

DATA *Nugget*

Poop, poop, goose!

Featured scientists: Trisha Atwood of Utah State University and Bonnie Waring of Imperial College. Written by Andrea Pokrzywinski.

Research Background:

Each spring, millions of birds return to the Yukon-Kuskokwim Delta. This delta is where two of the largest rivers in Alaska empty into the Bering Sea. It is also one of the world's most significant habitats for geese to breed and raise their young.

With all these geese coming together in one area, they create quite a mess – they drop tons of poop onto the soil. So much poop in fact, that scientists wonder whether poop from this area in Alaska could have a global impact! **Climate change** is a worldwide environmental issue that is caused by too many greenhouse gasses being released into our atmosphere. Typically, we think of humans as the cause of this greenhouse gas release, but other animals can contribute as well.



Cackling Goose next to a pile of goose poop, or feces.
Photo by Andrea Pokrzywinski.

When poop falls onto the soil it is decomposed by bacteria. Bacteria release methane (CH₄), a potent greenhouse gas. The more geese there are, the more poop they will produce and the more food there will be for soil bacteria. By increasing the amount of greenhouse gasses that are released by soil bacteria, geese might actually indirectly contribute to global climate change.

Trisha is an ecosystem ecologist who scoops goose poop for research projects. Her research is looking into whether animals, other than humans, can change the carbon cycle. Trisha teamed up with Bonnie, a fellow ecosystem ecologist. Bonnie studies how matter moves between the living parts of the environment, such as plants and animals, and the nonliving parts. She is especially interested in how bacteria in the soil play a role in the carbon cycle.

Together, the team designed a project to figure out the effects of goose poop on the carbon cycle. For two summers, a large team of researchers spend 90 days camping on remote sites near the Yukon-Kuskokwim Delta. The team scooped up poop from nearby goose habitats to use in their experiments. They set up six control plots where they added no poop and six treatment plots where they added poop. From these twelve plots, the team measured methane emissions from the soil. Methane was measured as methane flux in micromoles, or μM . These data helped them determine how ecosystems respond to geese by measuring whether goose poop affects methane production by soil bacteria.



A LICOR Analyzer that measures carbon dioxide and methane emissions from research plots. Photo by Dr. Trisha Atwood.

Scientific Question: Is goose poop in the Yukon-Kuskokwim Delta of Alaska contributing to global climate change?

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.

Scientific Data:

Use the data below to answer the scientific question:

| Plot ID | Plot Type | Methane Flux (μM) |
|----------------------------|------------|--------------------------------|
| 1 | control | 8 |
| 1 | poop added | 7 |
| 2 | control | 15 |
| 2 | poop added | 3 |
| 3 | control | 4 |
| 3 | poop added | 13 |
| 4 | control | 16 |
| 4 | poop added | 29 |
| 5 | control | 8 |
| 5 | poop added | 5 |
| 6 | control | 12 |
| 6 | poop added | 6 |
| | | |
| Averages | control | |
| | poop added | |
| | | |
| Standard Deviations | control | 4.6 |
| | poop added | 9.7 |

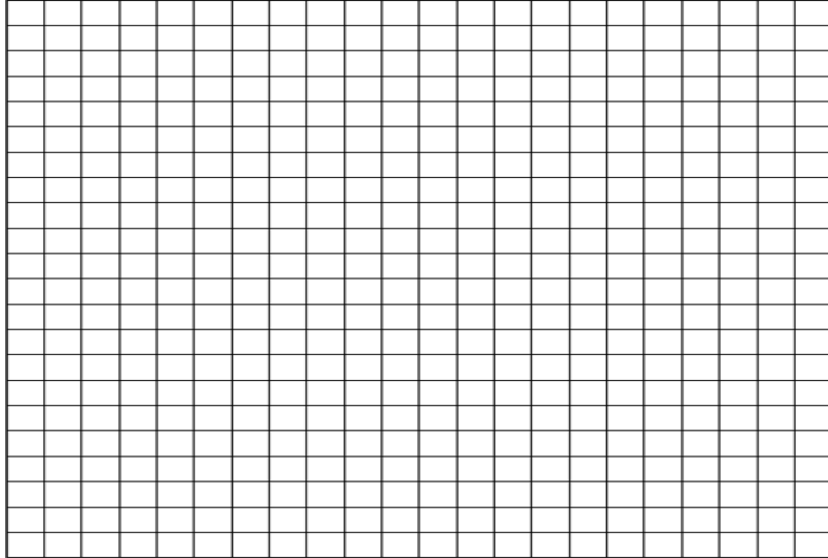
What data will you graph to answer the question?

Independent variable(s): _____

Dependent variable(s): _____

Name _____

Draw your graph below: 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.



Interpret the data:

Make a claim that answers the scientific question, is goose poop in the Yukon-Kuskokwim Delta of Alaska contributing to global climate change?

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

Name _____

Explain your reasoning and why the evidence supports your claim. Connect the data back to what you learned about the impact of goose poop on soil bacteria.

Did the data support Trisha and Bonnie'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 Trisha and Bonnie's research? How do your questions build on the research that has already been done?