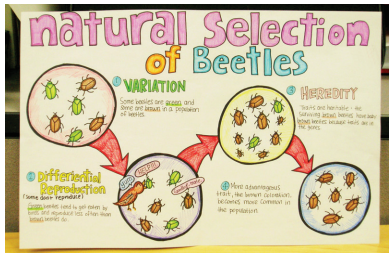
Lesson 2 Article: Level A

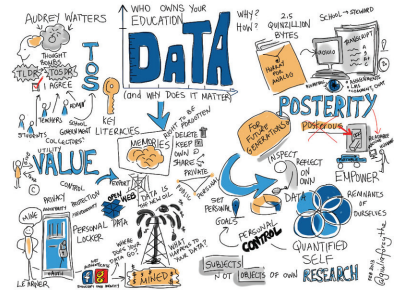
My assigned article from _____

is titled _____

Use the rubric below to create a One Pager on the next page.

1. Divide your page into five sections. Leave room around the edge for a border. You can make the sections in whatever shape you want. **Put your name on it**.
2. In the sections, draw and/or write:
   - **a.** Three quotes from people in the article that describe the problem.
   - **b.** A system model that shows how water is moving during some of the flooding described in the article.
   - **c.** Tell how runoff is involved in the flooding.
   - **d.** Tell how climate change is involved in the flooding.
   - **e.** How does this problem affect you, your family, or other people? Give two examples.
3. **Make a border** for the entire page. Use a word or symbol as part of the border design.
4. Use a lot of **color and illustrations** throughout your page.





Sample one page information graphics.

Name _____ Date _____ Section _____

Name _____ Date _____ Section _____

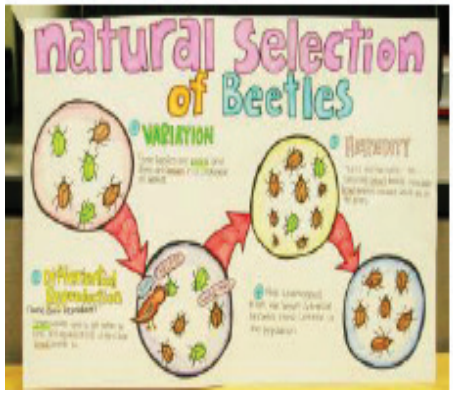
Lesson 2 Article: Level B

My assigned article from _____

is titled _____

Use the rubric below to create a One Pager on the next page.

1. Divide your page into five sections. Leave room around the edge for a border. You can make the sections in whatever shape you want. **Put your name on it.**
2. In the sections, draw and/or write:
   - **a.** Three quotes from people in the article that describe the problem.
   - **b.** A system model that shows how water is moving during some of the flooding described in the article.
   - **c.** Tell how more runoff is involved in the flooding.
   - **d.** Tell how climate change is involved in the flooding.
   - **e.** How does this problem affect you, your family, or other people? Give two examples.
3. **Make a border** for the entire page. Use a word or symbol as part of the border design.
4. Use a lot of **color and illustrations** throughout your page.



Sample one page information graphics.

Name _____ Date _____ Section _____

Name _____ Date _____ Section _____

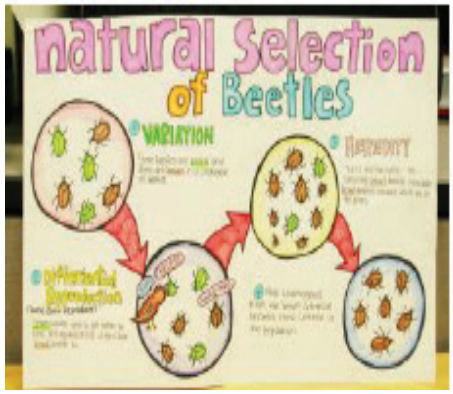
Lesson 2 Article: Level C

My assigned article from _____

is titled _____

Use the rubric below to create a One Pager on the next page.

1. Divide your page into five sections. Leave room around the edge for a border. You can make the sections in whatever shape you want. **Put your name on it.**
2. In the sections, draw and/or write:
   - **a.** Three quotes from people in the article that describe the problem.
   - **b.** A system model that shows how runoff is moving during some of the flooding described in the article.
   - **c.** Tell how climate change is involved in increasing the number and severity of rain events.
   - **d.** How does this problem affect you, your family, or other people? Give two examples.
   - **e.** How could engineers use gravity to change where the flood waters flow?
3. **Make a border** for the entire page. Use a word or symbol as part of the border design.
4. Use a lot of **color and illustrations** throughout your page.



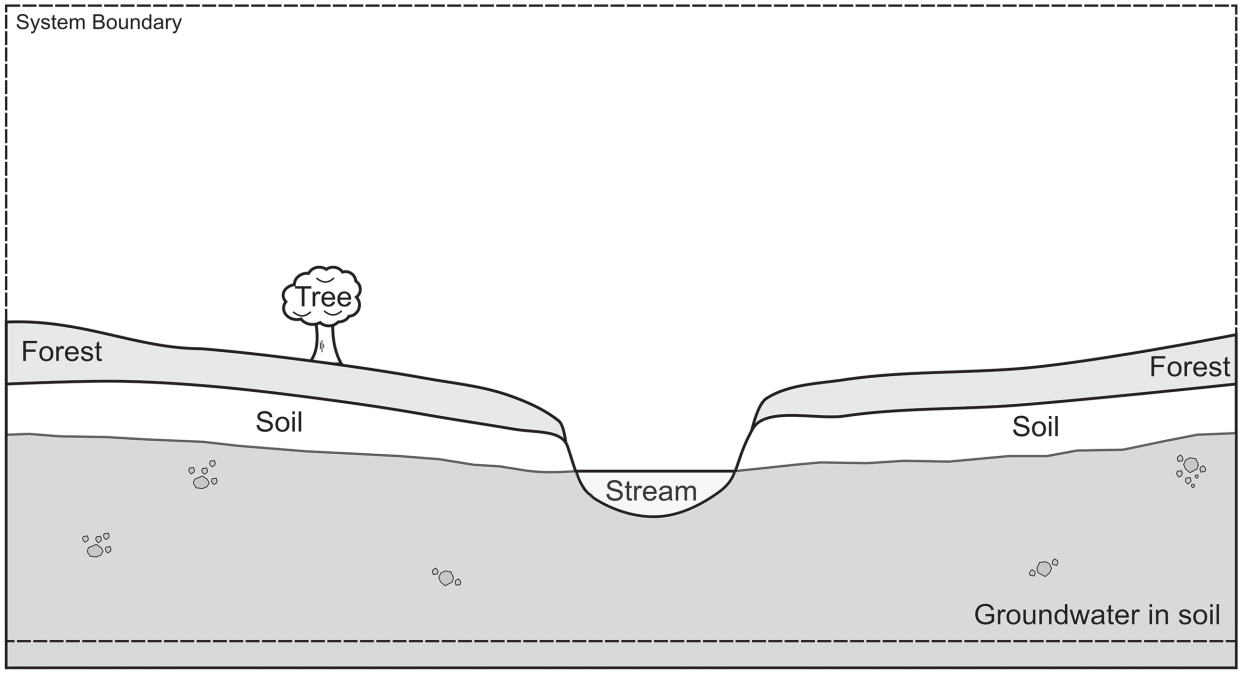
Sample one page information graphics.

Name _____ Date _____ Section _____

Lesson 2 & 3

Forested Lot Model

Pathways of Water: Forested Lot Name: _____ Hour: _____



☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____

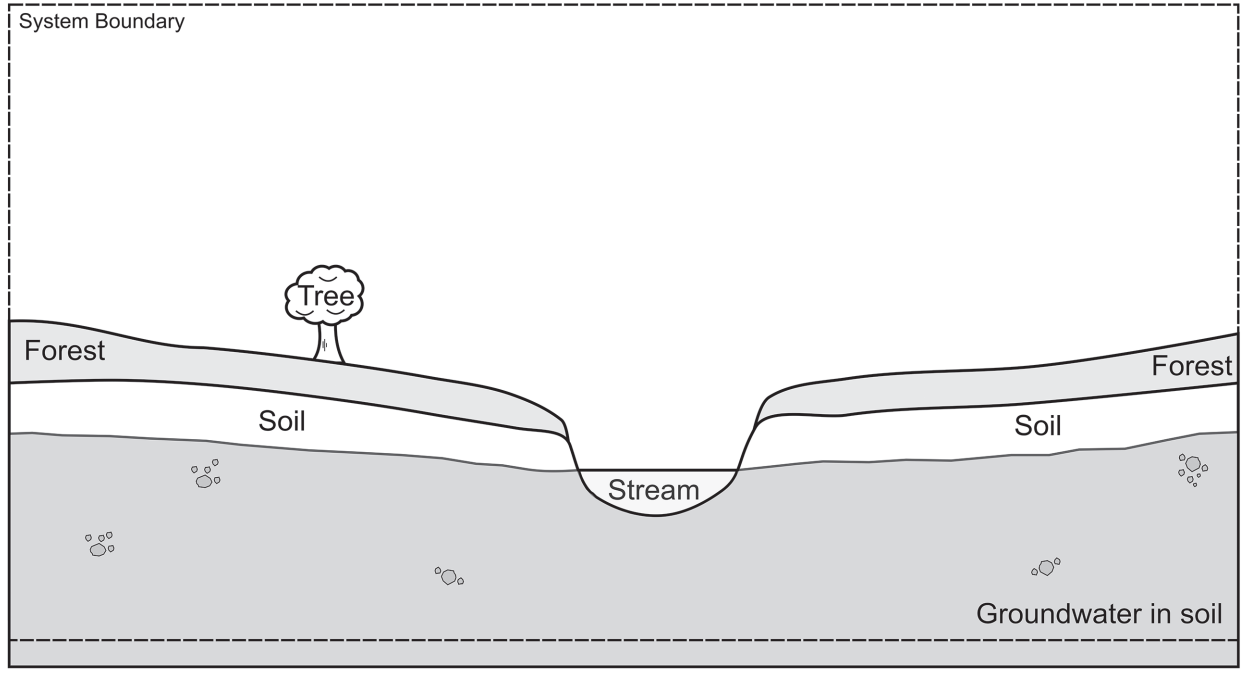
Name _____ Date _____ Section _____

Lesson 2 & 3

Forested Lot Model

Pathways of Water: Forested Lot

Name: _____ Hour: _____



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Name _____ Date _____ Section _____

Name _____ Date _____ Section _____

Unit Summary Table

Lesson 2 Lesson Discovery Question:

What causes water to go into a stream?

A. What activity did we do?	***We used 4 models:*** **1.** *We used a soil column to model how water moves into the ground.* **2.** *We poured water over forest soil to model how water runs over the ground.* **3.** *We created different landscapes and sprayed water over the different landscapes to test how the shape of the land affects how water runs over it.* **4.** *We watched a video of a groundwater model and observed how water moves through the ground.*
B. What evidence did we gather?	
C. My answer to the Lesson Discovery Question:	
D. Connecting my ideas to the Unit Challenge:	

Name _____ Date _____ Section _____

6.1 Civil Engineering Career Connection

Directions: Choose three careers (trade & college educated) involved in or associated with civil engineering using the given links. Research the information outlined in the table about each job. Would one of them be a good fit for you?

- Construction & Skilled Trade Careers **https://thebestschools.org/careers/construction-skilled-trade-careers/**
- The Balance Careers **https://www.thebalancecareers.com/entomologist-125921**
- U.S. Bureau of labor Statistics (Click on our state) **https://www.bls.gov/**
- Occupational Outlook Handbook **https://www.bls.gov/ooh/a-z-index.htm**
- Xello **https://xello.world/en/blog/michigan-career-development-model-xello/**
- Career One Stop **https://www.careeronestop.org/**
- Nepris (online live conversations with industry professionals) **https://nepris.com/home/v4**
- Michigan Department of Technology, Management & Budget **https://milmi.org/**

Investigate	Career#1 _____	Career #2 _____	Career #3 _____
Amount of pay that can be earned.			
Level of education needed.			
Duties for this professional.			
What would the work environment be like?			
Important qualities for this professional.			
Important qualities for this professional.			
Would this field interest you? Why or why not?			

Name _____ Date _____ Section _____

Student Glossary

Name _____ Date _____ Section _____