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

Research Assistant Notebook

Student Name

Teacher Name

Class Period

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.

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

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**
TERTIARY CONSUMERS			
Cooper's hawk			
Cougar			
Wolves			
Black bear			
SECONDARY CONSUMERS			
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**
PRIMARY CONSUMERS			
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			
PRODUCERS			
Grouse whortleberry			
Pinegrass			
Lodgeople 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: Draw an arrow to indicate 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 10 **ANALYZE & PREDICT:** Identify patterns in future models of temperature and precipitation models. Then choose three years to focus on as your 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.

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 12 **FORMULATE:** Use the outline below to construct an evidence-based argument to explain what the future may look like for 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]*

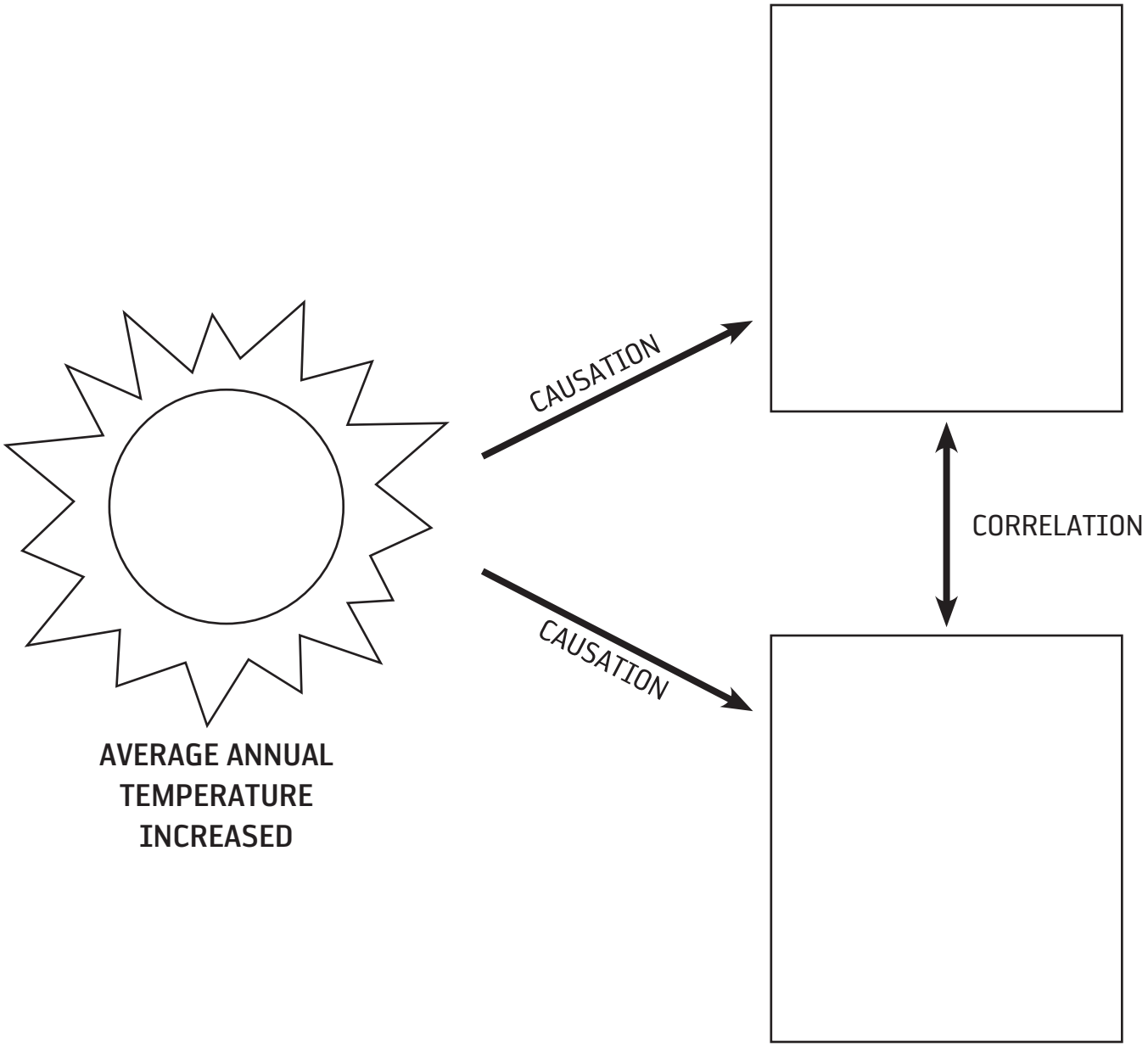
then _____.
[Describe what might happen if your audience takes your suggested action]

SECTION 3: INTERPRET *(CONTINUED)*

Steps 11-13

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

DIAGRAMING CAUSATION vs. CORRELATION



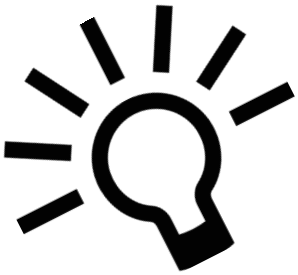
SECTION 4: COMMUNICATE

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?

What supplies do you need?

Why did you choose this idea?

What will your action look like?

Who can help you with this?