Name_____

# DATA Nugget

**Where to find the hungry, hungry herbivores**

Featured scientist: Carina Baskett from Michigan State University

*Research Background:*

When travelling to warm, tropical places you are exposed to greater risk of diseases like malaria, yellow fever, or dengue fever. The same pattern of risk is true for other species besides humans. For example, scientists have noticed that crops seem to have more problems with pests if they grow at **lower latitudes** (closer to the equator). Locations that are at lower latitudes have warm climates. We don't know exactly why there are more pests in warmer places, but it could be because pests have a hard time surviving very cold winters.

Carina and some pokeweed plants in Tennessee.

Carina is interested in figuring out more about this pest-y problem. She first got excited about plants in school, when she learned that they use photosynthesis to make their own food out of light, air, and water. She thought it was fascinating that plants have evolved so many different strategies to survive. Even though they don't have brains, plants do have adaptations that help them compete for light and mate in many different habitats. Carina continues to learn more every day, and especially enjoys researching how plants defend themselves against **herbivores**, or animals that eat plants. Herbivores pose a challenge because plants can't run away or hide!

Carina studies ways wild plants can defend themselves against herbivores. What she learns in wild plants could give us ideas of how to help crops defend against pests too. Scientists aren't sure why crops have more pest problems in warmer places, but it would help to understand if wild plants also have the same pattern.

So Carina decided to travel all across the eastern United States to measure herbivory on pokeweed, a common wild plant there. Carina drove a lot for this project! In one

summer, she visited ten patches of pokeweed spread out between Michigan and Florida. Carina thought that the pokeweed found at lower latitudes (Florida, 27° N) would have higher herbivory than pokeweed at northern latitudes (Michigan, 42° N) because pests may not be able to survive as well in places with harsh winters.

At each of the ten sites, she marked five very young leaves on 30 to 40 plants. That equals over 1,500 leaves! She then came back six weeks later to measure how much the leaves were eaten as they grew into large, mature leaves. When leaves are young, they are more tender and can be more easily eaten by herbivores (that's why we eat "baby spinach" salad). To measure herbivory she compared the area that was eaten to the total area of the leaf, and calculated the percent of the leaf area eaten by caterpillars, the main herbivores on pokeweed. She then averaged the percent eaten on leaves for each plant. Some plants died in those 6 weeks, so the sample size at the end of the study ranged from 4 to 37 depending on the site.

*Scientific Question*: At what latitudes do caterpillars do the most damage to pokeweed?

*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.

Pokeweed (*Phytolacca americana*) is a common wild plant that grows all over the eastern US. Pokeweed has beautiful pink stems and dark purple berries.

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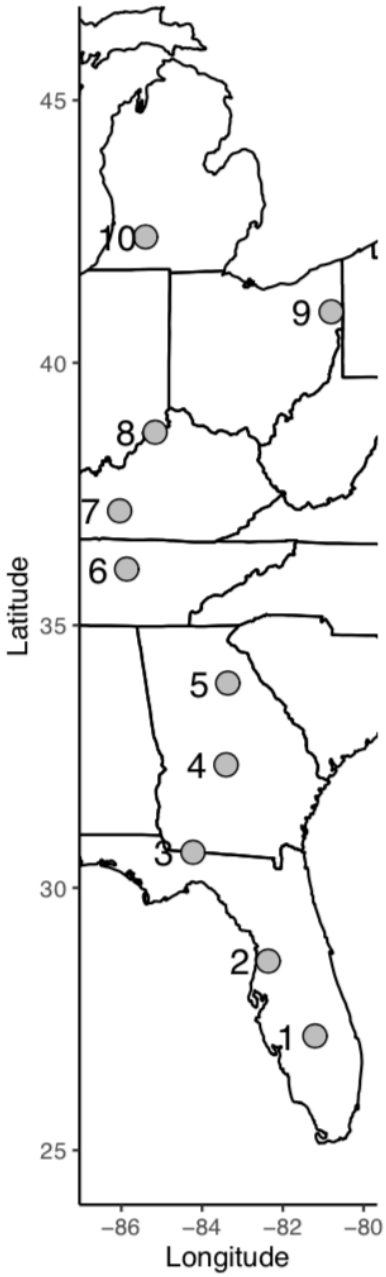
*Scientific Data:*

**Use the data below to answer the scientific question:**

| Site number | Latitude (N) | Sample size (n) | Average percent of the total leaf area eaten | SD | SE |
|---|---|---|---|---|---|
| 10 | 42.5 | 30 | 12.80 | 13.77 | 3.85 |
| 9 | 41.0 | 28 | 22.28 | 21.78 | 4.61 |
| 8 | 38.7 | 27 | 6.46 | 11.23 | 4.42 |
| 7 | 37.2 | 24 | 26.59 | 27.49 | 5.33 |
| 6 | 36.1 | 20 | 6.45 | 13.81 | 5.44 |
| 5 | 33.9 | 26 | 73.30 | 32.89 | 3.84 |
| 4 | 32.3 | 26 | 87.01 | 22.37 | 2.40 |
| 3 | 30.7 | 17 | 98.46 | 3.44 | 0.35 |
| 2 | 28.6 | 4 | 78.10 | 9.87 | 1.12 |
| 1 | 27.2 | 37 | 60.35 | 27.15 | 3.49 |

**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 data points 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.*




What data will you graph to answer the question?

Independent variable: _____

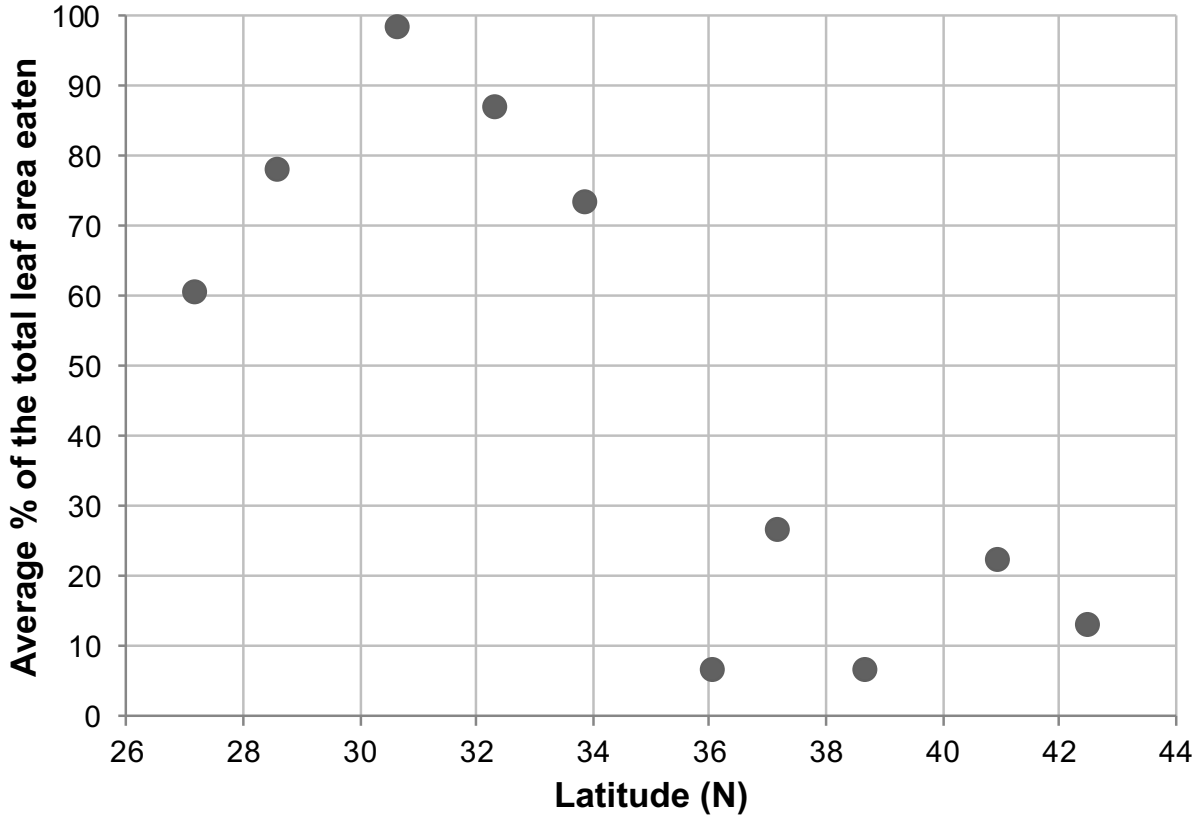
_____

Dependent variable: _____

_____

Name_____

*Below is a graph 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.




*Interpret the data:*

Make a claim that answers the scientific question.

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

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Explain your reasoning and why the evidence supports your claim. Connect the data back to what you learned about how latitude may affect the number of pests on plants.

Did the data support Carina's hypothesis? Use evidence to explain why or why not. If you feel the data was inconclusive, explain why.

*Your next steps as a scientist:* Science is an ongoing process. What new question do you think should be investigated? What future data should be collected to answer your question?