Name _____   Class _____   Date _____

Zebra Mussel Simulation Lab

Background: Like all ecosystems, ponds respond to change. Change can be seasonal and predictable, like the arrival of cold temperatures every fall, or it may take place unpredictably, like the influx of water that accompanies heavy rains. Over time ponds have evolved ways to respond to natural change.

Ponds are also altered by the activities of humans. Fertilizer from nearby farm fields may wash into the pond altering nutrient cycles. Road salt may enter during heavy winter rains. Alien species find their way into ecosystems through accidental or purposeful introductions. How would you expect the pond to respond to these changes? In today's lab you will create artificial ponds and design an experiment to study the effects of an invasive species on these mini ecosystems.

Before you begin:
What do you think will happen to a small, artificial pond if you added an alien species? Think about what kinds of changes you might see: color, amount of organisms, amount of vegetation, smell, etc. You need to be able to measure the change in some way. Write your ideas here:
_____
_____
_____
_____
You can add fertilizer or salt as an additional variable if time permits.

Materials:

Large mouthed Mason jars	Fertilizer solution
Pond water	Salt solution
Popsicle sticks or tongue depressors	Mystery snails
Permanent markers	50 or 100 mL graduated cylinder

Procedure
1. Get 2-4 large-mouthed Mason jars.
2. You will be provided with pond water from a nearby pond. Stir the pond water and put 600 ml into each of the jars.
3. Cut two wooden tongue depressors in half and label one side with your group number and treatment as you did the jars. The labels should read: S for salt solution, F for fertilizer, and A for alien species. This piece of wood will simulate a stick on the bottom of the pond. Match the labels to the pond treatments and add one stick to the each pond.
4. Treat your ponds by adding 50 ml of fertilizer solution to the pond labeled F, 50 ml of salt solution to the pond labeled S, and alien species to the pond labeled A. Be sure to add the same amount of the alien species; for instance, add two snails to each container.
5. Observe your artificial ponds and record your observations on the data sheet. In your group discuss how you think a pond would respond to the addition of fertilizer, road salt or an alien species. Discuss your ideas with your instructor. Can you think of a way to measure this change in your artificial ponds?   Write a hypothesis for each experiment.

Include these data tables in your final lab write-up.

Jar Number	Treatment	Observations: original	Hypothesis

6. After one-two weeks, depending on your teacher, you will be able to make the final observations and measurements of your artificial ponds.

Jar Number	Treatment	Observations: Final	Describe how you measured each change

7. When you have gathered your results, report them to the rest of the class.

Discussion Questions:

1. Discuss the appearance of your group's artificial ponds at the beginning of the two week study and at the end. Did your ponds change during this time, and if so, how did they change?

2. You added fertilizer to one jar to simulate fertilizer runoff from a farm field, and salt to another to simulate road runoff. Do you think this was a reasonable way to simulate this type of disturbance? How might real fertilizer or road runoff be different?

3. You added "mystery snails" as an alien species in your artificial ponds. Do you think this was a reasonable way to simulate this type of disturbance? How might a real invasive species act differently in a natural ecosystem?

4. Consider the techniques you used to measure the number of floating plants, the amount of phytoplankton, the number of macroinvertebrates and the amount of organic matter. Which of these four measurements did you think was the least accurate and why? What would you do differently in the future?

5. Why did we need to have a control pond in these experiments?

5. Discuss the results. Does the class data support each hypothesis? If the data support the hypothesis, explain how you think the treatment caused this change. If the data do not support the hypothesis, do you think the hypothesis was wrong? Do you have an alternative explanation?