

# WHAT DOES THE FUTURE LOOK LIKE FOR A FOREST UNDER ATTACK?

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Research Assistant Notebook  
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Student Name

**SECTION 1: GATHER**

Steps 1-5

Your Task: Use models to visualize and test changes to populations of producers, consumers, and decomposers in this ecosystem.

Note, the steps on the left of this page match up with the steps in your online investigation.

STEPS	VOCABULARY WORD	DEFINITION (IN YOUR OWN WORDS) <i>BONUS: GIVE AN EXAMPLE</i>
1	<b>Food web</b>	
2	<b>Energy model</b>	
	<b>Producers</b>	
	<b>Consumers</b>	
	<b>Decomposers</b>	
3	<b>Abiotic factors</b>	
	<b>Biotic factors</b>	

SECTION 1: GATHER (CONTINUED)

Steps 1-5

4 **TRACK:** Record your test results in this population chart to track the changes you observe.

Use this **KEY** to complete your chart:  
 + Population increase, - Population decrease, 0 No change

**POPULATION CHART: WHAT HAPPENS WHEN CHANGE OCCURS?**

Population Chart	Biotic Change: Wolves added	Abiotic Change: Wildfire	Abiotic Change: Extreme Drought
<b>TERTIARY CONSUMERS</b>			
Cooper's hawk			
Cougar			
Wolves			
Black bear			
<b>SECONDARY CONSUMERS</b>			
Red-tailed squirrel			
Coyote			
Northern flicker			
Least chipmunk			
American beaver			
Clark's nutcracker			
Red-naped sapsucker			
American three-toed woodpecker			
Cutthroat trout			
Rainbow trout			
Brook trout			
River otter			
Carpenter ant			
Ground beetle			
Deer mouse			
Northern flying squirrel			

Population Chart	Biotic Change: Wolves added	Abiotic Change: Wildfire	Abiotic Change: Extreme Drought
<b>PRIMARY CONSUMERS</b>			
Vole			
Moose			
Snowshoe hare			
Mountain pine beetle			
Rocky Mountain mule deer			
Uinta ground squirrel			
Rocky Mountain elk			
Pocket gopher			
American pika			
Yellow-haired porcupine			
Aphid			
<b>PRODUCERS</b>			
Grouse whortleberry			
Pinegrass			
Lodgepole pine			
Aspen			
Douglas fir			

**REFLECT:** What patterns do you see in your results? (Use your Energy Pyramid Model - Step 2 and your Population Chart results - Step 4 for reference.)

**SECTION 2: ANALYZE**

Steps 6-10

Your Task: Use a simulator to explore how changes to abiotic and biotic factors may affect populations of organisms in this ecosystem.

- 6 **DEFINE:** Limiting Factors are:
- 7 **COMPARE:** Read how each of these four organisms is affected by precipitation and temperature. Record your notes in the charts below.

PART 1: LIMITING FACTORS		
	Precipitation	Temperature
Douglas fir		
Lodgepole pine		
Red-naped sapsucker		
Pika		

**COMPARE:** Mark each box to show the impact of the abiotic change on each organism's population. POPULATION INCREASE ↑ ↓ POPULATION DECREASE

PART 2: POPULATION IMPACT OF ABIOTIC CHANGES IN THE ENVIRONMENT							
	Decreased winter precipitation	Increased winter precipitation	Decreased summer precipitation	Increased summer precipitation	Increased average summer temperature	Increased average winter temperature	PREDICT: If trends continue in this way what might happen to this organism?
Douglas fir							
Lodgepole pine							
Red-naped sapsucker							
Pika							

SECTION 2: ANALYZE (CONTINUED)

Steps 6-10

- 9 **ANALYZE & PREDICT:** Identify patterns in future models of temperature and precipitation models. Then choose three years to focus on as you make your predictions about the future of this forest in the Uinta Mountains. Choose an organism for your case study. Determine the impact on their populations based on future models for temperature and precipitation.
- 10

ORGANISM NAME:			
PRECIPITATION IS EXPECTED TO:			
TEMPERATURE IS EXPECTED TO:			
ORGANISM DESCRIPTION:			
HABITAT DESCRIPTION:			
WHAT ARE THE PRECIPITATION CONDITIONS NEEDED TO SURVIVE?			
WHAT ARE THE TEMPERATURE CONDITIONS NEEDED TO SURVIVE?			
YEAR	PRECIPITATION (MM)	TEMPERATURE (C)	POPULATION IMPACT PREDICTION

SECTION 3: INTERPRET

Steps 11-13

Your Task: Construct an argument for how changes to abiotic and biotic factors interact to affect populations. Make predictions about what this could mean for the Uinta Mountains.

- 11 **FORMULATE:** Use the outline below to construct an evidence-based argument to explain what the future may look like for
- 12 populations of the organism you chose and the forest they live in.

\_\_\_\_\_ are important. As a \_\_\_\_\_ they are important because  
*[Case Study Organism]* *[Trophic level]*

\_\_\_\_\_  
*(Refer to case study information & trophic level relationships)*

Through my research, I learned their populations will \_\_\_\_\_ over the next \_\_\_\_\_ years. Their  
*[increase or decline or stay the same]* *[# of years]*

limiting factors are \_\_\_\_\_,  
*[Limiting factors]*

which means \_\_\_\_\_ will have a \_\_\_\_\_ impact on their populations.  
*[future temperature and precipitation will...]* *[negative or positive or no impact]*

That impact is likely to be \_\_\_\_\_.  
*[Explanation for the impact on their populations]*

This is one example of how one population of organisms may be impacted by a changing forest. Generally, future precipitation and temperature models suggest precipitation will \_\_\_\_\_ and temperature will \_\_\_\_\_.  
*[increase or decrease or stay the same]* *[increase or decrease or stay the same]*

This means that organisms are likely to \_\_\_\_\_ in these changing conditions because \_\_\_\_\_.  
*[struggle/succeed]*

\_\_\_\_\_  
*[Evidence supported explanation for why the organism will struggle or succeed]*

\_\_\_\_\_  
*[Evidence supported explanation for why the organism will struggle or succeed]*

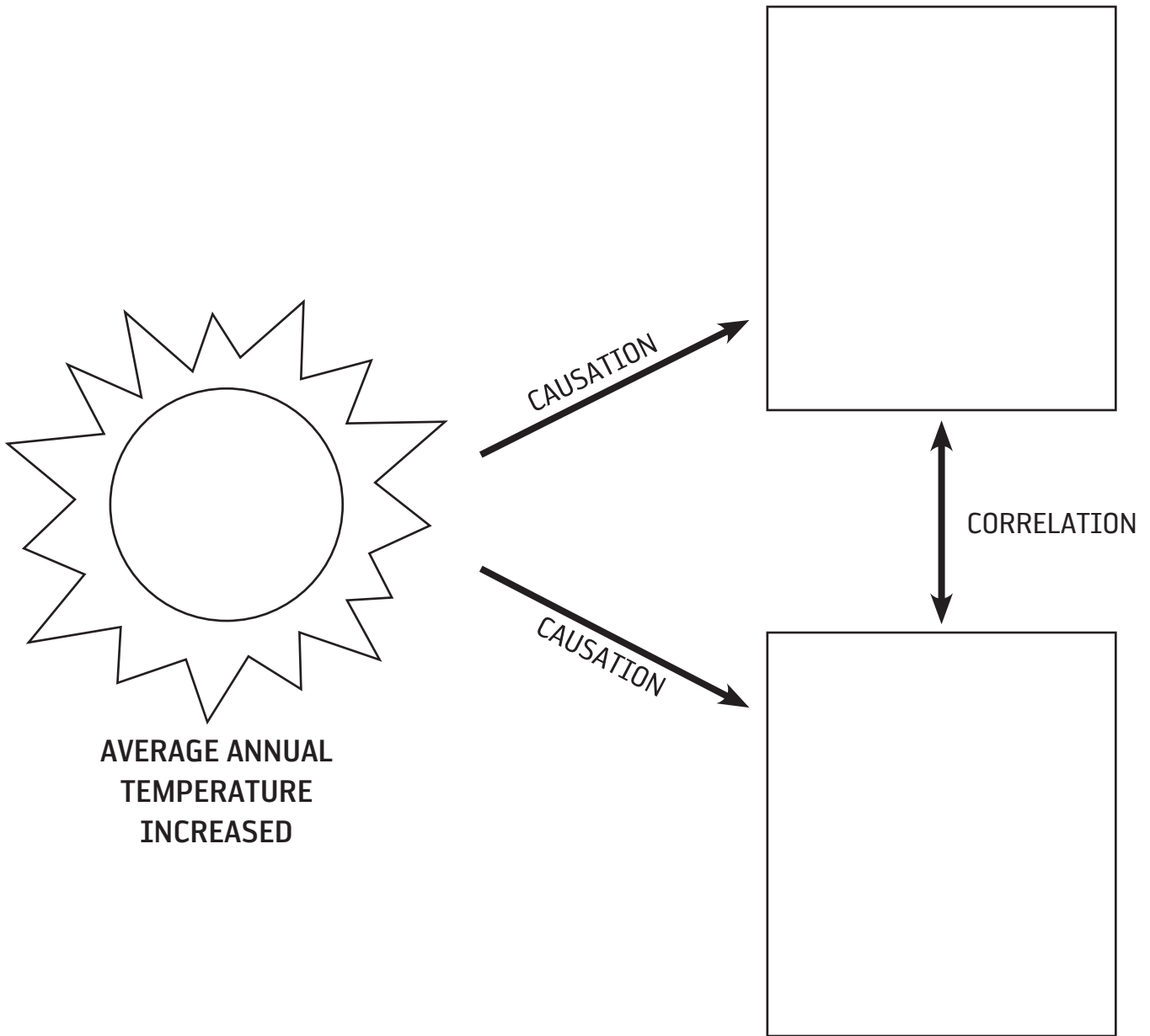
I think that if \_\_\_\_\_ does \_\_\_\_\_  
*[Who]* *[What]*

then \_\_\_\_\_.  
*[Describe what might happen if your audience takes your suggested action]*

SECTION 3: INTERPRET (CONTINUED)  
Steps 11-13

13 INTERPRET: Complete the graphic below to help you visualize Causation vs. Correlation.

DIAGRAMMING CAUSATION vs. CORRELATION



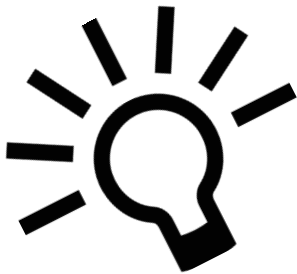
SECTION 4: COMMUNICATE

Steps 13-14

Your Task: Using your case study, develop a proposed plan to support your organism's population in the Uinta Mountains.

- 14 TAKE ACTION:** Work with your partner to identify solutions that can help your case-study organism thrive in this changing forest. What can you do to identify and protect ecosystems at risk for faster-than-normal change? Make a list of action items that you can do to help protect the ecosystem and the population you studied. *Will you write a letter to your local representative? Will you plant more food sources? Develop shelters? Educate your community? Something else?* Be creative and use your talents.

List Limiting Factors here for your case study population	List what your chosen population needs to thrive.	List action items that you or your audience can do to help your chosen population to thrive.



Narrow it down to **one** idea.  
What can you do to help protect the ecosystem around your house?

Why did you choose this idea?

What supplies do you need?

What will your action look like?

Who can help you with this?