Name____________________

DATA Nugget

Stormy shorelines

Featured scientists: Karen Beard (she/her) of Utah State University, Kathy Kelsey (she/her) of the University of Colorado Denver and Josh Leffler (he/him) of South Dakota State University. Written by: Andrea Pokrzywinski (she/her).

Research Background:

Chevak, a village in Alaska.

Chevak is a village that sits along the Ningliqvak River in Alaska. The area around the village is a flat coastal wetland, a landscape of winding river channels, marshes, and saltwater lakes. In the Yup'ik language, this low-lying terrain is called *maraq*. Here, salt-tolerant grasses and sedges thrive in an environment where the water is saltier than fresh water, but less salty than sea water. These wetlands serve as nesting grounds for waterfowl during the spring and summer months.

Further upland, the higher ground that sits roughly three meters in elevation is called *nunapik*, meaning tundra. Salt water from the sea does not touch these areas. The tundra has many freshwater lakes and supports a different plant community, rich with forbs, shrubs, and lichen. Because it experiences less flooding, more types of plants can live in the upland tundra, providing important resources for food and medicine.

Scientists pump salt water on an experimental plot to model the effects of flooding on plant communities.

In recent years, coastal flooding has become more common near Chevak. Protective sea ice melts earlier each year. Storm surges and rising sea levels now push salt water further inland. These flooding events increase erosion, damage property, and alter the delicate balance of wetland and tundra ecosystems.

Ecologists Karen, Kathy, and Josh began studying the plants around Chevak to better understand how flooding affects these ecosystems. To understand how plant communities at high and low elevations

Name____________________

respond to flooding, the scientists designed an experiment at Old Chevak, the original village site abandoned decades ago due to flooding.

Working in collaboration with the Chevak community and the Yukon Delta National Wildlife Refuge, they established experimental plots to simulate flooding. The flooded plots were created by pumping in seawater to simulate high-tide flooding. This was repeated 3 times during the summer. Karen, Kathy, and Josh also kept control plots where no salt water was added. The treatments were repeated at both high and low elevation sites. There were 7 replicates at each location.

At the summer's end the team collected data on plant growth. They measured the biomass, or weight, of all plants in all of the plots. Karen, Kathy, and Josh grouped the plants into 4 groups. **Graminoids**, which include grasses and sedges, are the dominant plant group of the *maraq*. They typically grow well in flooded wetland areas. **Forbs** are broadleaf herbs, like salmonberries, that grow well in the *nunapik*. **Shrubs** include species such as blueberries, cranberries, and tundra tea. Like forbs, they also grow well in the *nunapik*. **Lichens** are plant-like species that form low crusts along the ground and are only found in the higher elevation sites.

Karen, Kathy, and Josh thought that plants from the low elevation sites would be made up of more salt and flood-tolerant species and would therefore be less harmed by frequent floods. On the other hand, high elevation sites would consist mostly of plant species that are not salt or flood-tolerant and would not do well during floods.

Scientific Question: How does flooding affect the low and high elevation plant communities near Chevak, Alaska?

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.

Low elevation wetlands (left) and higher elevation tundra (right).

Name____________________

Scientific Data:

Use the data from low and high elevation sites to answer the scientific question:

Site	Plant group	Treatment	Average plant biomass (g/m^2)
Low elevation	Graminoids	Control	126.3
Low elevation	Shrubs	Control	108.9
Low elevation	Forbs	Control	6.4
Low elevation	Lichen	Control	0.0
Low elevation	Graminoids	Flooding	150.3
Low elevation	Shrubs	Flooding	116.7
Low elevation	Forbs	Flooding	5.7
Low elevation	Lichen	Flooding	0.0
High elevation	Graminoids	Control	13.0
High elevation	Shrubs	Control	156.7
High elevation	Forbs	Control	27.0
High elevation	Lichen	Control	180.7
High elevation	Graminoids	Flooding	20.5
High elevation	Shrubs	Flooding	138.4
High elevation	Forbs	Flooding	20.0
High elevation	Lichen	Flooding	126.4

What data will you graph to answer the question?

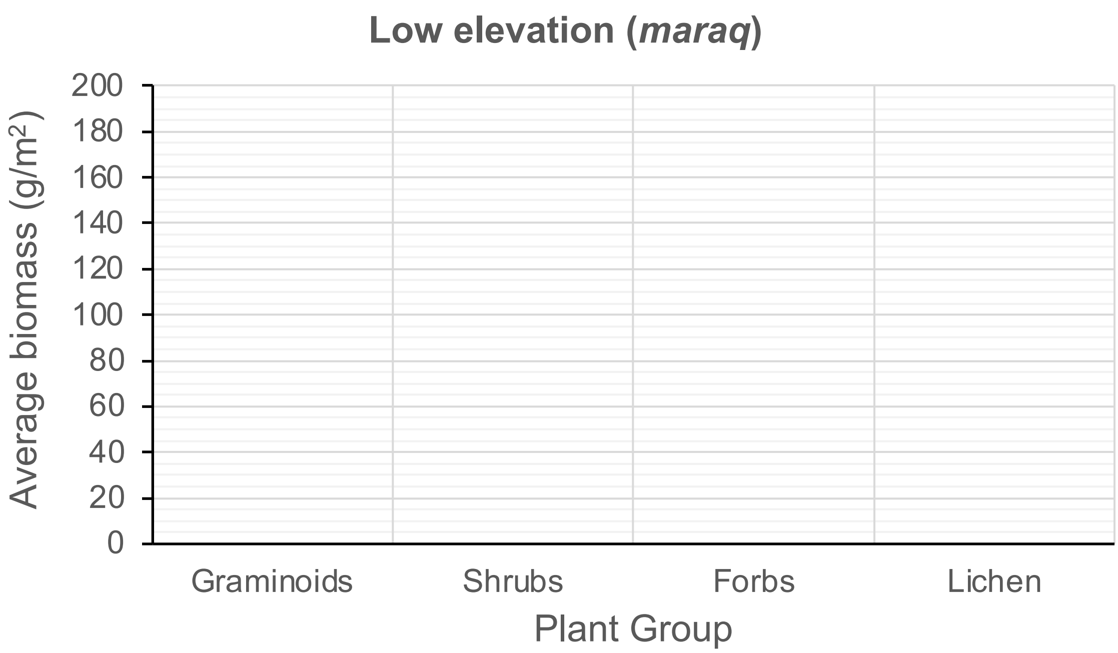
Independent variables: ____

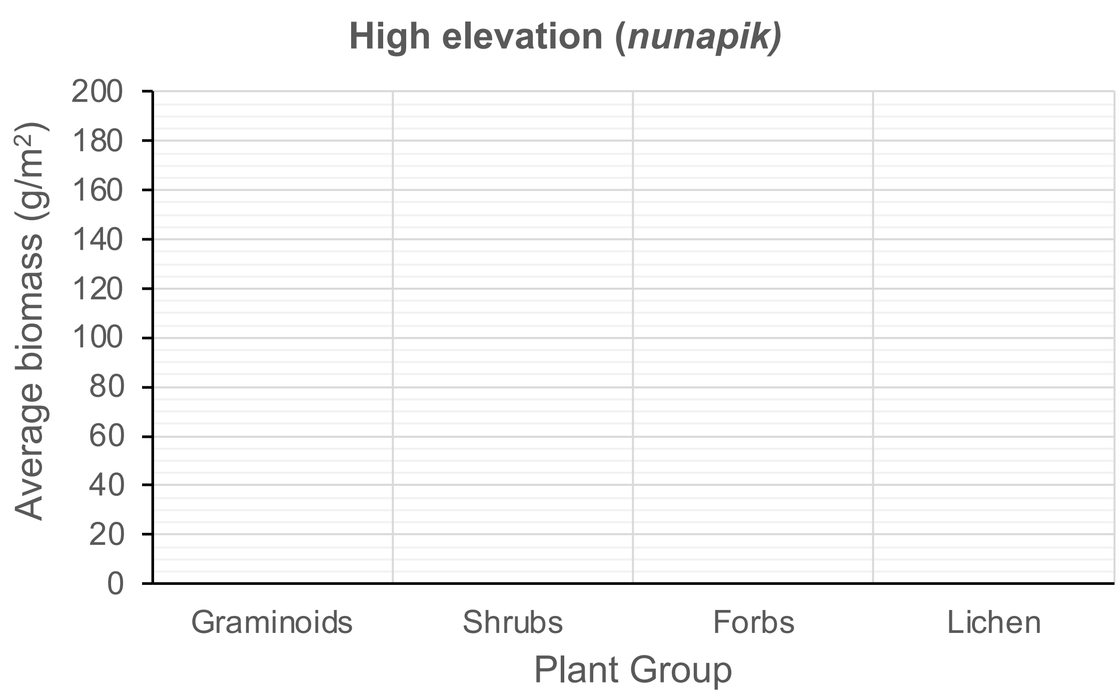
____

Dependent variable: ____

Name____________________

<u>Draw your graphs below</u>: 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.





Name____________________

Interpret the data:

Make a claim that answers the scientific question: How does flooding affect the low and high elevation plant communities near Chevak, Alaska?

What evidence was used to write your claim? 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 the history of flooding at low and high elevation sites, and the life history of the plant groups.

Name____________________

Did the data support Karen, Kathy, and Josh's hypothesis? Use evidence to explain why or why not. If you feel the data are inconclusive, explain why.

Your next steps as a scientist: Science is an ongoing process. What new question(s) should be investigated to build on Karen, Kathy, and Josh's research? How do your questions build on the research that has already been done?