

WHAT'S KILLING THE LODGEPOLE PINE TREES?

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Research Assistant Notebook

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Student Name

SECTION 1: GATHER

Steps 1-6

Your Task: Define the problem by identifying dead pine trees in aerial images of Uinta Mountains of Utah. Determine whether the amount of dead trees found this year is significantly different than the historic average.

Note: The step numbers on the left of this page go with the steps in your investigation.

STEPS

2 GATHER: How many dead trees were found at each site? Use this chart to record your data.

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6
Your data						
Larger Data Set	AVERAGE DEATH RATE FOR TREES: _____%					
Historical data	AVERAGE DEATH RATE FOR TREES: _____%					

5 RESEARCH: Use the chart below to list your findings.

Which resources does a lodgepole pines need to survive?	Which pathogens weaken or kill lodgepole pines?	Which predators are often weaken or kill lodgepole pines?	Which natural disturbances & hazards can weaken or kill for lodgepole pines?
<i>(list natural resources)</i>	<i>(list pathogens)</i>	<i>(list predators)</i>	<i>(list natural disturbances)</i>

6 PREDICT: Based on the information you've gathered explain why you think the trees are dying.

I think the trees might be dying because:

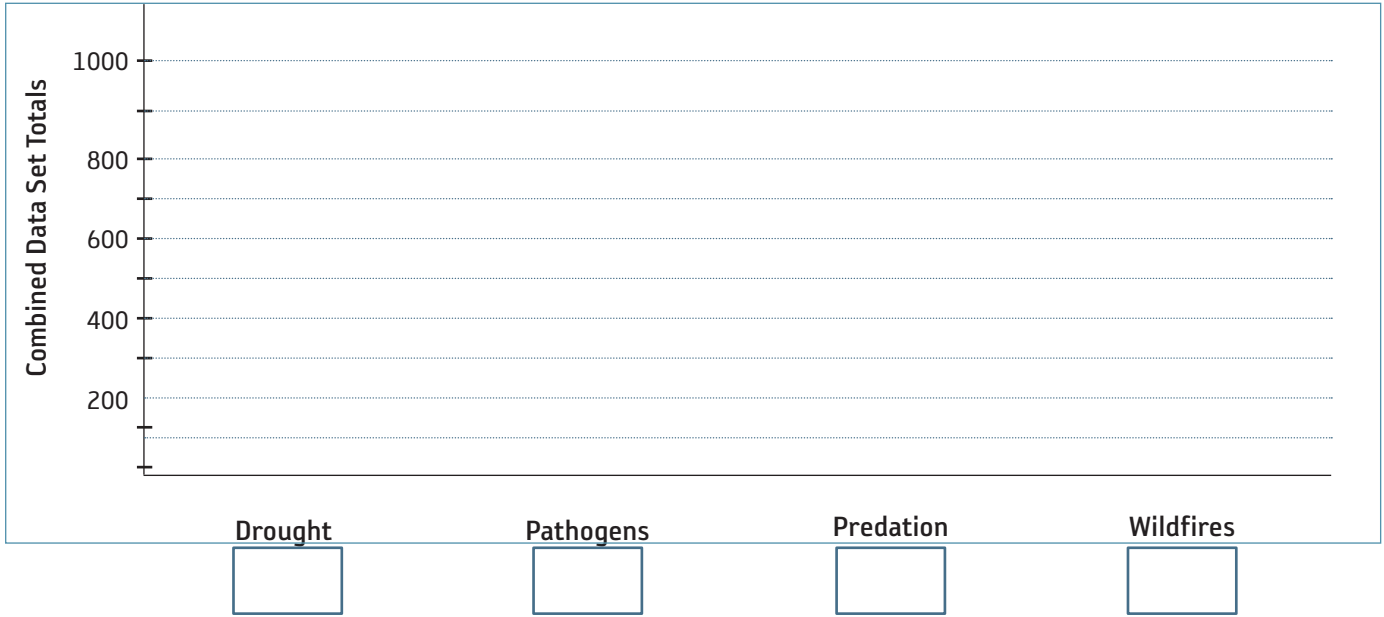
SECTION 2: ANALYZE

Steps 7-14

Your Task: Examine tree photos, bark samples and tree cookies to look for evidence that can help you identify what is killing the trees. Then, analyze precipitation and temperature data to look for cause and effect relationships that could explain this phenomena.

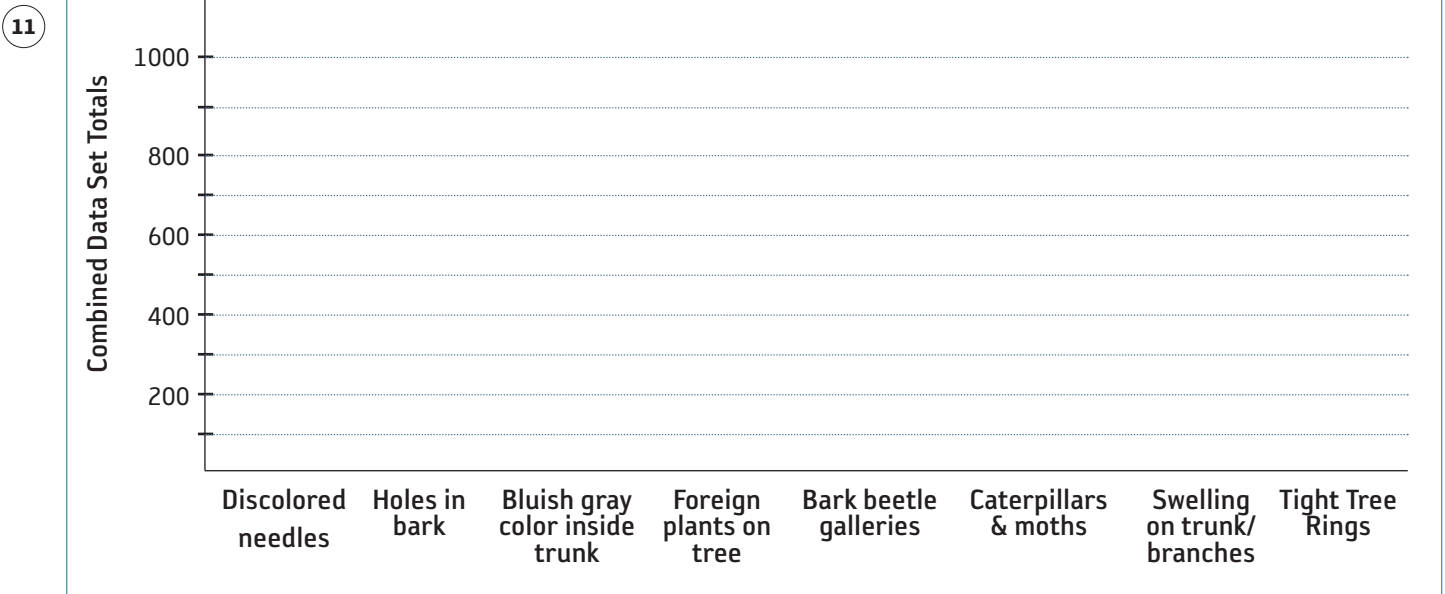
- 10 **VISUALIZE:** Create a bar graph of your data. You will use this evidence later when you communicate your findings.

Possible Causes of Lodgepole Pine Tree Deaths



REVIEW: Based on the graph above, what is most likely killing the lodgepole pines in the Uinta Mountains? Use the squares above to rank the causes in order from 1 - most likely to 5 - least likely.

Possible Signs that Lodgepole Pine Trees are Dying



SECTION 2: ANALYZE (CONTINUED)

Steps 7-14

- 11 **EVALUATE:** What does your evidence suggest? Evaluate your evidence by completing each of the sentences below. [Hint: use the 'causes' graph on the previous page.]

Strong: supports one explanation **Weak:** supports several explanations **Disconfirming:** rules out explanations

(Choose one. Mark with an X.)

The discolored needles are	strong evidence weak evidence disconfirming evidence	that suggests _____ is the tree killer.
The holes in bark are	strong evidence weak evidence disconfirming evidence	that suggests _____ is the tree killer.
The bluish gray color inside trunk is	strong evidence weak evidence disconfirming evidence	that suggests _____ is the tree killer.
The foreign plants on tree are	strong evidence weak evidence disconfirming evidence	that suggests _____ is the tree killer.
The bark beetle galleries are	strong evidence weak evidence disconfirming evidence	that suggests _____ is the tree killer.
The caterpillars & moths are	strong evidence weak evidence disconfirming evidence	that suggests _____ is the tree killer.
The swelling on trunk/branches is	strong evidence weak evidence disconfirming evidence	that suggests _____ is the tree killer.
The tight tree rings are	strong evidence weak evidence disconfirming evidence	that suggests _____ is the tree killer.

- 13 **ANALYZE:** With your partner, examine the precipitation data. What patterns do you notice?

- 14 **ANALYZE:** With your partner, examine the temperature data. What patterns do you notice?

SECTION 3: INTERPRET

Steps 16-17

Your Task: Gather additional evidence about mountain pine beetles. Then, reflect on all the data you've gathered to construct an explanation, supported by evidence, for why lodgepole pine tree deaths are so much worse now than in the past.

- 16 **EVALUATE & INTERPRET:** Research information about the mountain pine beetle. Record evidence you think could help explain why there are more lodgepole pine deaths now than in the past.

<p><i>Important fact:</i></p> <p><i>This is important because:</i></p>	<p>WHY?</p> <p>TEMPERATURE + MOUNTAIN PINE BEETLE = LODGEPOLE PINE TREE DEATH</p>	<p><i>Important fact:</i></p> <p><i>This is important because:</i></p>
<p><i>Important fact:</i></p> <p><i>This is important because:</i></p>		<p><i>Important fact:</i></p> <p><i>This is important because:</i></p>

SECTION 3: INTERPRET (CONTINUED)

Steps 16-17

- 17 INTERPRET & REFLECT:** Look at your findings from Steps 10-16 to construct your explanation for why there are more lodgepole pine deaths now compared with the past. *(If you cannot download your online explanation use the space below to record your thinking.)*

<p>Claim: Why are the lodgepole pine trees dying at a faster rate compared with the past?</p>	<p>Evidence: Cite at least 3 pieces of evidence from this investigation to back up your claim. <i>What tells you that it is worse now?</i></p>	<p>Reasoning: Explain how the evidence you cited backs up your claim. <i>Why did you choose this evidence?</i></p>

SECTION 4: COMMUNICATE

Steps 18-19

Your Task: Take your evidence supported explanation for what is killing lodgepole pines in the Uinta Mountains and why are there more deaths now than in the past to write a play. Use Steps 10-17 to help support your argument.

- 18 COMMUNICATE:** Write a one act play to communicate your explanation for what is killing the lodgepole pine trees and why it is happening at a faster rate than we've seen in the past. Use personification to develop characters from this ecosystem. For example, the lodgepole pine tree may be visiting a doctor. It may describe its symptoms (the evidence you observed). Its doctor may offer a diagnosis (the cause your evidence points to) and why it is happening (the reasons it is so much worse now compared with the past). Be creative! Use the "Script Template" to help. And, please share your work with your teacher or NHMU's educators.
- 19 VIDEO REVIEW:** Think about or discuss with your partner how your findings compare to Isabel's and Dr. Mitch's findings. Did you come to the same conclusions? Why or why not?

SCRIPT TEMPLATE

Play Title:

Characters in this scene: (Who are they? Describe them.)

The setting is: (Describe the setting. Where is it? Who is there?)

Character 1:

Character 2:

Character 1:

Character 2:
