Name_____ **Date** _____

Hudson River Food Webs

Part 1: Introduction to the Hudson River Food Webs

In part one, you will learn about food chains in one of the major environments in the Hudson River: marsh, brackish channel, freshwater channel, or freshwater shallows. You will also observe phytoplankton and zooplankton with a microscope.

1. Go to the following web site: http://www.caryinstitute.com/education/curriculum/hudson-river-food-webs and click on "Food Webs". Choose one of the four Hudson River habitat types.

2. Which habitat did you choose? _____

3. Using the food web shown, construct **two** different food chains for one consumer. Your selected consumer should occupy a different trophic (feeding) level in each chain. Be sure to use different producers and consumers in each food chain (except the one consumer in both food chains).

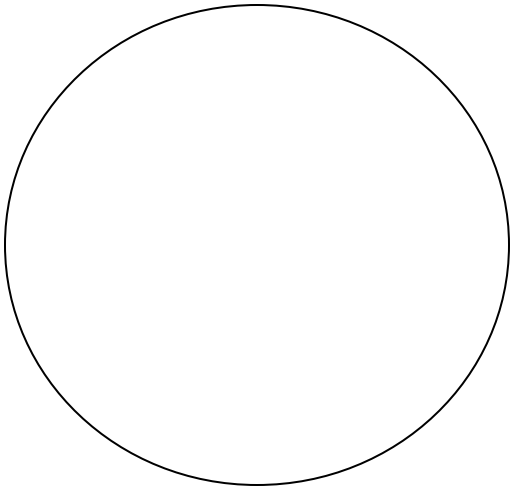
Producer	→	Primary Consumer	→	Secondary Consumer	→	Tertiary Consumer
1st Trophic Level		2nd TL		3rd TL		4th TL

4. Looking at the producer that you chose, use the food webs interactive to list the other consumers that eat it (**consumers you didn't use in your food chains):**
   _____
   _____

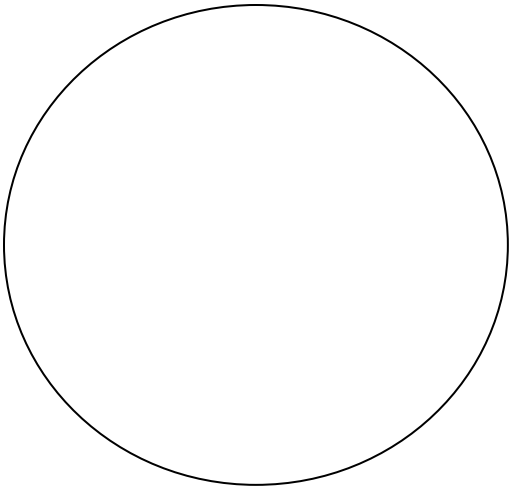
5. Finally, look for the zebra mussel in the fresh water channel food web.
   a. What do zebra mussels eat? _____
   b. What eats the zebra mussels? _____

Plankton identification

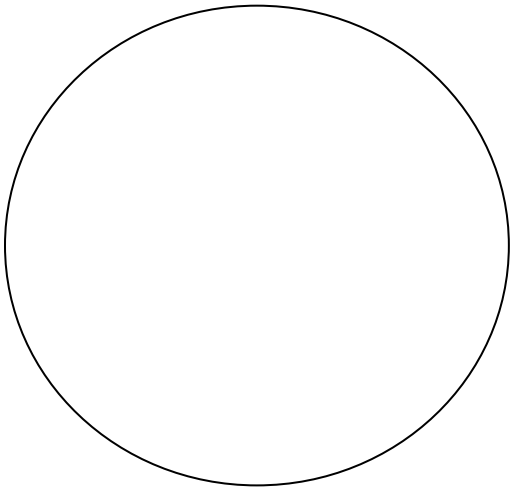
6. Several stations are set up around the room. Using the space below, sketch what you see at each station. Label each organism and find an example of its prey/food and predator.



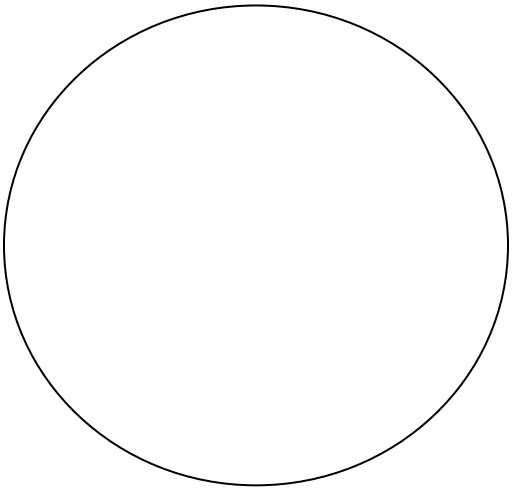
Station 1: _____
Prey _____
Predator_____



Station 2: _____
Prey_____
Predator_____

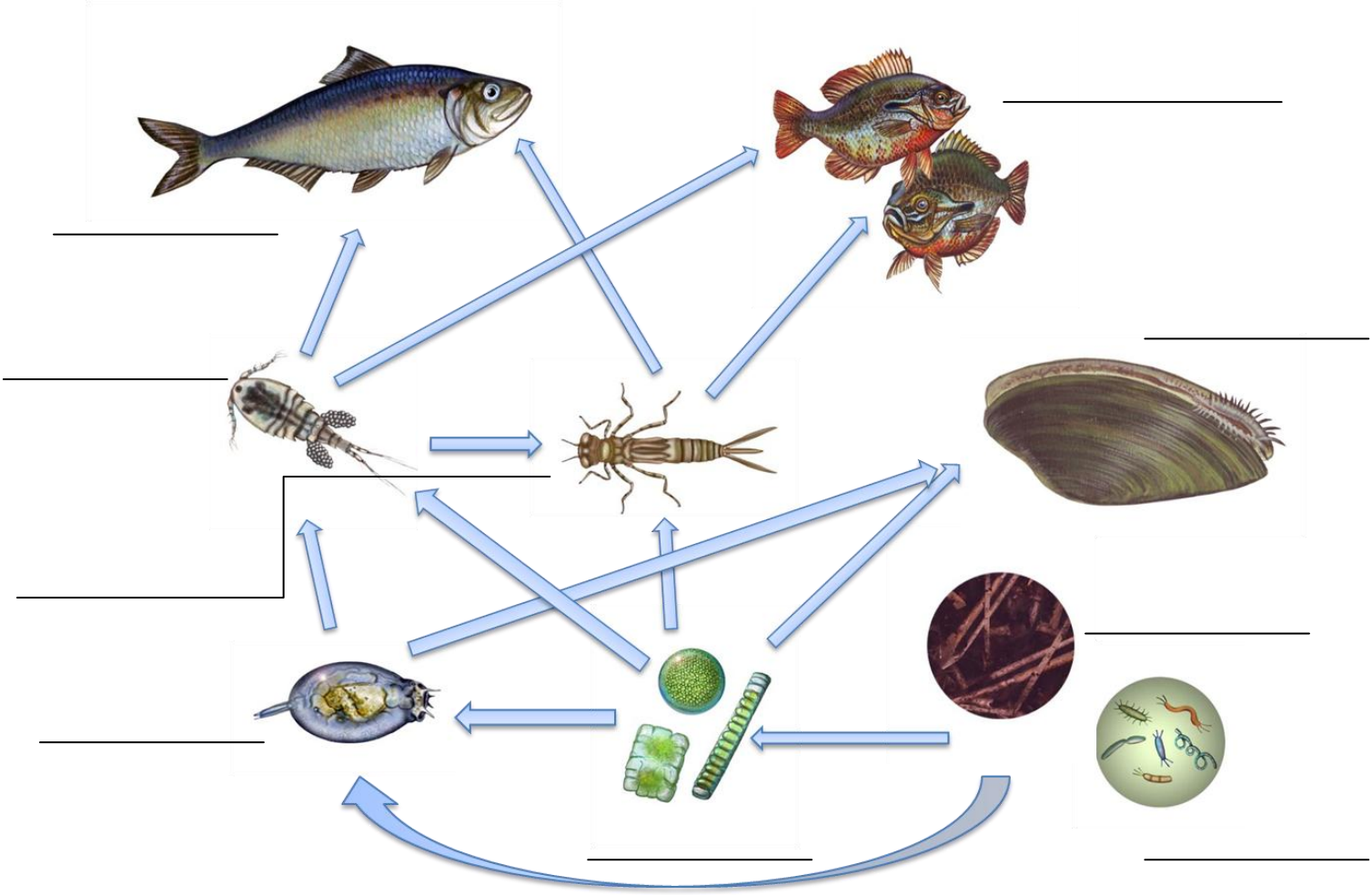


Station 3: _____
Prey _____
Predator_____



Station 4: _____
Prey_____
Predator_____

7. This simplified food web shows the Hudson River prior to the zebra mussel invasion. Label the organisms. Use the reading provided by your teacher or the online food webs to help you.



8. How do you think the invasion of the zebra mussels will change this food web? Explain your answer.

9. Could there be additional consequences that are not depicted in the food web above?

Hudson River Food Webs

Part 2: Invasion of the Zebra Mussels -- Population Changes

1. Where are zebra mussels from? _____
2. When did they arrive in the Hudson River? _____
3. How much water do zebra mussels filter? _____

You and your partners will analyze three graphs that show how the population of a group of organisms changed during different time periods. Record the name of your organism:

_____

1987 – 1991 data

4. How did the population numbers for your organisms change during these years?
   _____
5. Is there an overall trend in these data? Describe.
   _____
6. What is the range of population numbers during these years? _____
7. Based on these data, what do you think might happen to the population during the next decade? Explain your thinking, referring to your data to support your ideas.
   _____

NOTE: populations for 1992 are not included on the graphs. 1992 was year of the zebra mussel invasion in the Hudson River and population levels were in flux and therefore not reliable indicators of zebra mussel affects.

1993 – 2004 data

8. Looking at the graph for 1993-2004, how did the population change during this time?
   _____
9. Is there an overall trend? Describe.
   _____
10. What is the range of population numbers during these years? _____
11. Compare this graph (1993-2004) to the previous graph (1987-1991). What do you notice?
    _____
12. What do you think might happen to the population numbers during the next decade? Explain your thinking, referring to your data to support you ideas.
    _____
13. Compare your organisms' population during 1987 – 1991 and 1993-2004. Is the population increasing, decreasing, staying stable, or fluctuating? Describe the overall trend.

_____

_____

_____

Trends in the Living and Non-Living Environment

14. You will complete the following chart as a class. Each team of students will summarize the information for the graphs for their organisms. You will use this information plus additional information supplied by your teacher to complete the rest of the chart. To begin, complete only the 1993-2004 column. **Use trend arrows should reflect the overall trend in an organism's population from 1993 – 2004, when compared to the 1987-1991 data:**

Decline in population ⇩ Increase in population ⇧ Stable or fluctuating population ⇔

Biotic (living) or Abiotic (non-living) Factor	Trends		
	1993-2004 (compared to 1987-1991)		2005-2009 (compared to 1993-2009)
 Phytoplankton (chlorophyll data) < 20µm			
 Nauplii (Zooplankton) 20-200µm			
 Rotifers (Zooplankton) 20-200µm			
 Copepods (Zooplankton) 200-2000µm			
 Cladocerans (Zooplankton) 200-2000µm			
 Freshwater mussels & clams (native Unionidae)			
 Zebra mussels (non-native)			
 Open water (Pelagic) Fish	Prediction	Actual	
 Dissolved Oxygen			
 Water transparency			
 Submerged aquatic plants in water up to a few meters deep			
 Shallow water (Littoral) Fish			

Small zooplankton

Large zooplankton

Abiotic factors

Littoral species

Analyze the information in the 1993-2004 column.

15. Which organisms' populations suffered declines when the zebra mussels arrived?

_____

16. Which organisms' populations did not show a clear trend when zebra mussels arrived?

_____

17. What generalizations can you make about which organisms were affected by the zebra mussels?

_____

_____

_____

18. Why do you think only some organisms were affected by the zebra mussels?

_____

_____

_____

19. How might the changes in water transparency contribute to these effects?

_____

_____

_____

Part 3: Small, Medium, & Large Zebra Mussels 2005-2009 data

Now you will examine the final graph showing 2005 – 2009 data for your team's organism.

1. How did the population numbers for your organism change during 2005-2009?

_____

_____

_____

_____

Be prepared to report information about your team's organism to the class.

Record arrows on the chart you began in Part 2 as each team reports on the 2005 – 2009 information for their organisms. **Arrows should reflect changes in organisms' populations since 2004.**

After viewing the video or reading the article answer the following questions.

2. Explain how the change in zebra mussel size classes that began in 2005 has affected the Hudson River.

3. How did the change the transparency of the water in the Hudson River?

4. Do you think this will affect your team's organism? Yes _____ No _____ Explain your thinking.

Looking Ahead

5. Think about a food web of the Hudson River. Now, imagine that you are going to reduce the population of an organism by 90% - one that is neither a top predator nor a producer. Explain how this change might impact the food web & the wider ecosystem. Then, explain how this may NOT have any impact at all.

6. Based on what you've learned about recent changes to the Hudson River, what do you think will happen to the Hudson River ecosystem over the next ten years?

7. How confident are you with your answer?

8. What else would you like to know in order to be more confident?

9. Crane flies are great shredders of leaves in a stream. This means that when they eat, they tear up leaves into little pieces. Imagine the cranefly shredder population has dropped by 80%.

   a. Predict what would happen to the other living things in the stream now that there are fewer cranefly shredders. Name as many consequences as you can.

   b. Predict what would happen to the environment (abiotic factors) of the stream now that there are fewer cranefly shredders. Name as many consequences as you can.

   c. Would you make different predictions if there were many types of shredders, not just craneflies, in the stream? ____ Yes ____ No

   d. How would your predictions change?