## Reading 2.1 - What Caused These Population Changes?

## Getting Ready

If you have only seen mountains in pictures, you may think they are just rocks. Or, maybe you think they are rocks with snow on top. If you live near mountains, or have traveled near them, you know that trees can also grow on mountains. But trees are only able to grow so far up a mountain. The edge of their habitat is called a tree line or a timberline. They cannot grow any farther up the mountain because they would not have the right conditions for survival.
Biologists are interested in organisms like trees and Dall sheep, their habitats, and changes that affect the survival of populations. Today, you will read about other populations and changes that affect them. For example, what happens to cause the timberline to change for a population of trees? What could cause a frog population to decrease over time? Why would a penguin that lives in one area suddenly show up thousands of miles away? As you read, think about being a scientist and why you might be concerned about changes in these populations.

## The Mystery Begins

In Lesson 1, your class created a Driving Question Board with four sections. Each section names a type of interaction that could affect a population.

- Other Organisms
- Environment
- Food
- Reproduction

Each interaction can be investigated to understand the change in a population. In class, you learned about a mystery that occurred in on the the afific Northwest Something happened that caused the population to decrease.

Using the Driving Question Board, you began to ask questions about the four types of interactions. These questions will guide your investigation of the mystery: What caused the turtle trout population to change?

Think about the Dall sheep mystery in Lesson 1. One of the interactions you read was In late May or early June, the young sheep, called lambs, are born. You could choose to think about reproduction, and ask the following question:

Question: Has something happened to the ewes so they cannot have lambs?
Interaction: Reproduction

Write at least one question in the table. Make sure it matches the interaction. (For example, asking about predators in the "environment" section is incorrect.)

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## The Trees Are Marching Up

Something strange has been happening with several timberlines around the world. Look at the picture at the beginning of this reading. Imagine living near the mountain and noticing that the timberline is farther up the mountain than it used to be. What could be happening? Think about that as you read the next section.

| Interaction |  |
| :--- | :--- |
| Environment |  |
| Reproduction |  |
| Other |  |
| Organisms |  |

In Europe, scientists collected data about the timberline on some mountains called the Alps. For about 80 to 100 years, scientists' records show that plants are growing farther up the Alps every year. Their data show that plants have moved up the mountain at a rate of about four meters every 10 years. Scientists studied several locations and saw the trend happening in two-thirds of the sites they examined.
In a different study in the United States, a scientist discovered that one kind of tree was moving farther up the mountain in Nevada. His data for nine years showed that the tree had moved its timberline 650 feet. At the lowest elevation, there were only six trees where there used to be 41. At higher elevations, the number of trees increased.

| Interaction | Question |
| :--- | :--- |
| Environment |  |
| Food |  |
| Other <br> Organisms |  |
| Why would a tree's habitat move farther up the mountain? Choose |  |
| one of the four interactions from your Driving Question Notes that |  |
| might be causing the change. Then, write one question about that |  |
| interaction that could guide an investigation of the mystery. |  |
| Penguins Travel North |  |

Imagine your reaction if you saw a kangaroo hopping down the street where you live. How could it get to your neighborhood from its habitat in Australia? Some penguins live in the Northern Hemisphere, but one species, called the Humboldt penguin, lives in the Southern Hemisphere. Imagine people's surprise when Humboldt penguins began showing up in the Northern Hemisphere.

You have probably seen penguins in pictures or in zoos. Penguins do not fly; they swim. Most penguins live in the southern half of the

The tables are not in the right place, but hopefully you get the idea. :)


| Interaction | Question |
| :--- | :---: |
| Environment |  |
| Food |  |
| Reproduction |  |

world, below the equator. However, a fisherman in Alaska took a picture of a Humboldt penguin in 2002 when he was surprised to see one in the Northern Hemisphere. The year before, he had seen another one while he was fishing. Several years before that, in 1976, researchers in Alaska reported seeing penguins, too.
How did the birds get there? Did they swim more than 5,000 miles? Why did they come north?
Choose one of the interactions and write it above Then, write a question that could guide an investigation about this population change.

## Frogs Disappear

In 1865, Mark Twain wrote a famous short story about a frog that could jump farther than any other frogs. He was writing about a species named the California red-legged frog. California red- legged frogs used to be very common. They covered a lot of territory as their habitat, but they lived mostly in wetlands and streams in the middle part of the state. Red-legged frogs need an aquatic habitat for breeding purposes, but they live in other environments, too. The frogs often live where there is thick vegetation next to deep pools of water, often with overhanging plants (like willow trees) nearby. Over time, scientists have observed that California red-legged frogs can no longer be found in more than 70\% of the habitats in which they used to live. In fact, they now seem to live in only about $10 \%$ of the places they once lived.
This population of frogs decreased. Why are they now only found in $10 \%$ of the habitat that they used to live?


Same directions for this table.


| Interaction | Question |
| :--- | :--- |
| Environment |  |
| Reproduction |  |
| Other <br> Organisms |  |

In each of the three sections, find the answer to the highlighted section and underline or highlight it.

## What Some Biologists Have Figured Out

Biologists investigated these population changes. They began by asking questions about interactions just as you have. Their questions guided their investigations. The data they gathered from their investigations led them to some important conclusions.

Timberlines: Why are timberlines moving farther up mountains? Scientists focused on the trees' interactions with their environment. They asked whether something was changing with the climate. They also asked questions about reproduction. Scientists believe that climate change is a part of the change in the timberlines. Global warming is the average increase in the earth's temperature that can lead to climate change. When the temperature increases and the air is dry, the climate is too warm for certain tree populations to survive. Seeds that scatter at the lower levels of the mountainside grow to small, young trees called seedlings. Seedlings cannot survive in warmer temperatures. Seeds that scatter at higher, cooler levels produce seedlings that have a better chance for survival, so the timberlines move up the mountains due to two types of interactions.

Penguins: Why are penguins whose habitat is in the Southern Hemisphere showing up in the Northern Hemisphere? Two biologists studied these Humboldt penguins. They knew that the penguins could not have moved thousands of miles by themselves. The penguins do not fly, so they would have had to swim through waters that were very different from their native climate. They would not have been able to survive.
Biologists wondered if an interaction with other organisms could have led to the change. They asked, "Could the movement of penguins be caused by humans?" Biologists believe that crews on fishing ships caught the penguins in their nets as they were fishing. People like penguins because they are cute and friendly, so the fishermen probably kept them as pets. Then, the ships sailed from the Southern to the Northern Hemisphere. When the ships arrived at a place the fishermen thought would make a good habitat, they released the penguins. Humboldt penguins that are native to the Southern Hemisphere ended up in the Northern Hemisphere due to an interaction with other organisms.

California red-legged frogs: What has happened to cause the frog population to decrease? Biologists are still investigating the interactions. They do not understand everything yet, but they are learning some of the causes. One cause is other organisms. Bullfrogs are not native to the area, but humans brought them into the area. Bullfrogs prey on the red-legged frogs.
Another interaction has to do with the environment and reproduction. Red-legged frogs live in the swampy area between land and water. They lay their eggs in shallow water. Their habitats
have been destroyed by farming, and by building houses, roads, and malls. The frogs are losing places to live and lay eggs, so at least three types of interactions are causing the population to change.

## Collecting Data about Populations

All three of the populations you just read about have changed. Biologists observed how each population interacted with the other organisms and with the environment. They thought about the four kinds of interactions that you have on the Driving Question Board, and they developed questions that would guide their investigation. They gathered data. When they examined the data, they began to have ideas about what might have caused the changes. Scientists continue to observe and question as they try to understand the causes of these population changes and many others around the world.
In this unit, you will be using the types of interactions on the Driving Question Board to ask questions and to investigate the turtle mystery. The data you gather will help you to explore possible answers to this mystery.

Congrats! You are finished with the reading!
Be sure to upload this into Drive, then attach it to the correct assignment in GC.

