

Date: _____

Your Name: _____



**NEW ENGLAND
COMMON ASSESSMENT PROGRAM**

Released Science Inquiry Task

Pond Weeds

2009

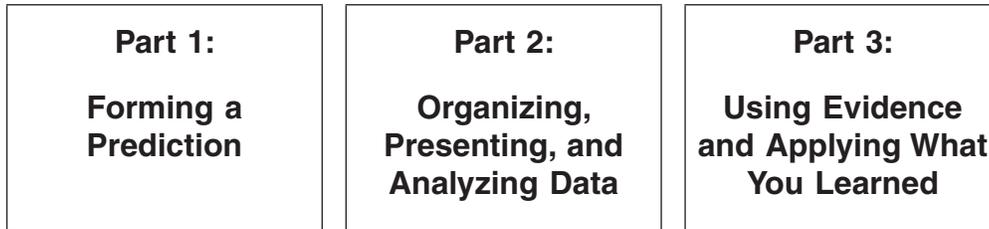
Grade 8

Science

Directions:

You will be completing an extended-response inquiry task called **Pond Weeds**. Explain the reasons for all of your answers. You may include a drawing or labeled diagram to help explain your answers.

There are three parts to this task.



The words listed in the table below are used in this investigation.

Word Bank

Biodiversity	the number of species present in a given habitat
Biomass	the amount of living matter in a given habitat
Dry Weight	the weight of material after water has been removed
Enclosure	a place confined to a certain area
Eurasian water milfoil (EWM)	nonnative plants that live in shallow freshwater
Invasive	having the ability to move into new ecological zones, survive, and sometimes outcompete native species
Population density	the average number of individuals in a species in a given area
Predation	feeding on or killing and eating another species
Weevils	small aquatic insects related to beetles

Pond Weeds

The ecology club at Maplewood Middle School adopted Two Island Lake as a club project. Lenore, the club president, brings the newspaper article below to discuss at the club's monthly meeting.

The Daily News

Tuesday, May 15, 2008

Invasive weeds spotted on Two Island Lake

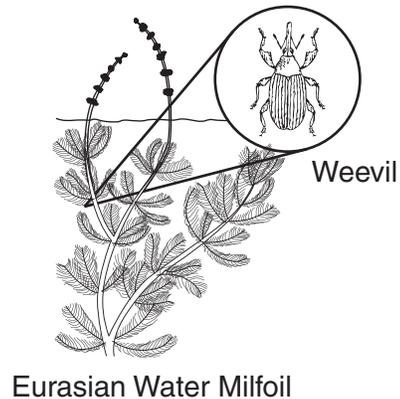
Ecologists from the State Department of Ecology have discovered mats (tangled masses) of Eurasian water milfoil (EWM) in Two Island Lake.

EWM are not native plants. People dumping aquarium plants into lakes and ponds introduced the weeds to northeastern lakes earlier this century. The weeds spread by small fragments that stick to the propellers of motorboats that move among lakes in the area.

EWM are considered destructive pond weeds because they spread quickly and form dense, floating mats that prevent native plants from getting light, which results in a loss of biodiversity. The mats of these pond weeds also interfere with boating and swimming.

Two Island Lake has been clear of EWM until this recent discovery. Ecologists hope that weevils, natural predators of EWM, that are found in the lake will be able to control the pond weeds before they become a problem.

The picture below shows a magnified weevil on a stem of EWM.



After reading the article, a club member asks, "So what's the problem? It sounds like the lake is going to take care of getting rid of the milfoil by itself."

Lenore explains that she did some research on the Internet. She learned that water milfoil weevils are small insects that feed on EWM. Weevils drill holes in the pond weeds and cause the weeds to die. She also learned that biologists have experimented with adding weevils to lakes to help control EWM.

"It's not that simple," Lenore says. "First, we don't know how many weevils it takes to control EWM. Does Two Island Lake have enough weevils in it? How many is enough? There might be something we can do to increase the number of weevils in the lake."

The club members decide to study EWM, weevils, and predators of weevils in Two Island Lake. They plan to collect data to investigate the research question below.

Research Question 1:

How do weevils affect the growth of EWM in a lake?

A Section of Two Island Lake with Eurasian Water Milfoil



Young Eurasian water milfoil

Part 1: Forming a Prediction

Answer question 1 on page 1 in your Student Answer Booklet.

- 1 Write a prediction about the possible relationship between the number of weevils and the growth of EWM in a lake. Use information from the story to explain your prediction.

Answer question 2 on page 1 in your Student Answer Booklet.

- 2 What evidence do the club members need to collect to test the relationship between the number of weevils and the growth of EWM in Two Island Lake? Use information from the story to explain your reasoning.

Part 2: Organizing, Presenting, and Analyzing Data

The ecology club members decide to first look at how weevils affect the growth of EWM. They conduct research on the Internet and find a study conducted at Lake Bomoseen in Vermont during the summers of 1993 and 1994. In the study, scientists collected weevils from other Vermont lakes and added the weevils to patches of EWM in Lake Bomoseen. The scientists added the weevils to two patches called *experimental sites* (with added weevils). The scientists made sure that a *control site* (no added weevils) was located near each experimental site. During the two-year period, the scientists added 20,000 weevils to the experimental sites on the lake.

Each year, the scientists counted the number of weevils in a random 1 square meter (m^2) sample at each site. Data Table 1 below shows the data the scientists collected.

Data Table 1: Average Number of Weevils per Stem of EWM

Control Sites (no added weevils)		Experimental Sites (with added weevils)	
1993	1994	1993	1994
25	32	34	73

Data adapted from Sheldon, 1995

Answer question 3 on page 2 in your Student Answer Booklet.

- 3 Explain why the scientists counted the number of weevils at the experimental sites (with added weevils) **and** the number of weevils at the control sites (no added weevils). Use specific examples in your explanation.

At the end of the second year of the study, the scientists harvested, dried, and weighed an equal number of EWM stems from the experimental sites and the control sites. Data Table 2 below shows the average weight of the stems harvested from the control and experimental sites.

Data Table 2: Average Biomass of EWM in Lake Bomoseen

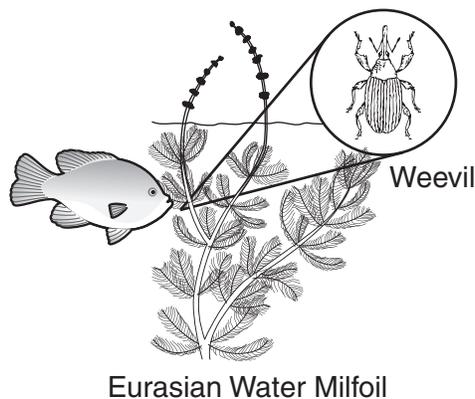
	Control Sites (no added weevils)	Experimental Sites (with added weevils)
Average Dry Weight (g)	30.22	21.32

Data adapted from Sheldon, 1995

Answer question 4 on page 2 in your Student Answer Booklet.

- 4 Explain how the data in Data Table 2 supports or does not support (refutes) your prediction about how weevils affect EWM growth in a lake. Use specific evidence from Data Table 2 to explain and support your answer.

The ecology club members wonder what would happen to the EWM in Two Island Lake if weevils had predators. While conducting Internet research, Lenore learns that sunfish eat weevils. The picture below shows a sunfish eating a weevil on a stem of EWM.



The club members decide to investigate the research question below.

Research Question 2:

How does sunfish predation of weevils affect the growth of EWM in a lake?

Answer question 5 on page 3 in your Student Answer Booklet.

- 5 Use what you have learned in this task to write a prediction about the relationship among the number of sunfish, the number of weevils, and the growth of EWM in a lake. Use evidence to explain your prediction.

Lenore finds another study conducted in Minnesota in 2000 and 2001. In the study, scientists investigated what happens to EWM when sunfish feed on weevils in a lake. The scientists hypothesized that sunfish predation would decrease the number of weevils in a lake and therefore increase the amount of EWM in the lake. The scientists designed the experiment described below to test their hypothesis.

Step 1:

The scientists selected 10 patches of EWM that were next to and at the same depth as one another. They placed a cage around each 1 square meter (m^2) patch. They closed five of the cages so that sunfish bigger than 6 in. could not get in. They left the other five cages open so that all sunfish could get in. The picture below shows the setup of the experiment. Graph 1 on the next page shows the number of sunfish the scientists found inside the closed and open cages.

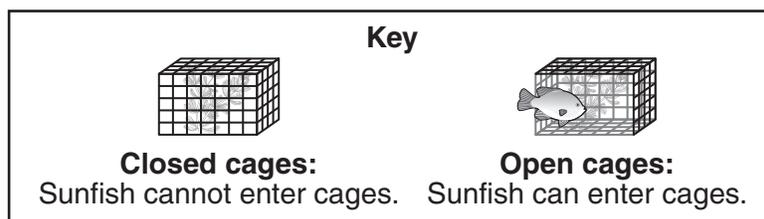
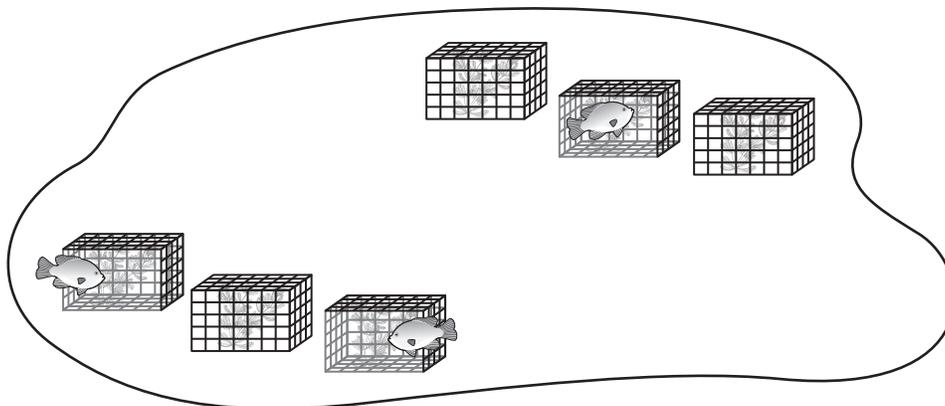
Step 2:

At the beginning of the growing seasons in 2000 and 2001, the scientists harvested random EWM stems from 10% of the area inside each 1 square meter (m^2) cage. They counted the number of weevils on the stems from open and closed cages. At the end of each growing season, the scientists repeated this process. Graph 2 on the next page shows how the numbers of weevils on stems from open and closed cages compared.

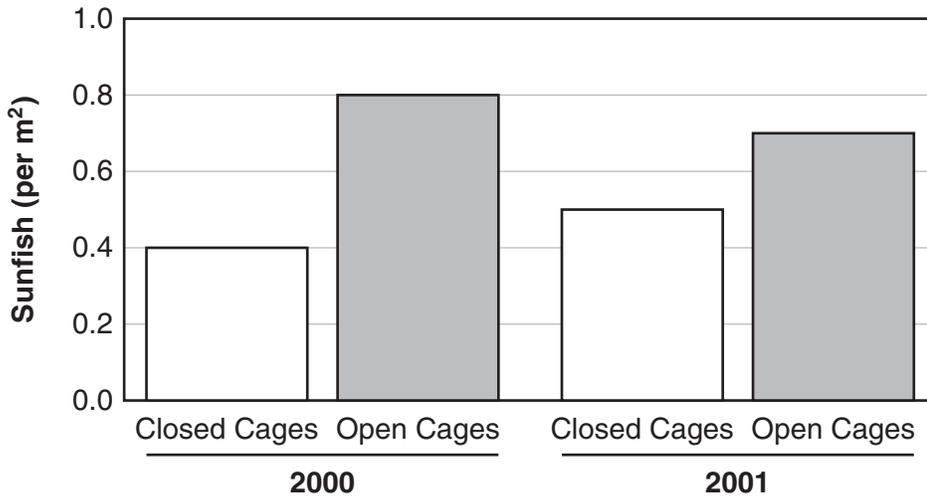
Step 3:

The scientists also dried and weighed the EWM stems they collected at the beginning and end of each growing season. They compared the weight of the stems at the beginning and end of each growing season. Graph 3 on the next page shows the data the scientists collected.

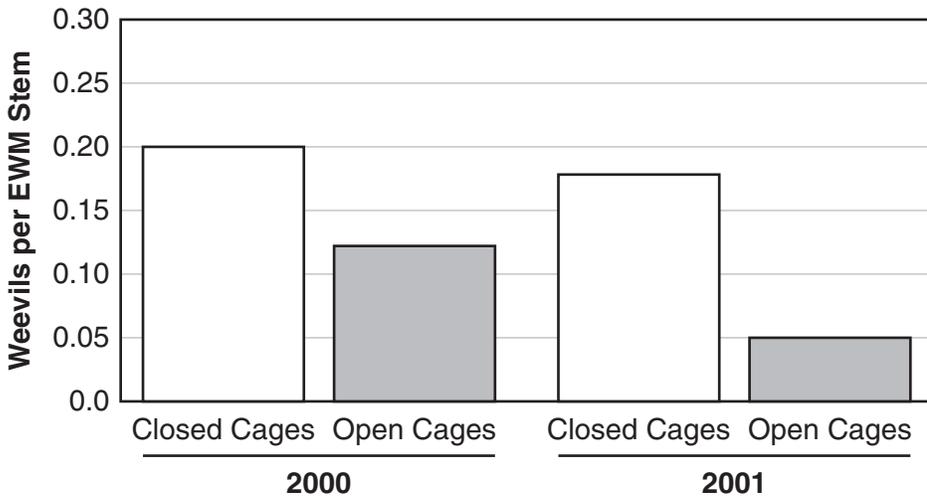
Experimental Setup of Closed and Open Cages



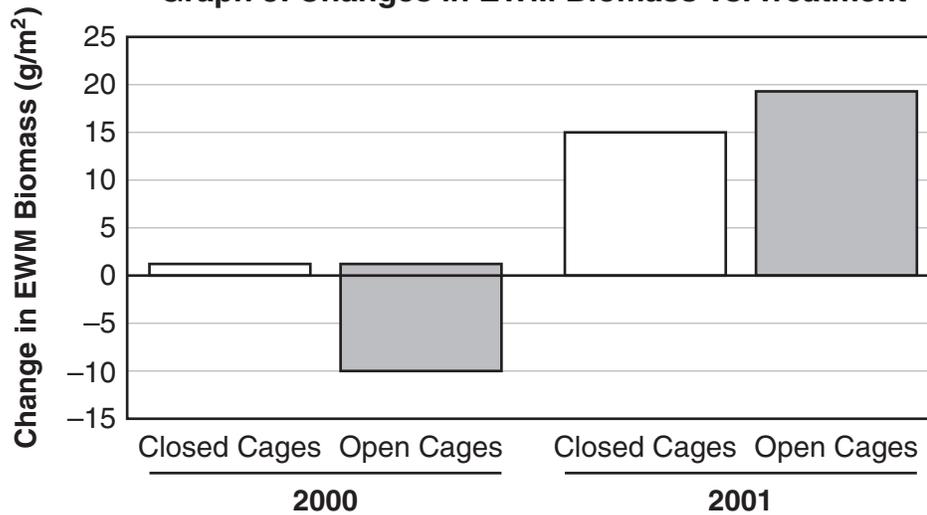
Graph 1: Average Number of Sunfish in Open and Closed Cages



Graph 2: Average Number of Weevils per EWM Stem



Graph 3: Changes in EWM Biomass vs. Treatment



Data adapted from Ward and Newman, 2006.

Answer question 6 on page 3 in your Student Answer Booklet.

- 6 The scientists hypothesized that sunfish predation would decrease the number of weevils in a lake and therefore increase the amount of EWM in the lake. Was their experiment a fair test of this hypothesis? Provide examples to support your answer and explain your reasoning.

Answer question 7 on page 4 in your Student Answer Booklet.

- 7 What conclusions can you make about the relationship among the number of sunfish, the number of weevils, and the growth of EWM in a lake? Use data from Graph 1, Graph 2, and Graph 3 to support your conclusions.

Using Evidence and Applying What You Learned

The ecology club members count an average of one weevil per stem of EWM in Two Island Lake. They use nets to collect sunfish from the lake and find that the population density of sunfish in the lake is approximately 1 sunfish per m^2 .

Answer question 8 on page 5 in your Student Answer Booklet.

- 8 What advice could Lenore and the other ecology club members give to ecologists to help control EWM in Two Island Lake? Use specific data and evidence to support the advice.

