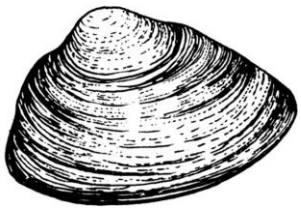
Native and Zebra Mussel Population Dynamics – Student Sheet

Problem:



Weyburg Lake is in central Minnesota, a region where many Minnesotans enjoy activities such as fishing, boating, and swimming. Weyburg Lake is a popular tourist destination in the summer due to its many water-related activities. Business owners in the town adjacent to the lake depend on these tourist dollars for their income. Any changes to the lake that impact fishing or water quality will have a huge impact on the town and its residents. Zebra mussels arrived in Weyberg Lake in 2009, a concern for both ecologist and local residents. In order to monitor the potential impact the introduction of Zebra Mussels has on the native mussel population, ecologists conducted annual population surveys of both native and zebra mussel populations.

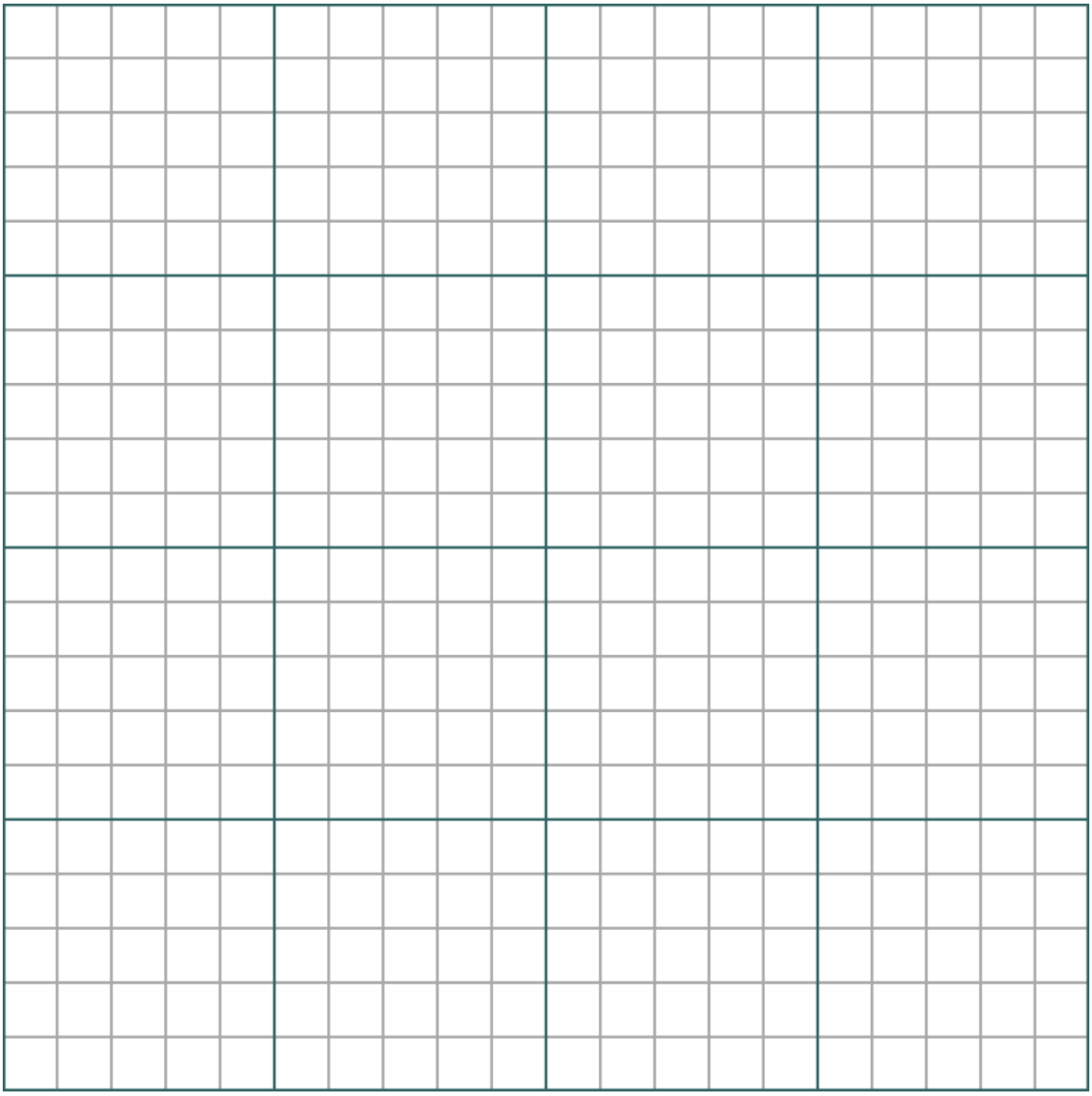
Procedure:

Getting a precise population of mussels in Weyburg Lake is very difficult. Mussels are numerous, small, and are very difficult to identify in murky water. Rather than count every individual in the lake, scientists have developed procedures, or protocols, to estimate mussel populations in a lake or river. For Weyburg Lake, ecologist decided to use a quantitative measure using SCUBA. A grid made of pvc pipe is lowered into the water in a location in the lake. In each square of the grad, buckets of sediment are collected. The number of native freshwater mussels and Zebra Mussels are then counted and recorded. Rather than report the total population for the lake, ecologist report the density of mussels. Density refers to the total number of individuals in a square meter area (mussels/m^2). Their results of the survey are shown in the data table below.

Data Table and Graph

Year	Zebra Mussels (mussels/m²)	Native Mussels (mussels/m²)
2006	0	22
2005	0	19
2004	0	20
2009	2	19
2010	4	18
2011	8	16
2012	17	10
2013	20	8
2014	22	5
2015	23	5
2016	25	3
2017	23	2
2018	25	3

1. Graph the Data
Use the data from the data table above to make a scatter plot of the each population density on the graph paper below. Graph both populations on the same page in two different colors, and make a key. Make sure your graph has: Title, X and Y axis labeled, appropriate scale, and a key. After making your scatter plot, connect the dots for each population to help visualize the changes in population from year to year.



2. According to the data table and graph, when do you think Zebra Mussels appeared in Weyberg Lake?

3. escribe the changes in Zebra Mussels population density between 2006 and 2018. Be sure to include evidence from the data table and graph in your answer.

4. Describe the changes in native mussel population density between 2006 and 2018. Be sure to include evidence from the data table and graph in your answer.

5. Stages of Invasion Notes
   Ecologist have broken down the steps it takes for an invasive species to overwhelm an ecosystem. Use the information presented to you by your teacher to complete the following.

Key Vocabulary

Invasive Species:

Niche:

Extirpation:

Stage Name and Definition	Sketch of graph	Sketch of the community
Transport		

Establishment		
Spread		
Impact		

Conclusion

6. On the graph you made of population density of zebra mussels and native mussels label the four stages of invasion.

7. List the years that Weyberg Lake was experiencing during each stage and the effect on native mussels:

   a. Transport years and effect

   b. Establishment years and effect

   c. Spread years and effect

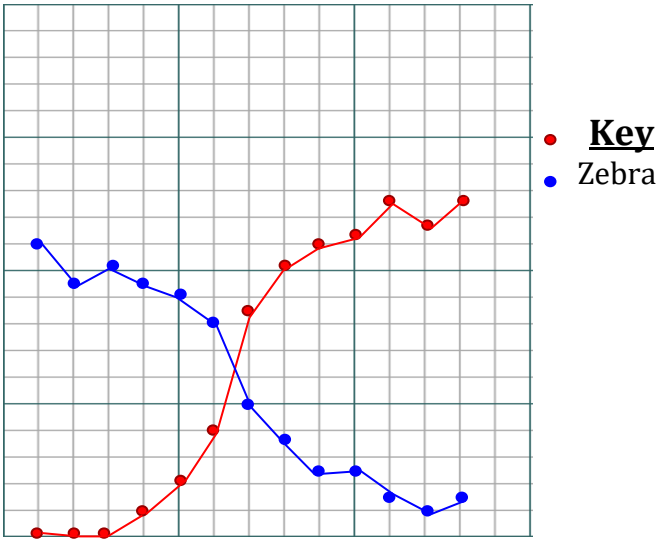
   d. Impact Years and effect

8. Describe the impact that Zebra Mussels introduction in Weyberg Lake has had on the ecosystem? Your answer should include impacts beyond those observed on the native mussel population.

Image Source http://clean-water.uwex.edu/pubs/clipart/critters.fresh.htm

Zebra Mussel and Native Mussel Populations
Student Sheet - Suggested Answers

1. Graph



2. According to the data table and graph when do you think Zebra Mussels appeared in Weyberg Lake?

   Between the years 2008 and 2009, however they could have arrived prior to 2008 but where not observed.

3. Describe the changes in Zebra Mussels population density between 2006 and 2018. Be sure to include evidence from the data table and graph in your answer

   Zebra mussel density population increased exponentially starting in 2009 and then leveled off starting in 2015 with the population at around 24 mussels/m^2.

4. Describe the changes in native mussel population density between 2006 and 2018. Be sure to include evidence from the data table and graph in your answer.

   Native mussel density decreased very quickly and then population density population levels leveled off at around 2-3 mussels/m^2.

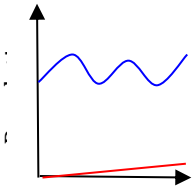
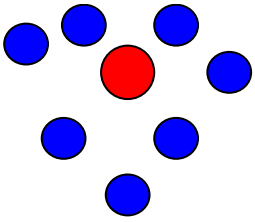
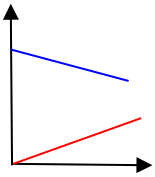
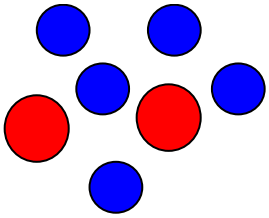
5. Stages of Invasion Notes

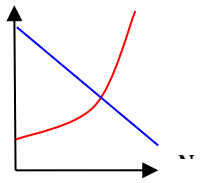
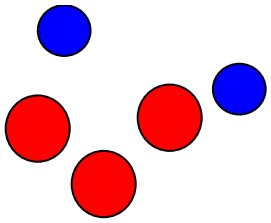
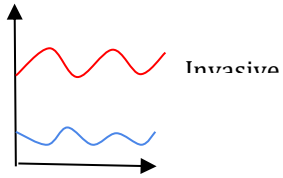
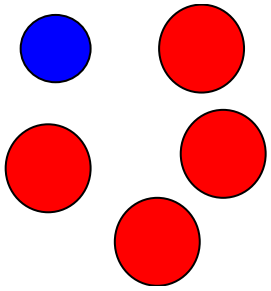
Key Vocabulary

Invasive Species: A species that is not native to an ecosystem and does harm to ecosystem. Invasive species often have adaptations that allow it to spread easily, reproduce fast, and often have no natural predators.

Niche: A job or role a species has in an ecosystem.

Extirpation: When a species no longer exist in a specific location but still exist in other places.

Stage Name and Definition	Sketch of graph	Sketch of the mussel community
Transport Moving from one place to another.		
Establishment Invasive species has adaptations to compete with native species. Begins to grow and reproduce in new ecosystem		

Spread Invasive species reproduces quickly and takes over the habit.		
Impact Invasive species has made a negative impact on the ecosystem changing the ecosystem		

Conclusion

6. On the graph you made of population density of zebra mussels and native mussels label the 4 stages of invasions.

7. List the years that Weyberg Lake was experiencing during each stage and the effect on native mussels.

Transport Years and effect: '06-'08, native mussels are unaffected

Establishment Years and effect: 2009-2010, native mussel population starts to decrease

Spread Years and effect: 2011-2014, sharp decrease in native population

Impact Years and effect: 2014-?, native population is very low or extirpate

8. Describe the impact that Zebra Mussels introduction in Weyberg Lake has had on the ecosystem? Your answer should include impacts beyond those observed on the native mussel population.

Zebra mussels change the water quality, in many cases makes the water clearer and less algae. Many organisms use algae as their food source.