Student Worksheets

What is the Water Like in Our River?

Student Materials

Content

Student Worksheets

LEARNING SET ONE

LEARNING SET TWO

LEARNING SET THREE

Name _____

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EXPLORING WATER QUALITY

Directions

Look at jars 1-4 that your teacher has provided. Would you use the water in each of those jars to fish? Swim? Boat? Drink? Record your answers on the back side of this sheet. Provide a reason for your answer.

JAR ONE

Would you use the water in this jar to:

Fish?	***Yes/No***
Swim?	***Yes/No***
Boat?	***Yes/No***
Drink?	***Yes/No***

JAR TWO

Would you use the water in this jar to:

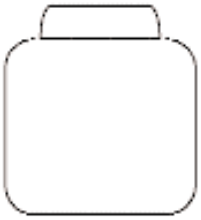
Fish?	***Yes/No***
Swim?	***Yes/No***
Boat?	***Yes/No***
Drink?	***Yes/No***

JAR THREE

Would you use the water in this jar to:

Fish?	***Yes/No***
Swim?	***Yes/No***
Boat?	***Yes/No***
Drink?	***Yes/No***

JAR FOUR



Would you use the water in this jar to:

Fish?	***Yes/No***
Swim?	***Yes/No***
Boat?	***Yes/No***
Drink?	***Yes/No***

Look at jar 5. Would you use the water in that jar to fish? Swim? Boat? Drink?

JAR FIVE

Would you use the water in this jar to:

Fish?	***Yes/No***
Swim?	***Yes/No***
Boat?	***Yes/No***
Drink?	***Yes/No***

1. How did we determine water quality for the bottles? Was it an adequate method?

2. How else could we measure water quality?

3. If we were walking along a river, lake, or stream how could we determine its quality?

4. How would you define water quality?

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WATERSHED VIRTUAL TOUR

Directions Answer the following questions as you take the watershed virtual tour.

What is the water like in our river?

1. What is water quality?

_____

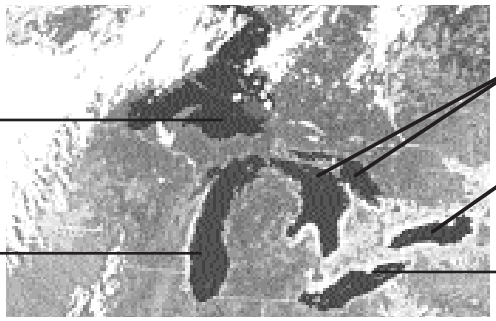
_____

2. What is a watershed?

_____

_____

3. Label each of the 5 Great Lakes:



4. How are larger and smaller watersheds connected?

_____

_____

5. Grand Rapids is closest to which Great Lake? _____

6. Where do you think all the rivers and streams in Michigan eventually end up?

_____

_____

7. How do you think the Grand River and the Thornapple River get their supply of water?

_____

_____

8. As water flows, what are the 3 basic types of land uses that it passes through?

_____

_____

9. What consequences or benefits might there be to building right along the shoreline?

_____

_____

10. How can fertilizers get into our river?

_____

_____

11. Using the second page of the "Our River" Worksheet (page 6), record your observations of the 3 sites.

_____

_____

12. Compare the 3 sites. Do you think they will have the same water quality? Explain your reasoning?

_____

_____

13. What are some things we can do to make recreation safe for everyone?

_____

_____

14. Some people rely on fish from the river to survive, what can we do to make the river safer for them?

_____

_____

15. Why do you think it is important to have clean, healthy water?

_____

_____

16. Brainstorm 3 questions that you have about watersheds or water quality.

_____

_____

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RIVER OBSERVATIONS

Location of your river

School name_____

River name _____

Branch of river _____

Location of your site
*(main cross streets)*_____

Length of area you are surveying_____

Shape of the river
_____Straight _____Meandering (curvy)

Speed of the river
_____Fast _____Medium _____Slow

Color of the river

_____ Green	_____ Foam
_____ Orange-Red	_____ Muddy/Cloudy
_____ Milky/White	_____ Multicolor
_____ Red	_____ Brown
_____ Black	_____ Other

Smells around the river

_____ Chlorine	_____ Rotten egg
_____ Musky/Sewage	_____ Flowery
_____ Fish	_____ Other
_____ Grassy	

Bottom of the river

_____ Rocky	_____ Gravel	_____ Clay
_____ Boulders	_____ Sand	_____Muddy
_____ Logs/limbs	_____ Other	

Edges
(banks) of the river

_____ areas where earth materials have been worn away
_____ bare soil at the sides of the river
_____ cement at the sides of the river
_____ rocks at the side of the river

Observation Field Notes:

Land area around your river

How is the land around your river being used by humans?
What man-made things can you find?

_____ houses _____forest _____highway
_____ factories _____park _____Other
_____ golf course _____farm
_____ apartments _____ parking lots
_____ shopping malls ____ residential streets

Living things

What living things can you observe on the land and in the water?

If you cannot observe the living things directly what evidence in the area can you find to let you know what kind of living things live there? ie. nests, foot prints
Be sure to write down what you see!!

Plants

_____
_____
_____
_____
_____

Animals

_____
_____
_____
_____
_____

Draw a map of your river area and include as many observations as you can.

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WHAT IS A WATERSHED?

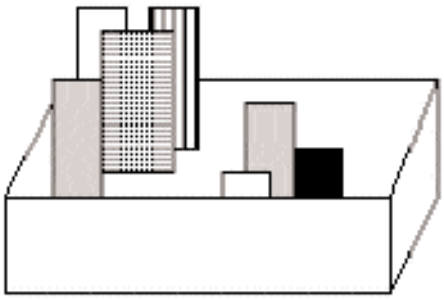
Building Your Watershed Model

1. Place newspaper under the tray.

2. Arrange a tall object near one edge of the tray and arrange the shorter objects toward the center of the tray.

3. Crumple up a piece of butcher paper. Be careful not to rip any holes in the paper.

4. Carefully cover the tall and short objects with the sheet of butcher paper pressing the paper down so that it looks like tall and shorter hills. Use pieces of tape to keep the paper from lifting up from the tray.



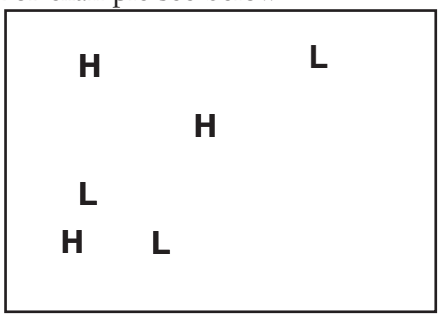
Drawing Your Elevation Map

5. On the model mark high areas with an "H" and low areas with an "L"

6. On the next page draw an elevation map of your model. Sketch a bird's-eye (as if you were looking down at your model) of the high and low areas. Mark the high areas with "H"s and the low areas with "L"s.

Note: *Each member of your group should draw your own elevation map. Chose one member to draw their map on a piece of transparency film.*

For example see below



Make Your Prediction

7. On the next page predict how the water will flow over the model if you spray water on it. Include where water will flow and accu mulate.On your elevation map draw arrows to show how the river will flow and draw circles to indicate where the water accumulates.

Observing Your Model

10. Hold the spray bottle about 5 inches from your model and spray for several minutes until you get a continual flow of water. Take turns spraying your model. Alternate where each person sprays.

11. Return spray bottle to teacher.

12. Using a different color pen draw on your map how the water flows over your model and where the water accumulates. Note the pattern of how the water flows over your model, how smaller rivers join to form larger rivers and how rivers flow into lakes.

Note: Each member of your group should draw your observations. One member should draw on the transparency film.

Make drawings on the back.

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ELEVATION/OBSERVATION MAP

Use space provided to make an elevation map and observation map of your watershed.

Elevation

Observations

1. Explain how the water flowed over your model(what patterns occurred)? What caused the water to flow the way it did? _____
_____
_____

2. Did your observations agree or disagree with your predictions? How were they similar or different?_____
_____
_____

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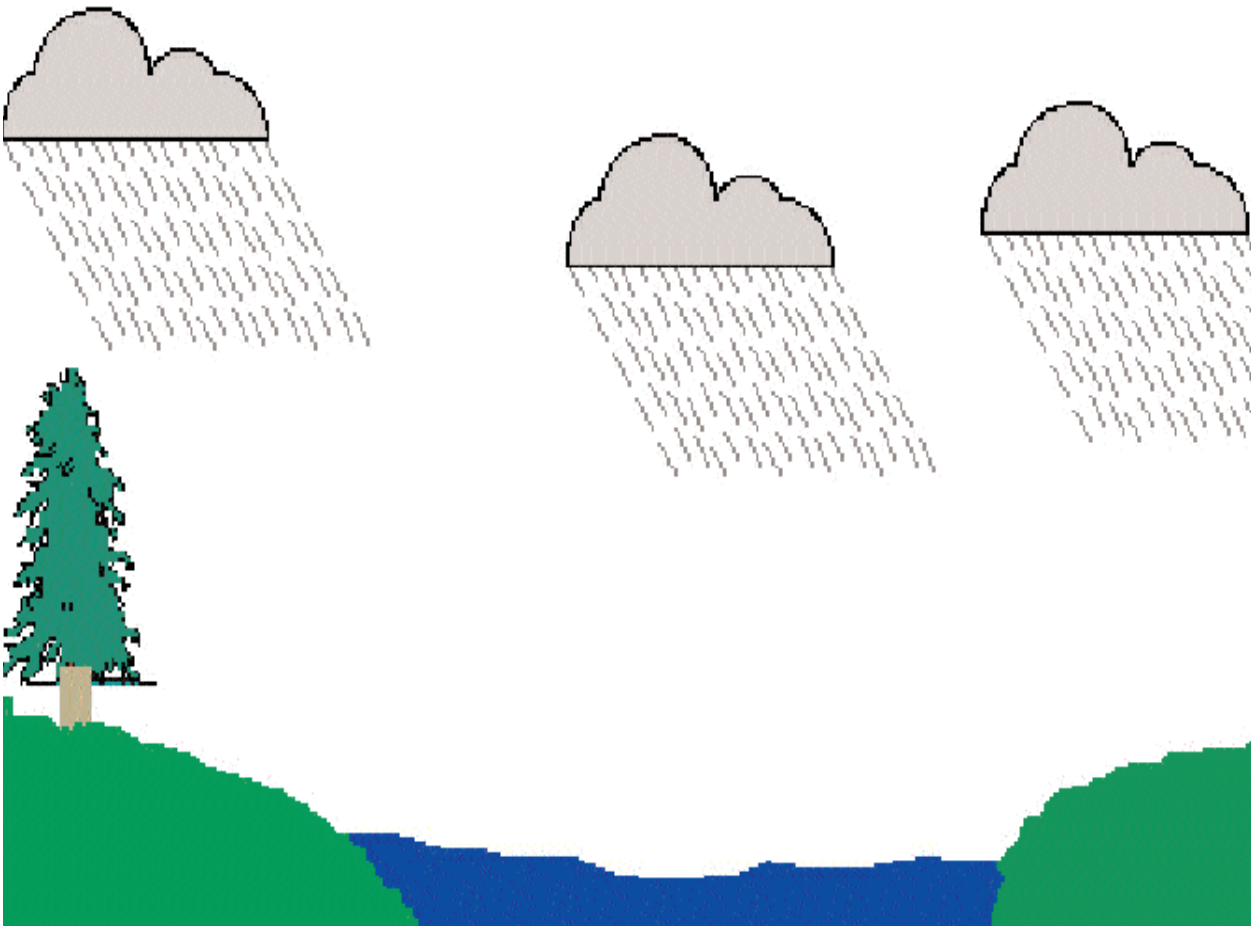
WHAT HAPPENS TO THE WATER WHEN IT RAINS?

1. Describe how the picture below is similar to the watershed model you built. Label the diagram with the objects you used in the model. (ie: paper, spray bottle)

2. Draw arrows of how the water will flow over the land.

3. Record vocabulary words on the picture, be sure to include: **absorption, accumulation, precipitation, run-off, watershed.**

4. Write the definition of the words above on the back of this sheet or in your journal.



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WHAT DIRECTION DOES THE WATER FLOW?

This is a picture of a watershed.

1. Draw arrows on the picture that show the direction the water will flow.

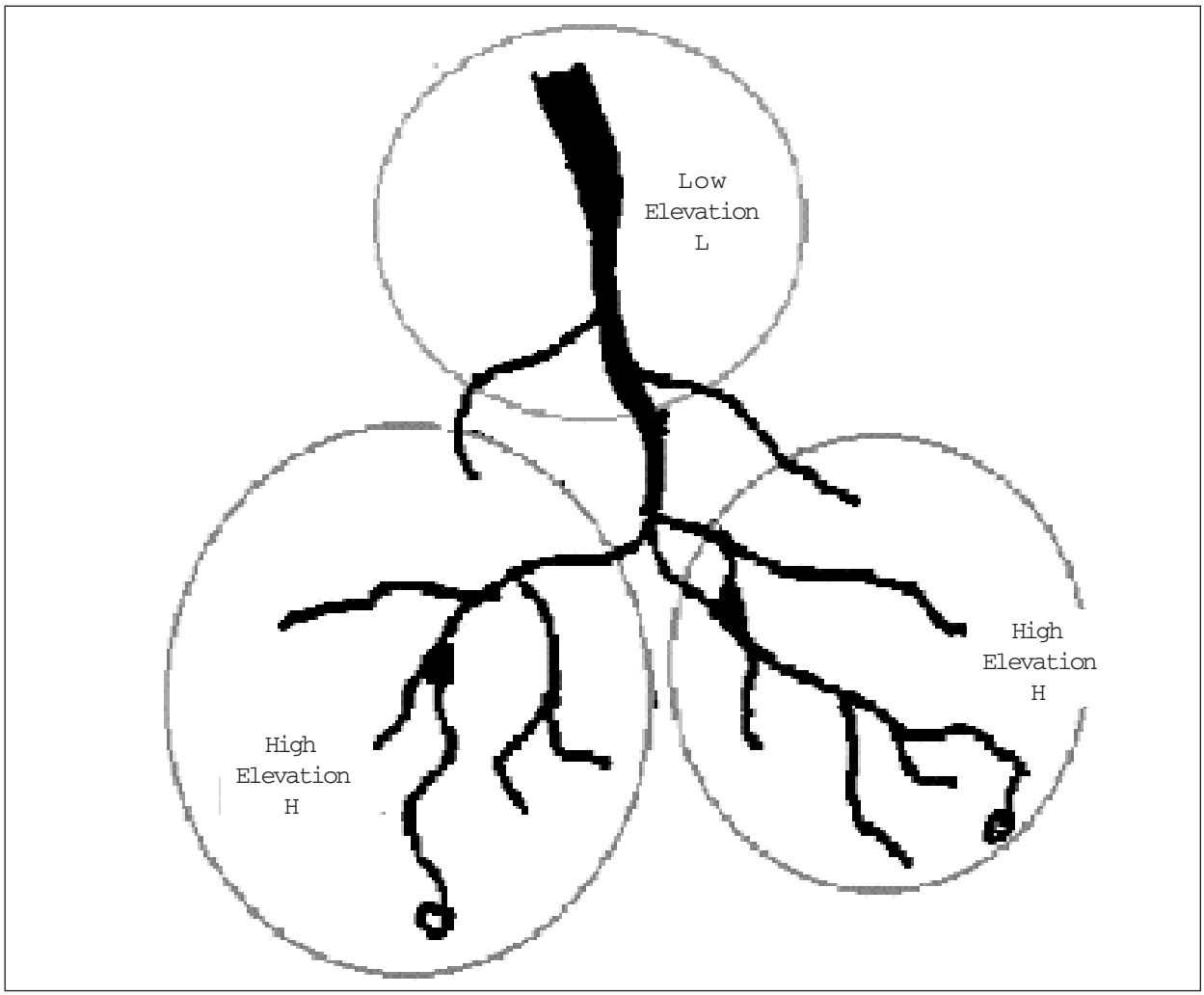
2. Explain why you predicted the water to flow in this direction.

_____

_____

_____

_____



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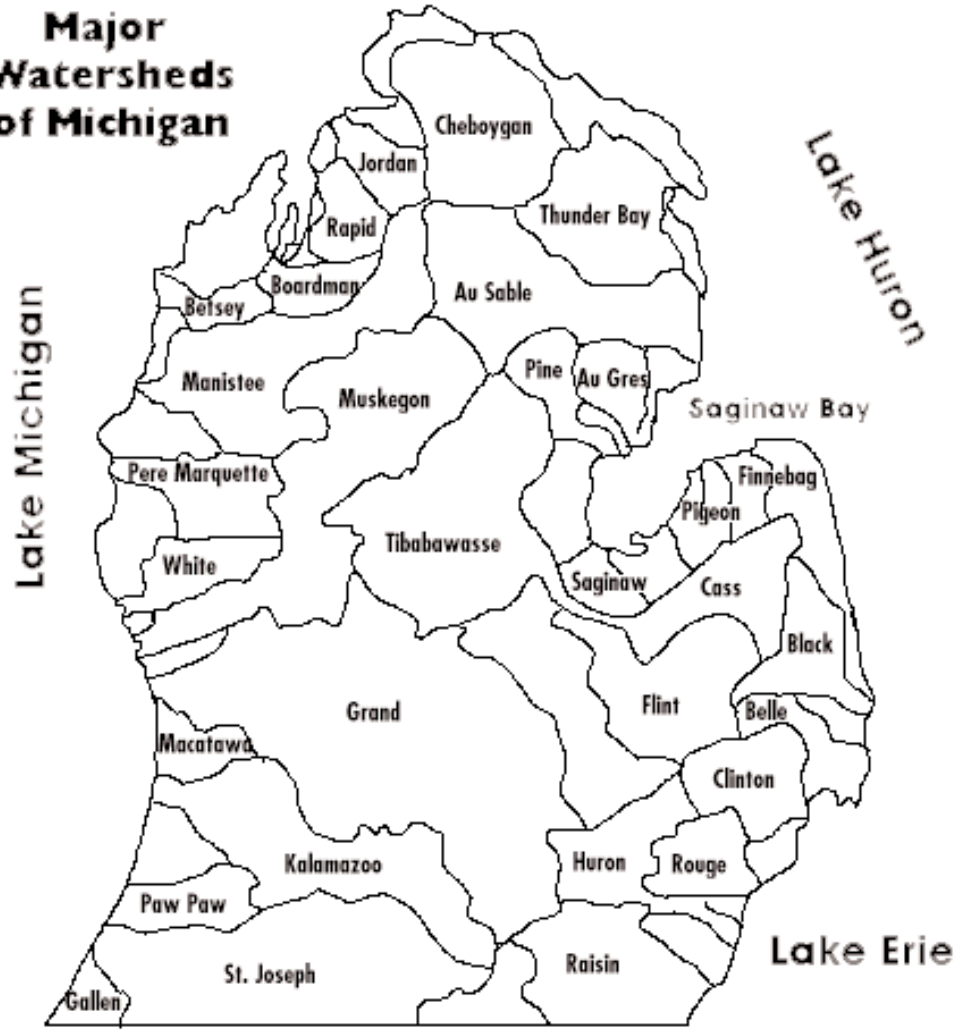
MAJOR MICHIGAN WATERSHEDS

This is a map of the entire Michigan Watershed.
Within the Michigan Watershed there are a large number of smaller watersheds. This map shows you each of these smaller watersheds.

As water enters each of the small watersheds as precipitation, the water flows in river systems and then into the Great Lakes.

1. Using your topographic map as a guide, indicate with arrows on this map where each watershed empties into the Great Lakes that surround Michigan.



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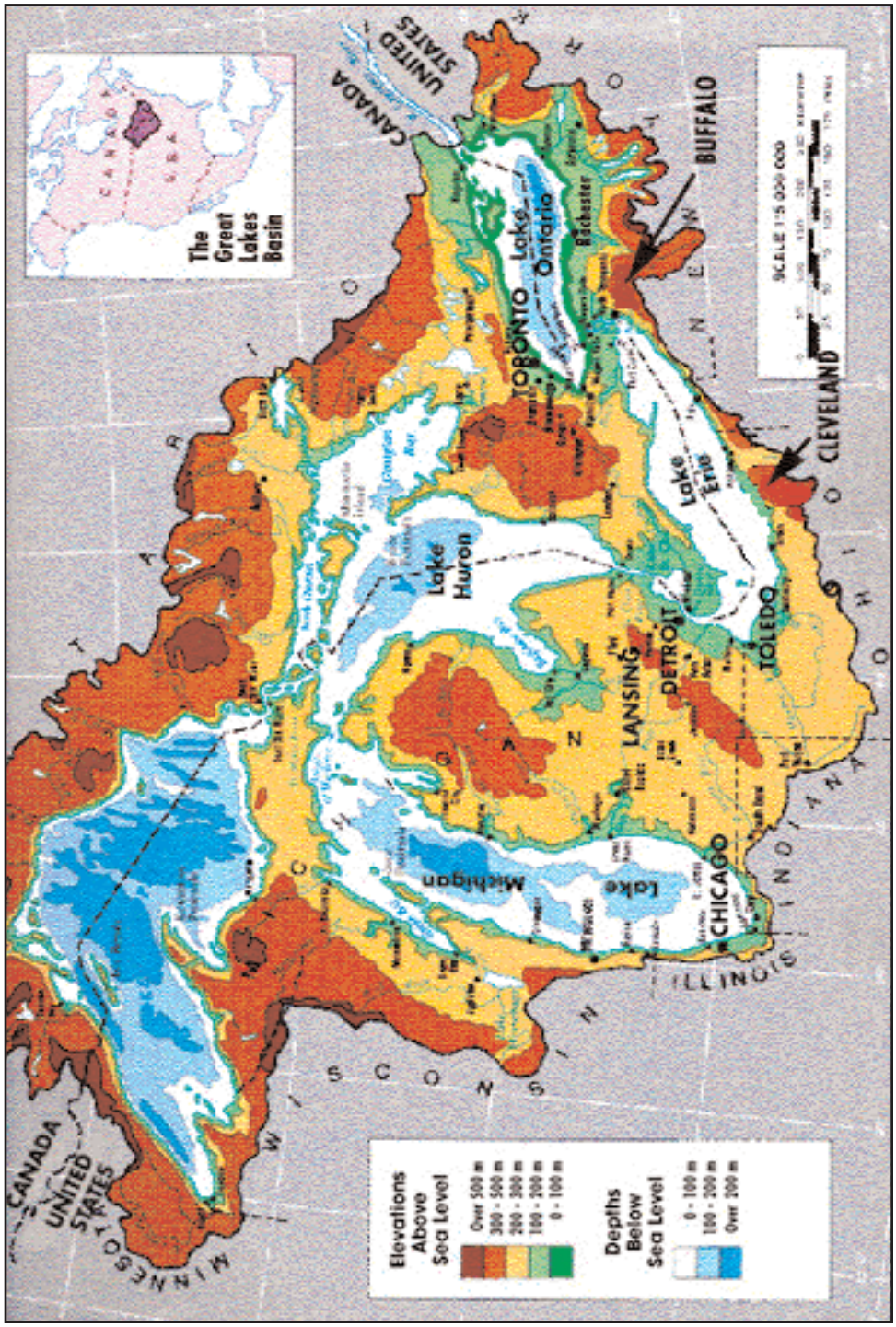
GREAT LAKES TOPOGRAPHIC MAP



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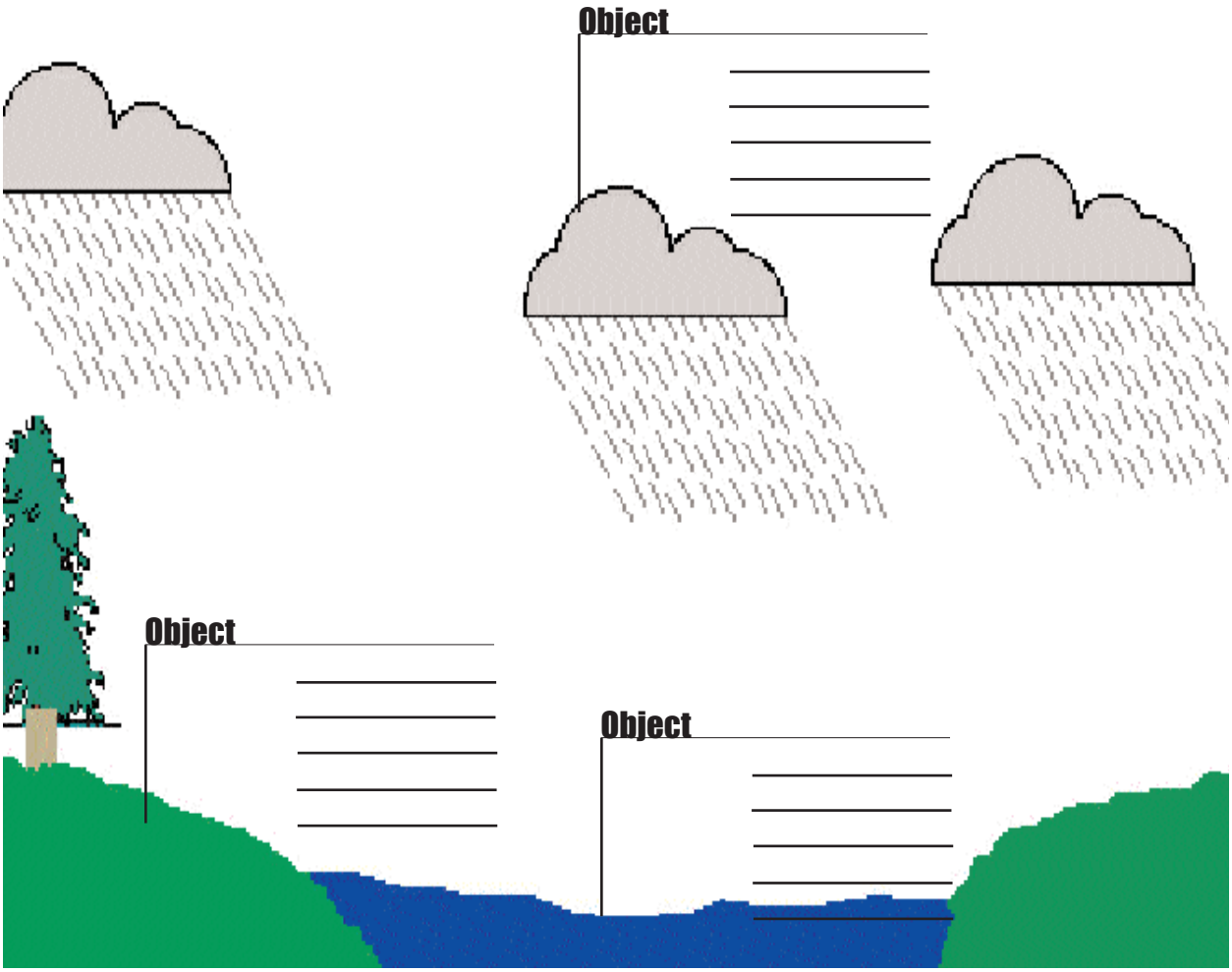
MODEL-IT PLAN
WHAT HAPPENS TO WATER WHEN IT RAINS?



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MODEL-IT RELATIONSHIP

DRIVING QUESTION

What Happens to Water When it Rains?

MODEL

Objects and Variable Editor for What Happens When it Rains

Objects	*Variables*	*Ranges*

RELATIONSHIP EDITOR

Relationship Prediction

Relationship Explanation

As _____ increases

_____ (increases/decreases)

because _____

_____

_____

_____

_____

_____

_____

(Be sure to label the axis)

RELATIONSHIPS EDITOR

Relationship Prediction

Relationship Explanation

As _____ increases

_____ (increases/decreases)

because _____

_____

_____

_____

_____

_____

_____

1. How does your computer model help to respond to the question "What is the water like in my river?"

_____

_____

_____

_____

_____

_____

_____

2. What are other relationships that you could to add to your model to answer the question "what happens when it rains?"

_____

_____

_____

_____

_____

_____

_____

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MODEL-IT TESTING

TEST 1

1. What relationship will you test?

_____

_____

2. What is your hypothesis or prediction?

_____

_____

3. What is the independent variable in this relationship?

_____

_____

4. What is the dependent variable in this relationship?

_____

Prediction Table - ***What happens when you change the meters?***

Independent Variable Change	***Dependent Variable (value)***
small increase	
small decrease	

5. Observations (description of the meter and graph results)

_____

_____

_____

6. Did the relationship act like you expected it would? Why or why not?

_____

_____

TEST 2

1. What relationship did you test?

_____

_____

2. What is your hypothesis?

_____

_____

_____

3. What is the independent variable?

_____

4. What is the dependent variable?

_____

Prediction - Table *What happens when you change the meters?*

Independent Variable Change	***Dependent Variable (value)***
small increase	
small decrease	

5. Observations (description of the meter and graph results)

_____

_____

_____

6. Did the relationship act like you expected it would? Why or why not?

_____

_____

Additional tests can be done to examine the rest of the model.

7. Does the model make sense? Why?

_____

_____

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EXPLORING STREAM TABLES/INTRODUCTION

How does water flow through a river?

Have you ever watched water flow through a river? What did you see? What happens to the water? What happens to the earth materials?

How to build our stream table?

Materials

- Spray bottles
- Stream table pan of earth materials
- Two water supply containers
- 1 waste water catch basin
- 2 wooden slats (ruler or paint stick)
- 1 wooden angle
- 1 large (2L) pop bottle filled with water
- 1 package transparency markers
- 1 tray cover (plexiglass)
- 1 magnifying glass
- Paper towels and a lot of newspapers

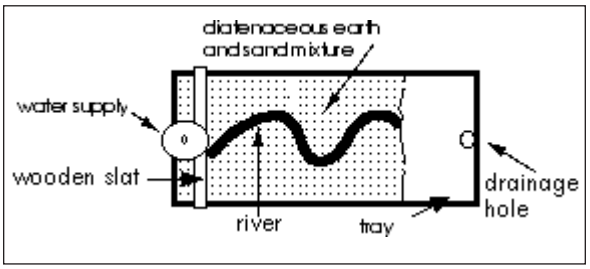
Procedure

1. Cover the work area with a lot of newspapers.
2. Place the tray flat on top of the newspapers. Position the tray so that the drain hole is off the table.
3. Place opened newspapers on the floor.
4. Position the waste water catch basin on the newspapers. The drain hole of the tray should be over the catch basin.
5. Push the earth materials to the end of the tray opposite the drain hole.
6. Flatten the earth materials at a slight slant downward and ending in a cliff. Use the wooden angle (ruler) to flatten and pack down the earth materials.The materials should fill 3/4 of the length of the tray.
7. Lay the ruler or wooden slat across the tray about 5 cm from the end. Position the water supply container labeled “normal” so that it bridges the wooden slat and the tray edge. The hole of the container should be over the earth materials.

8. Using your pointer finger, make a curved finger nail deep river bed from the ruler to the end of the earth material. Smooth the sides of the river channel with your fingers.

9. Sketch a copy of your river on your worksheet.

10. Place your finger over the hole of the normal water supply container and begin to fill the container with water to the line from the 2L pop bottle. Once filled, place the water supply so that it bridges the edge of the tray and the wooden slant.



11. Now it is time to observe your river. Watch what happens to the water and the earth materials. Release your finger from the hole. Let the water run for a slow count of 20 seconds and make your observations.

12. Place the wooden angle under the tray. Repeat steps

DON'T FORGET TO C LEAN UP!

Procedure

1. Tip the tray so a as much water as possible runs out of the tray.

2. Push all of the earth materials to the end opposite the drain using the wooden angle.

3. Drain off more of the water. Some of the earth materials may drain with the water into the catch basin. These materials can be retrieved at a later time.

4. When as much of the water is drained as possible, flatten the earth materials.

5. Place 1 layer of paper towels on the surface of the earth materials and then about 3 thick sections of newspaper.

6. Carry the trays to a designated storage space.

7. Clean any earth materials off the equipment and throw out the soggy news papers. If they are not soggy, they can be left for the next group.

8. Do not throw the waste water down the drain!! The waste water will be poured into a designated waste water pail.

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EXPLORING STREAM TABLES/OBSERVATION

Sketch a picture of your stream table when it was flat.

Label the following observations on your stream table drawings. Be sure to observe both sides of the river.

- mark places where earth material was picked up with an "E"
- mark places where earth material was dropped off with a "D"
- mark places where the river was moving fast with a "F"
- mark places where the river was moving slow with a "S"

Written Observations of the Flat Stream Table

1. What happened to the water?
- how did the speed vary?
- what direction did the water move?
- did the water collect? where?

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

2. What happened to the land?
- where were materials picked up?
- where were materials dropped off
- how did the shape of the river change?

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Sketch a picture of your stream table when it was slanted

Label the following observations on your stream table drawings. Be sure to observe both sides of the river.

- mark places where earth material was picked up with an "E"
- mark places where earth material was dropped off with a "D"
- mark places where the river was moving fast with a "F"
- mark places where the river was moving slow with a "S"

Written Observations of the Slanted Stream Table

1. What happened to the water?
- how did the speed vary?
- what direction did the water move?
- did the water collect? where?

2. What happened to the land?
- where were materials picked up?
- where were materials dropped off
- how did the shape of the river change?

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EXPLORING STREAM TABLES/COMPARISON

1. What was similar about how the water moved when the stream table flat and slanted?

_____

_____

_____

2. What was different about how the water moved when the stream table flat and slanted?

_____

_____

_____

3. What was similar about how the earth material moved when the stream table flat and slanted?

_____

_____

_____

4. What was different about how the earth material moved when the stream table flat and slanted?

_____

_____

_____

_____

Name_____

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Date_____

LANDCOVER EFFECTS ON STREAM TABLES

Introduction

Think back to when you went outside during a rain. What happens to the rain when it hits the ground? How does the type of land cover affect what happens to the rain? What kinds of landcover is there in our community?

These are some of the questions we will explore in this investigation. We will use our stream tables to model different types of land covers and investigate how they affect the stream. We will look at three different
settings:
1. Rural - bare soil
2. Residential - grass
3. Urban - pavement

Question

How does land cover around a river affect the amount of run-off after a rain?

Hypothesis

_____

_____

_____

_____

_____

_____

Material

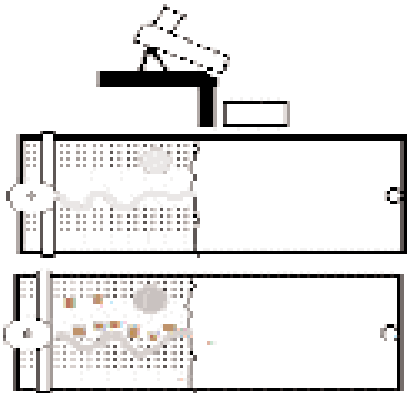
- One stream table model•
- One water source container
- 2L bottle filled with water (one food colored water)
- One piece of plexiglass
- One wooden slat
- One wooden angle
- Newspapers and paper towels
- Houses and buildings
- Piece of green turf (grass)
- One waste water bucket
- Transparency markers
- Three pieces of transparency film
- Laminated black paper

The Rural Setting

1. Set-up the stream table and place the stream table on the wooden angle so that the stream table is on a slant or a slope.

2. Using your pointer finger, make a smooth, curved, finger nail-deep river bed from the ruler to the end of the earth material. Smooth the sides of the river with your fingers. Scoop out a lake to the right of the river.

3. Place some cubes along the right side of the river to represent houses. Put some near the river and some farther away. Pour a small amount of water into the lake.



The Rural Setting

4. Have teacher check your set-up and then sketch your stream table on the next page.

5. Let one container of water flow continuously down the river. Record observations.

6. Spray your model with water. Record observations.

7. The houses around the right side of the river decide to spray their lawn with a combination of fertilizers and weed killers. Use the spray bottle with colored water and spray 3 strokes from a height of about 5 inches over the houses on the right side of the river. Record observations.

8. It rains right afterward. Spray the same area with 5 or so sprays of clear water and run water down the river for a slow count of 20 seconds. Record observations again.

9. Clean-up pollution. Use a spoon to remove the "polluted" soil. Place the "polluted soil" into a waste container.

The Residential Setting

1. A developer comes in and builds houses along the left side of the river. There is a lot of grass around the houses. Place some grass and houses on the left side of the river.

2. Have teacher check your set-up and then sketch your stream table on the next page.

3. Spray your model until you see water running along the surface into the river and lake.

Houses and Grass

4. Observe what happens to the water as you spray your model and count the number of sprays needed to create surface run-off

5. Clean-up and remove grass and houses.

The Urban Setting

1. A land developer decides to put in buildings streets and parking lots. On the left side of the river use the laminated black paper to represent pavement and then add buildings.

2. Have teacher check your set-up and then sketch your stream table on the next page.

3. Spray your model until you see water running along the surface into the river and lake.

4. Observe what happens to the water as you spray your model and count the number of sprays needed to create surface run-off.

5. Clean-up and remove pavement and houses.

Name _____

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Date _____

LANDCOVER EFFECTS ON STREAM TABLES RURAL OBSERVATIONS

Sketch a picture of your AGRICULTURAL stream table.

WRITTEN OBSERVATIONS OF THE STREAM TABLE

1. What happened to the land when water was sprayed?

- What happened to the houses?
- What happened to the land?
- What happened to the lake?
- How did the shape of the river change?

2. What happened to the land when the colored water was sprayed?

- What happened to the houses?
- What happened to the land?
- What happened to the lake?
- How did the shape of the river change?

3. What happened to the colored water when the model was sprayed again?

- What happened to the houses?
- What happened to the land?
- What happened to the lake?
- How did the shape of the river change?

Name_____

Home Room_____

Date_____

LANDCOVER EFFECTS ON STREAM TABLES RESIDENTIAL OBSERVATIONS

Sketch a picture of your RESIDENTIAL stream table.

WRITTEN OBSERVATIONS OF THE STREAM TABLE

What happened to the land when water was sprayed?

- What happened to the houses?
- What happened to the land?
- What happened to the lake?
- How did the shape of the river change?
- How many sprays did it take to create "run-off"?
- How did adding grass affect your model?

Name _____

Home Room _____

Date _____

LANDCOVER EFFECTS ON STREAM TABLES URBAN OBSERVATIONS

Sketch a picture of your URBAN stream table.

WRITTEN OBSERVATIONS OF THE STREAM TABLE

What happened to the land when water was sprayed?

- What happened to the houses?
- What happened to the land?
- What happened to the lake?
- How did the shape of the river change?
- How many sprays did it take to create "run-off"?
- How did adding pavement affect your model?

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LANDCOVER EFFECTS ON STREAM TABLES MAKING MEANING

What can we learn from our observations?

1. How did the different land covers (bare soil, grass, pavement) affect the type of materials carried by run-off? Include at least one observation from each setting (rural, residential, urban) that supports your answer.

_____

_____

_____

_____

_____

_____

2. How did the different land covers (bare soil, grass, pavement) affect the amount of water that was absorbed by the ground? Include at least one observation from each setting (rural, residen tial, urban) that supports your answer.

_____

_____

_____

_____

_____

_____

3. How did the different land covers (bare soil, grass, pavement) affect the amount of run-off produced? Include at least one observation from each setting (rural, residential, urban) that supports your answer.

_____

_____

_____

_____

_____

_____

Name _____

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MODEL-IT PLANNER/WATER QUALITY

Driving Question

_____

_____

Notes

Initial Objects	*Initial Variables*

What else do you need to add to your model to answer your driving question (what objects, variables or relationship?

_____

_____

_____

_____

_____

_____

_____

_____

Name _____

Home Room _____

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WHAT WILL HAPPEN? FERTILIZER INVESTIGATION

Question/Purpose

_____

_____

_____

List and describe the variables that you will investigate.

A. Independent (You changed it) Variable

_____

_____

B. Dependent (It changed) Variable

_____

_____

C. Control Variables (Variable that need to be kept the same)

_____

_____

Hypothesis and reason (if...then...because...)

How doses the independent variable affect the dependent variable?

_____

_____

_____

_____

_____

Materials

A. Small jars (4)
B. Graduated cylinder or 50 ml beaker
C. River water
D. Distilled water
E. Water plants (duck weed)
F. Fertilizer solution (Weak, Medium and Strong)
G. Plastic wrap
H. Rubber Bands (4)
I. Marker and Labels

Procedure

A. Label each jar 1-4
B. Label each jar with group member names, and date
C. Set up jars as follows
    i) Jar 1 (no fertilizer) - 50 mls of distilled water
    ii) Jar 2 (Low fertilizer) 25 mls of distilled water and 25 mls of fertilizer solution
    iii) Jar 3 (High Fertilizer) 50 mls of fertilizer solution
    iv) Jar 4 (river water) 50 mls of river water
D. Add same amount of plants to each jar (class needs to decide and keep constant)
E. Cover jars with lids or plastic wrap and rubber bands
F. Make first set of observations and record on Data section
G. Place jars in well lit area.

Data

(Observations may include, color, size, # of living plants, # of dead or dying plants, or anything else the class decides is important to notice.)

Date _____ ***Observers*** _____

Observations

_____

_____

_____

_____

_____

Date _____ ***Observers*** _____

Observations

_____

_____

_____

_____

_____

Date _____ ***Observers*** _____

Observations

_____

_____

_____

_____

_____

Data

(Observations may include, color, size, # of living plants, # of dead or dying plants, or anything else the class decides is important to notice.)

Date _____ ***Observers*** _____

Observations

_____

_____

_____

_____

_____

Date _____ ***Observers*** _____

Observations

_____

_____

_____

_____

_____

Date _____ ***Observers*** _____

Observations

_____

_____

_____

_____

_____

Data Analysis

Make a graph or chart that summarizes the data you collected. You may use data from the entire class. Decide which observations you want to include in your graphs or charts. Be prepared to explain why these observations are important and need to be organized in a chart.

Conclusion

Write a conclusion which describes what you learned from this investigation. The conclusion should be at least 2 paragraphs and include:

A. A description of the purpose of the investigation.
B. A description of the questions you were trying to answer.
C. A statement describing what the answers to your question was.
D. Evidence (numbers from your graphs or tables) that supports your answers to your questions.
E. Describe how this investigation relates to the driving question.

Name _____

Home Room _____

Date _____

WHAT WILL HAPPEN? ACID INVESTIGATION

Question/Purpose

_____

_____

_____

List and describe the variables that you will investigate.

A. Independent (You changed it) Variable

_____

_____

B. Dependent (It changed) Variable

_____

_____

C. Control Variables (Variable that need to be kept the same)

_____

_____

Hypothesis and reason (if...then...because...)

How doses the independent variable affect the dependent variable?

_____

_____

_____

_____

_____

Materials

A. Small jars (4)
B. Graduated cylinder or 50 ml beaker
C. River water
D. Distilled water
E. Water plants (duck weed)
F. Fertilizer solution (Weak, Medium and Strong)
G. Plastic wrap
H. Rubber Bands (4)
I. Marker and Labels

Procedure

Make sure the teacher checks your procedure when it is completed.

Data

(Observations may include, color, size, # of living plants, # of dead or dying plants, or anything else the class decides is important to notice.)

Date _____ ***Observers*** _____

Observations

_____

_____

_____

_____

_____

Date _____ ***Observers*** _____

Observations

_____

_____

_____

_____

_____

Date _____ ***Observers*** _____

Observations

_____

_____

_____

_____

_____

Data

(Observations may include, color, size, # of living plants, # of dead or dying plants, or anything else the class decides is important to notice.)

Date _____ ***Observers*** _____

Observations

_____

_____

_____

_____

_____

Date _____ ***Observers*** _____

Observations

_____

_____

_____

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_____

Date _____ ***Observers*** _____

Observations

_____

_____

_____

_____

_____

Data Analysis

Make a graph or chart that summarizes the data you collected. You may use data from the entire class. Decide which observations you want to include in your graphs or charts. Be prepared to explain why these observations are important and need to be organized in a chart.

Conclusion

What have you learned? Does your data support your hypothesis?
Your conclusion should be at least 2 paragraphs and include:

A. A description of the purpose of the investigation.
B. A description of the questions you were trying to answer.
C. Make a claim that you either support or reject your hypothesis.
D. Provide evidence to support your claim: use data that you have interpreted in the experiment.
E. Include limitations and or a statement of errors that might have occurred.
F. Write your claim clearly: it needs to be a complete thought , and written in precise scientific language. Anyone who picks this up should be able to understand what you did and what you write.

How can your conclusion be connected to the driving question, what is the water like in our river?

Name _____

Home Room _____

Date _____

WATER TESTING

Hypothesis

_____

_____

_____

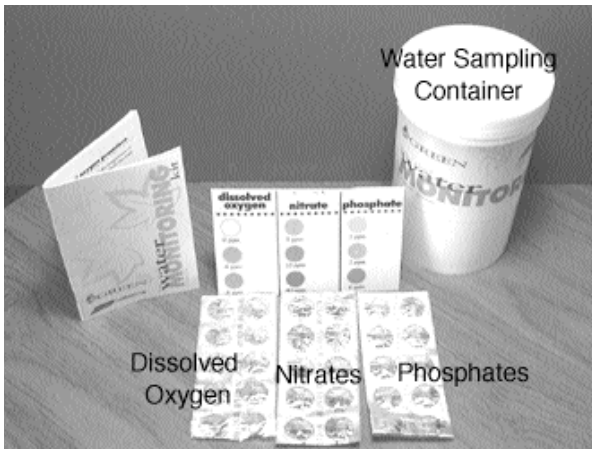
Reason For Hypothesis _____

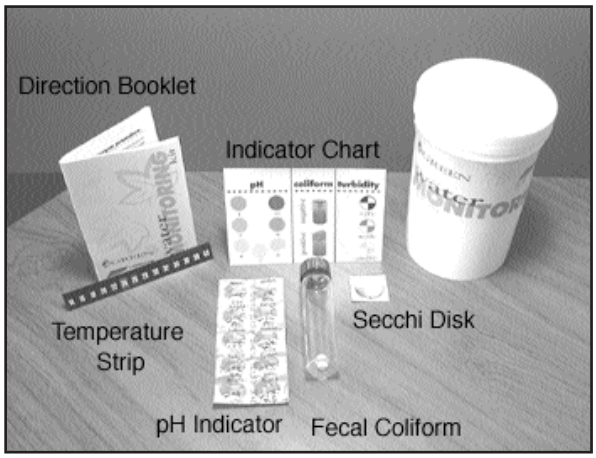
_____

_____

Materials

A. water sampling jar
B. river water sample
C. four square edged tube
D. two small vials
E. four large vials with fecal coliform tablet
F. Nitrate tablets
G. Phosphates tablets
H. DO tablets
I. pH Tablets
J. small secchi disk
K. color comparison card
L. procedure pamphlet
M. bucket





PROCEDURE

Read the procedure carefully. If you have any questions about the procedure refer to the procedure pamphlet in the kit. Decide who will perform each test. Place the name of the person performing the test next to the test name.

Collecting your sample

1. Collect the water sample with the water sampling jar.
2. Remove the cap of the sampling jar.
3. Rinse the jar 2-3 times with river water.
4. Hold the container near the bottom and plunge it (opening downward) below the water surface).
5. Turn the submerged container into the current and away from you.
6. Allow the water to flow into the container for 30 seconds.
7. Cap the full container while it is still submerged. Remove it from the river tank immediately.
8. Go back to your seats.

Turbidity - Name_____

1. Fill the jar to the turbidity fill line located on the outside kit label.
2. Hold the Turbidity Chart on the top edge of the jar. Looking down into the jar, compare the appearance of the secchi disk icon in the jar to the chart.
3. Record the result in the data chart (units are JTU)

Fecal Coliform - Name_____

1. Pour the water sample into the large test tube containing a tablet until it is filled to the 10ml line. Don't worry if you overfill or underfill a little.
2. Replace the cap on the test tube.
3. Stand the tube upright, with the tablet flat on the bottom of the tube.
4. Incubate by storing the tube upright, at room temperature, out of direct sunlight for 30-36 hours. Do not shake disturb or handle the tube during the incubation time.
5. Compare the appearance of the to the picture on the Coliform color chart. Hold the test tube up against the card in the open white space next to the color chart for the test.
6. Record the result as negative or positive in the data chart.

Negative

Liquid above gel is clear. Gel remains at bottom of tube. Indicator remains red or turns yellow with no gas bubbles. Indicates less than 200 total coliform colonies per 100 ml of water.

Positive

Many gas bubbles present. Gel rises to surface. Indicator turns yellow. Indicates more than 200 total coliform colonies per 100 ml of water.

Right after test, give your vial to your teacher for special disposal.

Nitrates - Name _____

1. Fill the square edged test vial to the 5 ml line with the water sample.

2. Add **one** Nitrate Wide Range TestTab to the vial.

3. Cap and mix by inverting until the tablet has dissolved. Bits of material may remain in the sample.

4. Wait 5 minutes for the **red** color to develop.

5. Compare the color of the sample to the Nitrate color chart. Hold the test-tube up against the card in the open white space next to the color chart for the test.

Phosphates - Name_____

1. Fill the square edged test vial to the 10 ml line with the water sample.

2. Add **one** Phosphate Wide Range TestTab to the vial.

3. Cap and mix by inverting until the tablet has dissolved. Bits of material may remain in the sample.

4. Wait 5 minutes for the **blue** color to develop.

5. Compare the color of the sample to the Nitrate color chart. Hold the test-tube up against the card in the open white space next to the color chart for the test.

6. Record the result in the data chart.

pH - Name_____

1. Fill the square edged test vial to the 10 ml line with the water sample.

2. Add **one** Phosphate Wide Range TestTab to the vial.

3. Cap and mix by inverting until the tablet has dissolved. Bits of material may remain in the sample.

4. Compare the color of the sample to the Nitrate color chart. Hold the test-tube up against the card in the open white space next to the color chart for the test.

5. Record the result in the data chart.

FINDINGS

Data Chart for Group

Record your test results in this chart.
Use the "Ranking Your Results" worksheet at the end of this packet to determine the Quality and Ranking.

TEST	READING	QUALITY	RANKING
DO			
Fecal Coliform			
pH			
BOD			
Temperature			
Phosphates			
Nitrates			
Turbidity			

TEST	READING (Class Average)	RANKING (Class Consensus)
DO		
Fecal Coliform		
pH		
BOD		
Temperature		
Phosphates		
Nitrates		
Turbidity		

DATA ANALYSIS (USE DATA FROM CLASS CONSENSUS)

Copy class average Rankings into the chart.

Multiply each Ranking by the weighting.

Add all the "Over-all Ranks" to calculate "Total".

TEST	RANKING	WEIGHTING	OVER-ALL RANK (Rank X Weight)
DO			
Fecal Coliform			
pH			
BOD			
Temperature			
Phosphates			
Nitrates			
Turbidity			
Over all Water Quality Index			**Total=**

OVERALL WATER QUALITY Index Total	WATER QUALITY
4.00	Excellent
3.99 - 3.00	Good
2.99 - 2	Fair
1.99 - 1.00	Poor
0.99 or less	Very Poor

CONCLUSIONS

What have you learned? Does your data support your hypothesis?

Your conclusion should be at least 2 paragraphs and include:

A. A description of the purpose of the investigation.
B. A description of the questions you were trying to answer.
C. Make a claim that you either support or reject your hypothesis.
D. Provide evidence to support your claim: use data that you have interpreted in the experiment.
E. Include limitations and or a statement of errors that might have occurred.
F. Write your claim clearly: it needs to be a complete thought , and written in precise scientific language. Anyone who picks this up should be able to understand what you did and what you write.
G. If any pollution was detected review what you learned about pollution sources from earlier projects activities (nine water quality factors, Stream Table activity, or river walk) and report where the pollution may have come from.

How can your conclusion be connected to the driving question, what is the water like in our river?

RANKING YOUR RESULTS

Look on this chart to convert your results to a water quality rank. Be sure to copy the results onto your data table!

FACTOR	RESULTS	QUALITY	RANK
Dissolved Oxygen (DO)	91-100%	Excellent	4
	71-90%	Good	3
	51-70%	Fair	2
	<50%	Poor	1
Biological Oxygen Demand BOD	0 ppm	Excellent	4
	4 ppm	Good	3
	8 ppm	Fair	2
Coliform Bacteria	Negative	Good	3
	Positive	Poor	1
pH	4-5	Poor	1
	6	Good	3
	7	Excellent	4
	8	Good	3
	9-10	Poor	1
Temperature Change	0-2 degrees	Excellent	4
	3-5 degrees	Good	3
	6-10 degrees	Fair	2
	>10 degrees	Poor	1
Nitrates	5 ppm	Fair	2
	20-40 ppm	Poor	1
Phosphates	1 ppm	Excellent	4
	2 ppm	Good	3
	3 ppm	Fair	2
Turbidity	0	Excellent	4
	>0 - <40	Good	3
	>40 - <100	Fair	2

Name _____

Home Room _____

Date _____

MACROINVERTEBRATE SORTING AND IDENTIFICATION

Sensitive Benthos

- Stoneflies
- Water Penny Beetles
- Mayflies
- Dobsonflies
- Alderflies
- Snipeflies
- Mussels
- Riffle Beetles

Stonefly

Riffle Beetle Adult

Gilled Snail

Planarian

Mayfly

Water Penny

Caddisfly

Hellgramite

MACROINVERTEBRATE SORTING AND IDENTIFICATION

Moderately Tolerant Benthos

- Damselflies
- Dragonflies
- Crayfish
- Amphipods
- Blackflies
- Caddisflies
- Isopods
- Craneflies

Crayfish

Alderfly

Crane Fly

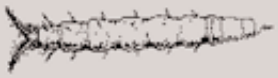
Riffle Beetle Larva

Crane Fly

Riffle Beetle Larva

Damselfly

Sowbug



MACROINVERTEBRATE SORTING AND IDENTIFICATION

Pollution Tolerant Benthos

- Midgeflies
- Worms
- Leeches
- Pouch Snails