# DATA Nugget

**Tree-killing beetles**
Featured scientist: Tony Vorster from Colorado State University
Co-written with Yamina Pressler and Paul Evangelista

## Research Background:

A beetle the size of a grain of rice seems insignificant compared to a vast forest. However, during outbreaks the number of mountain pine beetles can skyrocket, leading to the death of many trees. The beetles bore their way through tree bark and introduce blue stain fungi. The blue stain fungi kills the tree by blocking water movement. Recent outbreaks of mountain pine beetles killed millions of acres of lodgepole pine trees across western North America. Widespread tree death caused by mountain pine beetles can impact human safety, wildfires, nearby streamflow, and habitat for wildlife.

Mountain pine beetles are native to western North America and outbreak cycles are a natural process in these forests. However, the climate and forest conditions have been more favorable for mountain pine beetles during recent outbreaks than in the past. These conditions caused more severe outbreaks than those seen before.
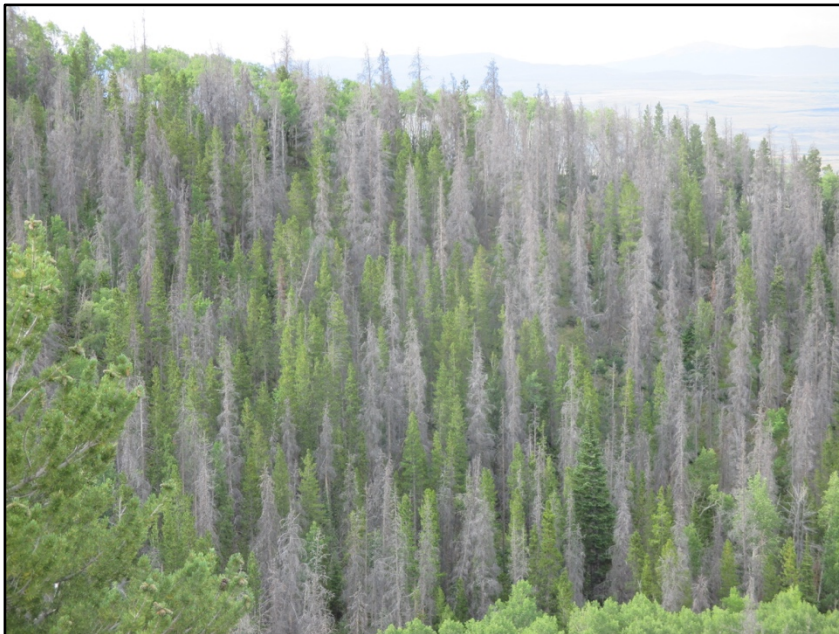


A Colorado forest impacted by a mountain pine beetle outbreak. Notice the dead trees mixed with live trees. Forests like this with dead trees from mountain pine beetle outbreaks cover millions of acres across western North America.

When Tony moved to Colorado, he drove through the mountains eager to see beautiful forests. The forest he saw was not the green forest he expected. Many of the trees were dead! Upon closer examination he realized that some forests had fewer dead trees than others. This caused him to wonder why certain areas were greatly impacted by the mountain pine beetles while others had fewer dead trees. Tony later got a job as a field technician for Colorado State University.

During this job he measured trees in mountain forests. He carefully observed the forest and looked for patterns of where trees seemed to be dead and where they were alive.

Tony thought that the size of the trees in the forest might be related to whether they were attacked and killed by beetles. A larger tree might be easier for a beetle to find and might be a better source of food. To test this idea, Tony and a team of scientists visited many forests in northern Colorado. At each site they recorded the diameter of each tree's trunk, which is a measure of the size of the tree. They also recorded the



Logs from mountain pine beetle killed lodgepole pine trees. The blue stain fungi is visible around the edge of each log. Mountain pine beetles introduce this fungus to the tree.

tree species and whether it was alive or dead. They then used these values to calculate the average tree size and the percent of trees killed for each site.


*Scientific Question*: How does the average tree size in a forest influence its susceptibility to mountain pine beetles?

*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:**

| Site number | Average lodgepole pine diameter (cm) | Percent of trees killed | Proportion of forest that is lodgepole pine |
|---|---|---|---|
| 1 | 25 | 67 | 0.99 |
| 2 | 19 | 41 | 0.65 |
| 3 | 22 | 61 | 0.99 |
| 4 | 16 | 49 | 0.68 |
| 5 | 16 | 62 | 0.99 |
| 6 | 14 | 44 | 1 |
| 7 | 13 | 30 | 0.94 |
| 8 | 5 | 1 | 1 |
| 9 | 35 | 15 | 0.15 |
| 10 | 25 | 73 | 0.85 |
| 11 | 4 | 0 | 1 |

What data will you graph to answer the question?

Independent variable(s): _____

Dependent variable(s): _____

*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.
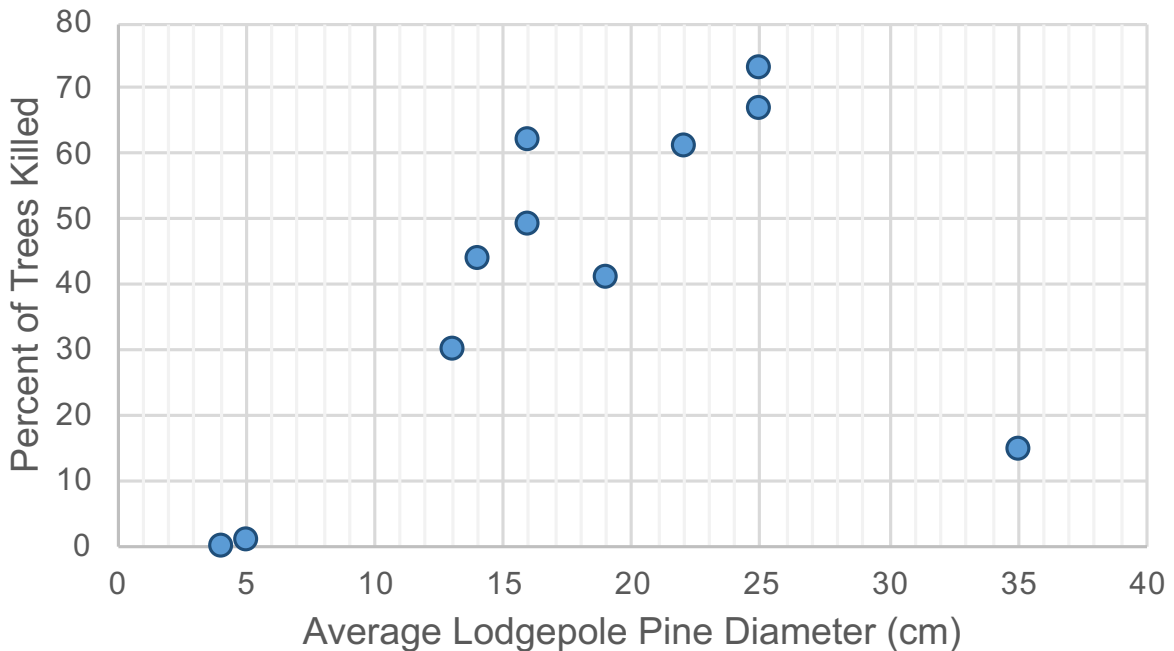
_Interpret the data:_

Make a claim that answers the scientific question.

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

Explain your reasoning and why the evidence supports your claim. Connect the data back to what you learned about the impact of mountain pine beetles on lodgepole pine trees.

Did the data support Tony'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?