Lesson: Activity 77: Ups and Downs

Teacher:	Kaylan Duthie
Unit Theme/Course:	SEPUP Ecology
Date:	
Timing:	2 days

Challenge Question:

How do scientists study the size of a population and predict future population changes?

Overview:

Students will begin by reading about the introduction of zebra mussels to the United States, including how it was introduced, its distribution, and how it has spread. Students will then graph and interpret population data about the zebra mussels in Lake Miko. Student will then make a prediction about the future population of the zebra mussel, as well as potential difficulties in collecting ecological data, and how this data could be used to predict populations in other areas. As part of this lab, students will also be completing an anticipation guide, deciding whether they agree or disagree with a variety of statements. They will return to this worksheet throughout the unit, and reassess their answers.

Learning Objectives [cognitive, academic, language, socio-cultural]	**Assessment Criteria**
Students construct graphs to reveal patterns that are not immediately apparent in data tables	Student completes a graph, including labels for both axes, and a title. Use the OD scoring guide
A population consists of all individuals of a species that are together at a given place and time	Students explain that although the zebra mussels are throughout the United States, there are different populations in different places. For example, each lake has its own separate population
The number of organisms an ecosystem can support depends on the resources available and abiotic factors	Students identify causes of the zebra mussel increases and decreases in population as a result of the predators, food sources that are available, and the nutrients that they need from the lake that are also being used by other organisms.

Standard/EALR:

6-8 SYSF	The *natural* and *designed world* is complex; it is too large and complicated to *investigate* and comprehend all at once. Scientists and students learn to define small portions for the convenience of *investigation*. The units of *investigation* can be referred to as ―*systems*.‖	Given a complex societal issue with strong *science* and *technology* components (e.g., overfishing, global warming), *describe* the issue from a *systems* point of view, highlighting how changes in one part of the *system* are

6-8 INQC Investigate	Collecting, analyzing, and displaying data are essential aspects of all *investigations*.	*Communicate* results using pictures, tables, charts, diagrams, graphic displays, and text that are clear, accurate, and informative. *a Recognize and interpret *patterns* – as well as *variations* from previously learned or observed *patterns* – in data, diagrams, symbols, and words.*a Use statistical procedures (e.g., median, mean, or mode) to analyze data and make *inferences* about *relationships*.
6-8 LS2D	*Ecosystems* are continuously changing. Causes of these changes include nonliving *factors* such as the amount of light, range of temperatures, and availability of water, as well as living *factors* such as the disappearance of different *species* through disease, *predation*, *habitat* destruction and overuse of resources or the introduction of new *species*.	*Predict* what may happen to an *ecosystem* if nonliving *factors* change (e.g., the amount of light, range of temperatures, or availability of water or *habitat*), or if one or more *populations* are removed from or added to the *ecosystem*.
6-8 LS2E	*Investigation*s of *environmental* issues should uncover *factors* causing the problem and relevant scientific *concepts* and findings that may inform an *analysis* of different ways to address the issue.	*Investigate* a local *environmental* issue by defining the problem, researching possible causative *factors*, understanding the underlying *science*, and evaluating the benefits and risks of alternative *solutions*. Identify resource uses that reduce the capacity of *ecosystems* to support various *populations* (e.g., use of pesticides, construction).

Preparation Time:

30 minutes to make copies

Materials:

- Copies of student graph worksheet
- Copies of anticipation guide
- Transparency of graph for overhead display

Instructional Sequence:

Day 1

1. Review what we did yesterday
    a. Classified phyla of animals
    b. Classified vertebrates to class
    c. Now look very specifically at a population, which is a group of individuals of just one species living in an area.

2. Class discussion about successfulness
    a. *What is an introduced species? → Species not normally found in an area, moved by humans*
    What makes a species successful in an environment? How can you decide whether a species is successful in a new environment? → Watch to see how well get food, escape predation, follow population over time…
3. Pass out the students anticipation guide
    a. *Students complete "before" column → assess what they know about a topic before they learn about it.*
    b. We will be revisiting throughout rest of unit
    c. Place into long-term project section in their binder
4. Read the introduction
    a. Ask for student volunteers to read the first two paragraphs
    b. In this activity, look at data from Northern Poland where Zebra Mussels have been found for 150 years Only been in the Great Lakes since late 1980s
    c. Start a new entry sheet by writing down title and challenge question
    d. Add to journal grade sheet, with Due Date on Friday
5. Have students move to lab groups
    a. Each group should divide into pairs sitting next to each other. Each pair should make observations about one of the data tables.
    b. Pass out a copy of the student Ups and Downs graph sheet to every student
    c. Have each pair of students graph one data table (each should do their own, but can talk/work on it together)
        i. Note: year increments and tons need to be same on both graphs!!
        ii. Remind to label axes and title graph
        iii. *Students will have their graph assessed using the Organizing Data Rubric. Explain this rubric at some point n the class.*
    d. Each student should answer questions 1 and 2 on the worksheet working in the same pair that they made the graph with
        i. Note: No peeking at the other pair's graphs. SUPER SECRET!!!
    e. Students should now compare their graphs
        i. Place two graphs together – may need to fold edges to fit
        ii. Discuss observations about the completed graph

iii. *What conclusions are you drawing from the joined graph that are different from the single graphs?*
When is there a sharp population decline?
For how long does the population remain at less than 100 mussels per square meter?
When does the population begin to increase rapidly?
How does an ecologist know that they have sufficient data for a population over time? → may never know for certain, additional data always better, but requires money and time.

f. On the back of the paper, complete a sketch of what the entire graph looks like

Day 2

1. Q1 (Individually & discuss with groups)
   a. Add line to the sketch on the back of the graph
   b. Students write answers in their journals
   c. *On the overhead, draw in student predictions on the zebra mussel transparency*
2. Q1 (discuss with groups → each student should have answer prepared)
   a. *a) What factors affect the size of a population?*
   b) how does each of those factors affect population size? Make go up, down, or stay same?
      - *What factors do you think affected the populations in the lake?*
3. Q3 (Discuss with groups → each student should have answer prepared_
   a. *If you were conducting a well-designed experiment, would you collect data every year? What might prevent collection of data?*

   **Say you were an investigator collecting data on an introduced species and were unable to collect data for a number of years in the middle of the study. What would you do with the data you had collected?*
4. Q4 (Write individually)

a. *Describe the population trend in each graph. How does it change over time?*

   ** Should a rapid population decline automatically be cause for concern?*

5. Q5 (Discuss w/ group → each student have answer prepared)

a. *Sketch the rest of the data on your graph. How does the original data compare to Q1?*

   **On the zebra mussel transparency, plot the data to compare to the student guesses*

6. Q7 (Individually writing question)
   a. How do the population of zebra mussels in the great lakes compare to those found in the lakes in Poland?
   b. Sketch a graph showing what you think the mussel population might look like form 1985 to the present

c. *Have students come up and sketch a graph on the activboard*

7. Q7 (Individually writing)
   a. What do you think happened in the zebra mussel population in Lake Mikolajskie from 1987-1997?
8. Q8 → Anticipation Guide
   a. Fill in the "After" column for questions 1 and two

b. *Thumbs up or down for statement one and two*

   How many of you changed your answers?