

DATA *Nugget*

Salmonberries in our future

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

Research Background:



Picking salmonberries is a cultural tradition for many Alaskans.

In the Yup'ik and Cup'ik Native communities of western Alaska, berry picking is a deeply rooted tradition. Many villages are located more than 500 miles from the nearest road system or grocery store. Local berries are a lifeline in these remote places, where other fresh fruits and vegetables are flown in by small planes at significant cost.

Salmonberries (also known as cloudberry) are one type of Arctic berry. They are prized for their wonderful taste. Salmonberries are rich in nutrients like vitamin C, antioxidants, and essential minerals. One cup of salmonberries alone can meet a person's daily vitamin C needs. In addition to humans, these berries provide nutrients to other animals, such as migrating birds, small mammals, and bears.

During berry season, families travel across the land to gather berries, preserve them, and store them for the winter. Families use a vast web of winding rivers to travel by boat to reach their berry-picking camps. These western Alaska rivers flow towards the Bering Sea, where freshwater mixes with salty ocean tides.

This mix of saltwater and freshwater shapes the tundra landscape. Tough, salt-tolerant plants like grasses and sedges often dominate low-lying areas closest to the sea. Slightly higher ground, just above the reach of the tides, provides a more suitable home for berries. These subtle shifts in water levels play a large role in determining where berries can grow.



Salmonberry ready to be picked.

Ecologists Karen, Katharine, and Joshua work together to learn more about how changes in climate are affecting berry plants. They are studying two major changes already observed under climate change – warming and flooding.

Alaska's average temperatures are increasing, more so than other parts of the globe. This warming might help some plants by extending the growing season. With more time and sunlight, salmonberries and other plants may actually grow faster with climate change.

Climate change is also expected to increase flooding in some areas of coastal Alaska. Storms are already becoming stronger and more frequent, pushing seawater farther inland. Because of this, flooding events are increasing in frequency. Rising sea levels and storm surges may kill salmonberry plants because they are not adapted to having their roots submerged in salty water. Over time, warming and flooding combined could change the entire makeup of plant communities. This will affect whether local families are able to continue their traditions and access this valuable food source.

To tease apart the possible beneficial and harmful effects of warming and flooding, Karen, Katharine, and Joshua designed a field experiment to simulate climate change. They built clear plastic structures, called **open-topped chambers**, to trap heat and raise the temperature by about 2°C over experimental plots. These chambers can be thought of as mini time machines, creating small areas that have the expected



Top: Open-topped chambers increase the temperature over the experimental plots. Bottom: Researchers added brackish water to simulate flooding.

temperatures of the coming decades. Next, they created flooded plots using **brackish**, or slightly salty, water that they collected where the fresh river water meets the sea. They used this water to simulate flooding events in the plots. This means they had four different types of plots. Control plots, some plots that were warmed, others were flooded, and a set that were both warmed and flooded.

At the end of the growing season, the team collected data on how salmonberry plants grew. They measured both the height and biomass of salmonberry plants in all of the plots. This way, the scientists could look at plant growth in two different ways. They also measured whether they could survive the stress of these environmental changes. In a place where food and traditions are tied to the land, every berry matters.

Scientific Question: How do warming and flooding affect the growth of salmonberries in western Alaska?

What are the hypotheses? Find the two hypotheses in the Research Background and underline them. A hypothesis is a proposed explanation for an observation, which can then be tested with experimentation or other types of studies. Experimentation can determine if one, both, or neither of the hypotheses are supported.

Scientific Data:

Use the data below to answer the scientific question:

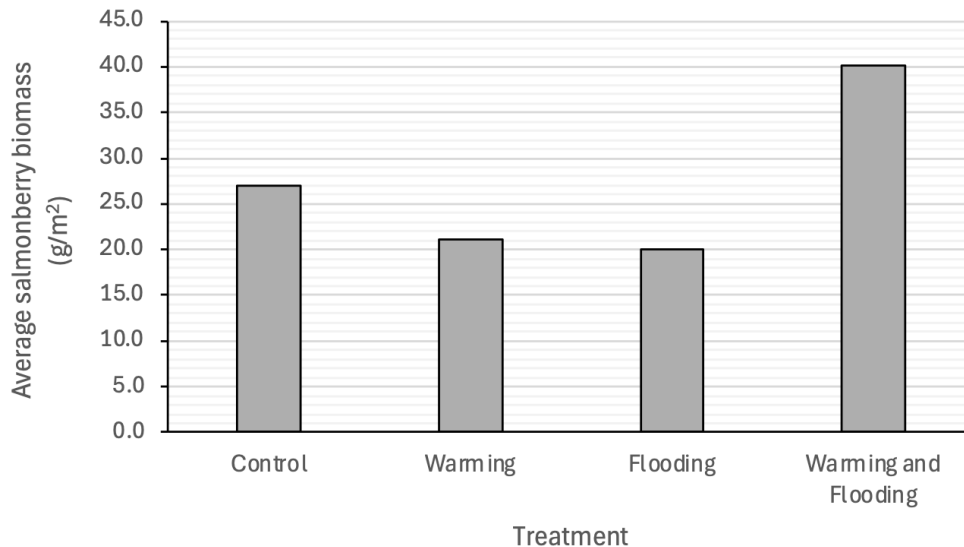
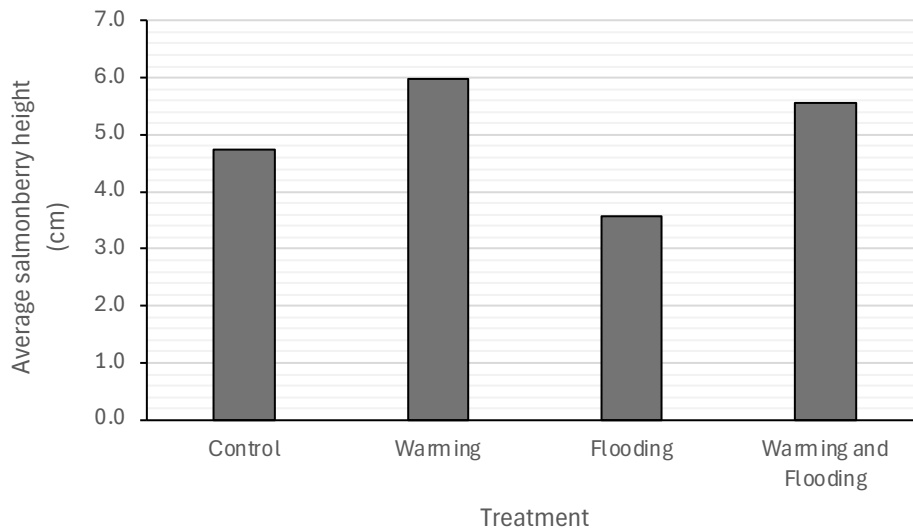
	Control	Warming	Flooding	Warming and Flooding
Average salmonberry biomass (g/m ²)	27.0	21.1	20.0	40.1
Average salmonberry height (cm)	4.7	6.0	3.6	5.6

What data will you graph to answer the question?

Independent variable:_____

Dependent variables:_____

Below are graphs of the data: Identify any changes, trends, or differences you see in your graph. 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 do warming and flooding affect the growth of salmonberries in western Alaska?

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

Explain your reasoning and why the evidence supports your claim. Connect the data back to what you learned about the expected impacts of climate change on Alaskan coastal ecosystems.

Name_____

Did the data support one, both, or neither of the two hypotheses? Use evidence to explain why or why not. If you feel the data were 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, Katharine, and Joshua's research? How do your questions build on the research that has already been done?