Name_____

DATA Nugget

Float Down the Kalamazoo River

Featured scientist: Leila Desotelle from Michigan State University

Research Background:

Ever since she was a kid, rivers have fascinated Leila. One of her hobbies is to kayak and canoe down the Kalamazoo River in Michigan, near where she lives. For her work, she researches all the living things in the river and how humans affect them. She is especially interested in changes in the river food web, caused by humans building dams along the river, and an oil spill in 2010.

Leila showing off some of the cool invertebrates that can be found in the Kalamazoo River.

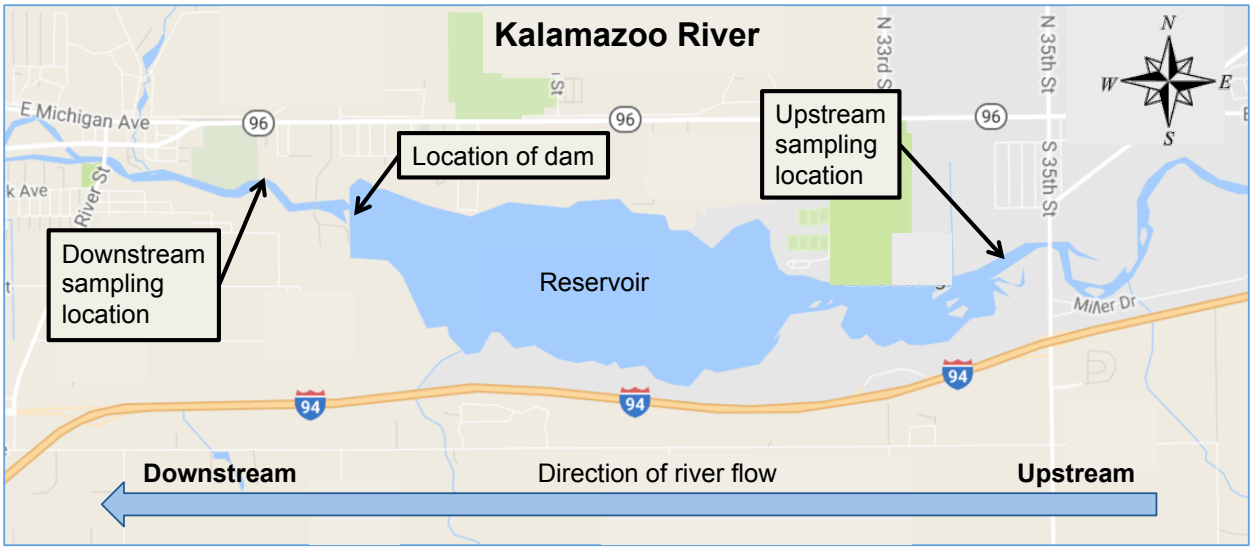
Leila knows there is a lot more in river water than what meets the eye! As the river flows, it picks up bits of dead plants, single-celled algae, and other living and nonliving particles from the bottom of the river. The mix of all these particles is called **total suspended solids (TSS)** because these particles are suspended in the river water as it flows. The food web in the Kalamazoo River depends on the particles that are floating in the water. Invertebrates eat decomposing leaves and algae, and fish eat the invertebrates.

A reservoir created by a dam along the Kalamazoo River. When water flows into the reservoir it slows, potentially letting some of the total suspended solids settle to the bottom.

As you float down the river, particles settle to the river bottom and new ones are picked up. The amount of suspended solids in a river is influenced by how fast the water in the river is flowing. The faster the water flows, the more particles are picked up and carried down the river. The slower the water flows, the more particles will settle to the bottom. **Discharge** is a measure of how fast water is flowing. You can think

about discharge as the number of cubes (one foot on each side) filled with water that pass by a point every second. During certain times of the year, water flows faster and there is more discharge. In spring, when the snow starts melting, a lot of water drains from the land into the river. There also tends to be a lot more rain in the fall. Things humans build on the river can also affect discharge. For example, we build dams to generate hydroelectric power by capturing the energy from flowing water. Dams slow the flow of river water, and therefore they may cause some of the suspended solids to settle out of the water and onto the bottom of the river.

Leila wanted to test how a dam that was built on the Kalamazoo River influenced total suspended solids. If the dam is reducing the amount of total suspended solids, it could have negative effects on the food chain. She was also curious to see if the dam has different effects depending on the time of year. On eight different days from May to October in 2009, Leila measured total suspended solids at two locations along river. She collected water samples upstream of the dam, before the water enters the reservoir, and samples downstream after the water has been in the reservoir and passed over the dam. She also measured discharge downstream of the dam.



Scientific Questions: (1) How does the dam influence the amount of total suspended solids present in the river water? (2) Does this effect differ depending on time of year?

What is the hypothesis? Find the hypothesis in the Research Background and underline it. A hypothesis is a proposed explanation for an observation, which can then be tested with experimentation or other types of studies.

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Scientific Data:

Use the data below to answer the scientific questions:

Date	**Day of Year**	**TSS** (mg/L) **Upstream of Reservoir**	**TSS** (mg/L) **Downstream of Reservoir**	**Discharge** (cubic feet/ second) **Downstream of Reservoir**
15-May	135	8.3	11.5	972
10-Jun	161	9.6	4.9	1850
30-Jun	181	16.7	8.5	923
15-Jul	196	14.0	8.3	971
30-Jul	211	9.9	18.3	681
15-Aug	227	5.9	17.0	593
30-Aug	242	7.7	13.9	800
30-Oct	272	2.7	4.3	956

Average			
Standard Deviation	4.4	5.3	383.8
Standard Error	1.6	1.9	135.7

** Standard deviation (SD) tells us about the amount of variation in the data. A large SD means there is a lot of variation around the mean, while a small SD means the values all fall very close to the mean. Standard error (SE) tells us how confident we are in our estimate of the mean, and depends on the number of replicates in an experiment and the SD. A large SE means we are not very confident, while a small SE means we are more confident.*

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What data will you graph to answer question 1?

Independent Variable: _____

Dependent Variable: _____

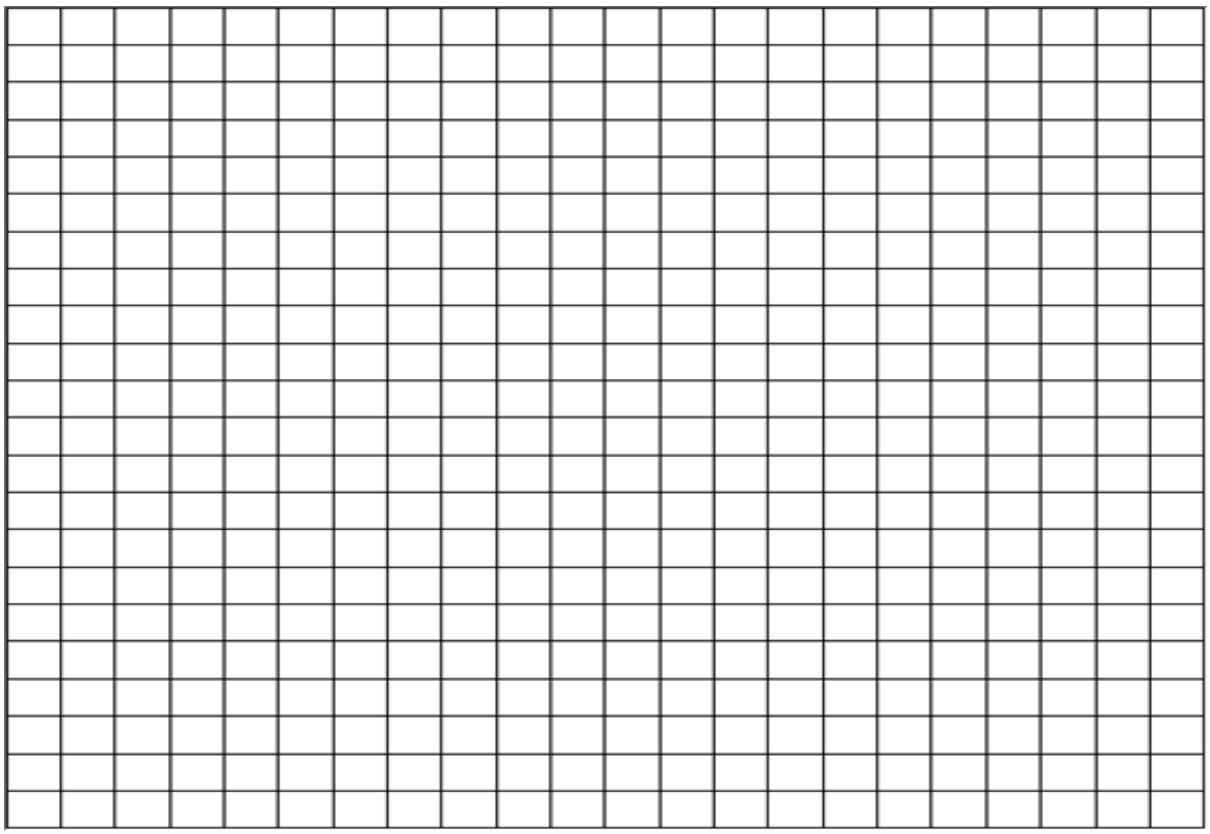
What data will you graph to answer question 2?

Independent Variable: _____

Dependent variable: _____

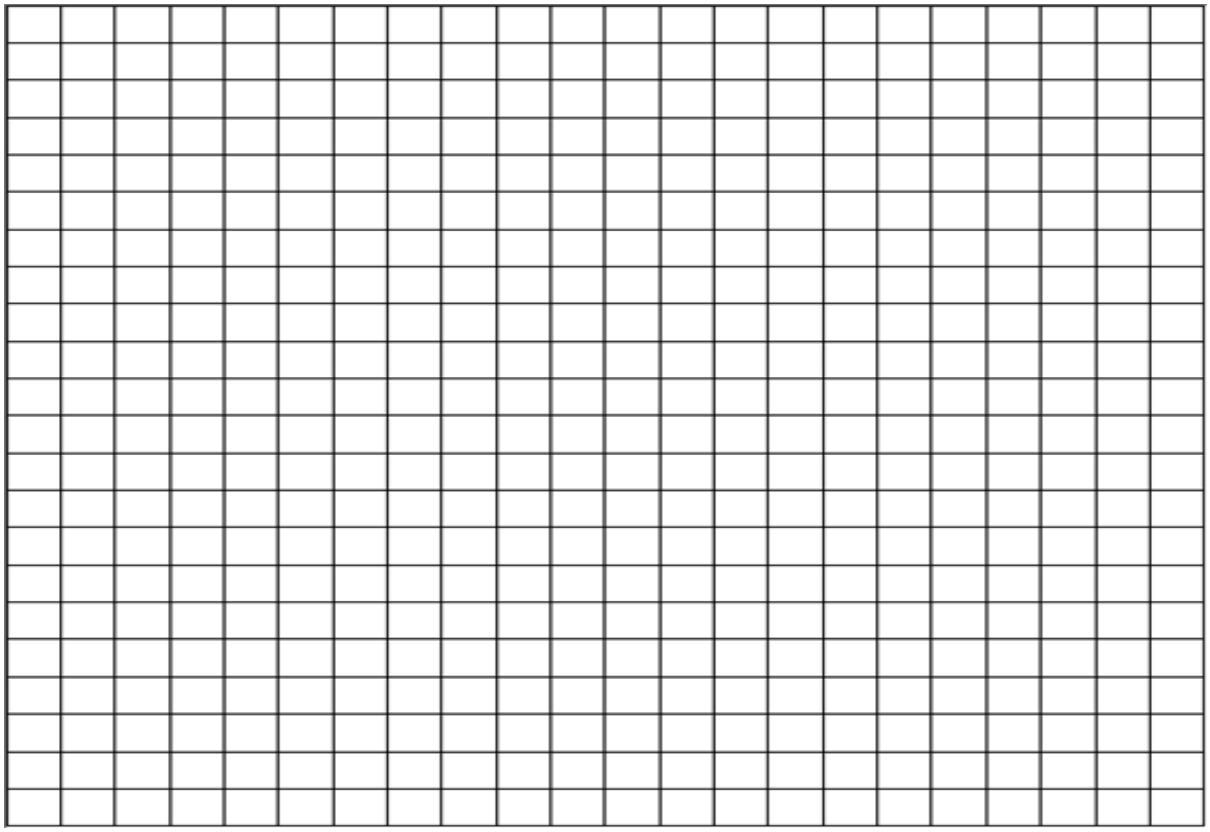
Draw your graphs below: Identify any changes, trends, or differences you see in your graphs. Draw arrows pointing out what you see, and write one sentence describing what you see next to each arrow.

Graph 1



Name_____

Graph 2



Interpret the data:

Make a claim that answers each of the scientific questions.

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What evidence was used to write your claims? Reference specific parts of the table or graphs.

Explain your reasoning and why the evidence supports your claim. Connect the data back to what you learned about how dams could impact the amount of suspended solids in the water.

What do the data from this study tell us about Leila's hypothesis?

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What conclusions can we draw from Leila's research? Discuss the limitations on what we can say, based on these data. What future data could be collected to address these limitations?

Your next steps as a scientist: Science is an ongoing process. What new question do you think should be investigated?