

Reflection Section Answer Guide

That's a Humdinger

Introduction

What did the scientists want to find out in this study?

Are black-chinned hummingbird nests affected by forest management methods such as managing for wildfire and managing for invasive species?

Why do you think removing small trees, shrubs, and extra litter may help reduce the risk of wildfire?

Small trees, shrubs, and litter provide fuel for fires. By removing these items, you reduce the amount of fuel for the fire.

Methods

Why do you think the scientists monitored for nesting sometime between the beginning of May and the end of August every year?

The scientists knew the hummingbirds typically make nests during those times of the year.

Why do you think the scientists visited the nests every 3 to 5 days until nesting was complete?

The scientists visited the nests frequently so they could make observations about whether the nest was active and if it was not, to find clues as to why the nest failed.

Findings

Why do you think it may have been hard to figure out why a nest failed?

Even though the scientists visited the nests every 3 to 5 days, they may have missed an important time to observe the nest and see why it failed.

Forest managers are often faced with decisions about how to best manage an area for multiple concerns. In this study, the area needed to be managed for fire, invasive species, and habitat for hummingbirds. Think of a time when you had to make a decision and there were competing interests. For example, you received \$10 from your grandmother and you really wanted to buy a video game with it, but you also wanted to buy a present for your mom's birthday. Think about how you made your decision. Write down two sentences about how you made your decision and compare it to the decisions these forest managers must make.

Discuss with your class.

This is an individual question, therefore there is no one

correct answer. Students should think about what they would do in the given situation and discuss what they think.

By the Light of the Silvery Minnow

Introduction

State in your own words what problem the scientist was trying to solve.

Students should realize that silvery minnows face many problems. The immediate problem the scientist wanted to solve was how to reduce the number of minnows dying of starvation after their release from hatcheries into the Rio Grande.

Use your imagination to brainstorm ways that young silvery minnows might be taught to recognize their natural food sources.

Students cannot be expected to know how to teach minnows to recognize their natural food sources. Still, encourage students to use their imagination to think of ways that these young minnows could learn. Hints include the use of an aquarium, small numbers of minnows, and diatoms.

Methods

Why did the scientist select the minnows randomly?

Students should realize that random selection is necessary to remove any preferences from the selection process. In a random selection process, each fish has an equal chance of being selected.

What is one advantage of using a video camera to observe the minnows' feeding behavior?

Students will have individual answers to this question. Some possible answers are: 1) To reduce the number of errors that could be made without recording; 2) To make it easier to track the behavior of 10 fish at one time; 3) To be able to observe the feeding behavior numerous times; 4) To increase the chances of noticing something that might be unexpected in the feeding behavior. Students may come up with other advantages.

Findings

Based on the findings, what conclusion would you reach about minnows' previous experience with finding and sampling natural food sources?

Students should conclude that, from the findings, young minnows with previous experience quickly recognized the pucks as a food source.

Reflection Section Answer Guide *continued*

Do you think the timing difference between inexperienced and experienced minnows could be due to something other than previous experience? Why?

Students will have individual answers to this question. Since everything else was the same except previous experience, students should conclude that it was highly likely the timing difference was due to previous experience.

Discussion

Is it important to save the silvery minnow population from becoming extinct? Why? Is it important to save any species from becoming extinct? Why?

Students will have individual answers to these questions. These questions could be used in a class discussion of the reasons for and importance of saving endangered populations from extinction.

The scientist observed that when other minnows saw one minnow eating, they quickly joined. Name one instance where you observed the same kind of behavior in humans. Your example does not have to be related to food, but to an observation of humans imitating or following others.

Students will have individual experiences to relate. Some examples might be: 1) when one student begins playing a game, others want to join; 2) when one student is wearing a particular type of clothing, others want to wear the same type; or 3) when a student is listening to a particular band or singer, others want to listen also.

Wild Ways

Introduction

In your own words, state what the scientists wanted to know.

The scientists wanted to know how vulnerable 30 species may be to climate change.

Why do you think the scientists chose some of these 30 species?

The scientists chose some of these species because they are already considered at risk of extinction. Therefore, these species may need the most protection from a changing climate.

Methods

Why do you think the scientists looked at an overall score for each species, category scores for each species, and taxonomic group scores?

The overall scores allowed the scientists to see which species had the highest vulnerability when answers to all questions were considered together. The category scores showed in what category each species was the most vulnerable. The taxonomic group scores helped scientists figure out what taxonomic group had the highest vulnerability when answers to all questions were considered together.

Look at figure 6 under biotic interactions. Why might it be important to know if there may be a change in the amount of diseases that are spread?

Some diseases may greatly impact some of the species so it is important to know if the diseases are more likely to spread as a result of climate change.

Methods

Look at figure 9. List one thing you notice when studying this table.

1) The high score for habitat and physiology were both received by species of frogs. 2) The elegant trogon is a bird and it scored the highest in phenology.

Look at figure 10. What do you notice about the scores for the four taxonomic groups?

All four groups appear to be vulnerable to climate change. The scores for the birds and amphibians are very close.

Findings

Do you think it is useful to figure out how vulnerable a species is to climate change? Why or why not?

This is an individual question. Students should support their answers with reasoning, logic, and evidence from the article. One reason it is useful to figure out species' vulnerability to climate change is: If we can predict which species are more vulnerable to climate change, we might be able to help those species adapt by doing things like helping them move to a more favorable climate.

Take a moment to think about all the members of your class. Write down three words to describe your entire class. For example, you could say energetic, smart, and

Reflection Section Answer Guide *continued*

fun-loving. Now take a moment to think about yourself. Write down three words to describe you. Did the three words that you wrote about the entire class and the three words you wrote about yourself match perfectly? How is this like what the scientists found out about the different species when they used the overall score, the category score, and the taxonomic group scores?

Most likely, all three words will not match perfectly. This is a good opportunity to discuss how the big picture is different than all the parts that make up the big picture. Therefore, it is important to look at a variety of different aspects of a problem. One answer may not be the best or most complete answer.

Streaming Live

Introduction

State the problem trees face when growing where water is scarce.

Students will have individual answers to this question. They should understand, however, that to use scarce water efficiently, trees should reduce transpiration. The problem with this reduction, however, is that by partly or entirely closing their stomata, trees also reduce photosynthesis.

How might nearby trees affect a tree's water use efficiency?

Students should realize that many trees competing for scarce water resources might increase or decrease a tree's water use efficiency. Students can discuss whether and why they think a tree's water use efficiency would increase or decrease when it is competing with other trees for scarce water resources.

How might wind speed affect a tree's water use efficiency?

Students should realize that wind might increase a tree's transpiration since wind makes water evaporate and exit the stomata on a leaf surface.

Methods

Why did the scientists need to know how much rain had fallen?

Students should realize that rainfall is directly related to the amount of water available to trees, both close to and away from intermittent and ephemeral streams.

As Earth's climate changes, some areas may receive less

rainfall. Could this research be useful to people living in areas that already have adequate rainfall? Why?

Students will have individual answers to this question. Students should realize, however, that this research may be useful to people who might, in the future, be faced with less rain than currently falls. This research may help these people understand how trees growing in their area might respond to less water in the future.

Findings

Look at figure 10. What other things can you conclude from this figure?

Students will have individual answers to this question. They should, however, see that leaf size is larger when CO₂ absorption, photosynthesis, transpiration, and the amount of light are lower. When sunlight, CO₂ absorption, and photosynthesis are higher, water use efficiency is higher. Students should also notice that trees growing away from intermittent and ephemeral streams have higher water use efficiency than trees growing closer to the streams.

Why do trees growing closer to intermittent and ephemeral streams not need to be as efficient with water use as trees growing away from streams?

More groundwater is available to these trees; therefore they do not need to be as efficient with their water use.

Discussion

Are you surprised that trees respond to environmental conditions? Why? What is another example of plants responding to their environment?

Students will have individual answers to this question. This question can be used in a class discussion of how plants respond to environmental conditions. Some trees and bushes, for example, curl their leaves in dry conditions to minimize leaf area and reduce transpiration. Plants respond to sunlight by bending toward it, and leaves dry up and fall off in very dry conditions. Students may name a number of examples of plants responding to environmental conditions.

In the human body, what mechanism is similar to transpiration?

Although humans sweat for different reasons than plants transpire, human pores open and close to varying degrees to allow water to escape.

Reflection Section Answer Guide *continued*

Prairie Dog Days

Introduction

What are the questions the scientists want to answer?

Which flea species transmit plague within a population of prairie dogs? Do burrows play a part in the plague outbreak?

Prairie dogs have no natural **immunity** to the plague. Think about some things that humans are not immune to. Why do you think it is helpful to have a strong immune system? What are some ways you can help protect yourself from illness?

Students may need help identifying diseases to which humans are not immune. Examples are measles, chicken pox, the flu (influenza), HIV, pneumonia, mumps, malaria, rabies, and Lyme disease. A strong immune system keeps you healthy and helps to fight off different viruses and illnesses. Some ways to help prevent illness are washing hands thoroughly and covering your mouth when you sneeze. Cover your mouth with the crook of your elbow to prevent the spread of germs. Also, exercising and eating a healthy diet help keep your body strong so it can fight off infections and illness.

Methods

The scientists used flannel clothes to capture fleas. Why do you think they used this kind of material? Do you think a slick surface would have been as effective at capturing the fleas? Why or why not?

The fleas became attached to the flannel. A slick surface would have made the fleas slide off and they may not have been captured. Teachers may want to introduce the following as well: The fleas may have felt that they were jumping on what they thought is a host animal. The flannel is “furry,” like the animal onto which they would normally jump.

The scientists used a dissecting microscope to identify the fleas. Why do you think the microscope was used instead of just looking at the fleas with the naked eye to figure out what species they were?

Some things are too small to accurately see with the naked eye. A dissecting microscope helps the scientists see all the different parts of the flea so they can make an accurate identification.

Findings

Look at Figure 15. What do you notice about the number of fleas present between the spring and the summer? Why do you think there might be this difference?

Depending on when the fleas breed, there will be more fleas at one time than another. Additionally, if the fleas don't have a large enough food source, then there may not be as many fleas.

What species of flea was most commonly found on the Gunnison's prairie dog? In the burrows? Why do you think this might be important information for the scientist to know?

Oropsylla hirsuta was the most common flea found on prairie dogs and in the burrows. The scientists are trying to learn more about plague and how the cycle of plague works. Knowing what types of fleas most likely carry plague can help them understand how plague could be transmitted from prairie dogs to other animals.

Discussion

Do you think it is important for scientists to study how the plague affects the prairie dogs? Why or why not? *Studying plague and how it affects prairie dogs and their burrows is important information. Prairie dog populations are declining and scientists and land managers may need to figure out ways to slow down the plague outbreaks in the prairie dog populations.*

Does this research have any importance for understanding how fleas might transmit diseases between other types of mammals? Why or why not?

Students will have individual answers to this question. They should conclude that, even though another situation might not be exactly the same as the one studied, research nearly always provides benefits beyond the particular study. As an example, it might be that the scientists' method of using flannel clothing to catch fleas could be used in other studies of fleas. It might be that the seasonal differences in disease transmission might give clues as to other types of disease transmission by fleas.

The Lands of Time

Introduction

Describe the problem investigated by the scientists.

Students should be able to explain that Hispanic ranchers were given land grants by the Spanish and

Reflection Section Answer Guide *continued*

Mexican governments. Students should be able to describe how these land grants were lost following the Mexican-American war, and why some of the descendants of these land grant-owners feel they have a right to regain their ancestors' land.

State the last sentence in the “Introduction” as a question. *How can we resolve the conflict between the Hispanic descendants who want to regain their ancestors' land grants and the Forest Service's land grant policy?*

Methods

Why did the scientists talk with Hispanic ranchers as well as with Forest Service workers?

Students should realize that if the scientists were to answer their question, they had to talk with everyone so they could better understand the situation. Plus, the scientists wanted to know if Forest Service workers had ideas for how the conflict could be resolved.

Other cultures experienced something similar to this situation in America's past. What other large cultural group in America lost lands on which their ancestors once lived? Where do many of these people live now?

Students should be reminded of the Native American tribes who lost their historic lands and were placed on reservations.

Findings

How do Hispanic ranchers and Forest Service workers feel about resolving the land grant issue? How do you know?

Students will have individual answers to this question. Students should conclude that many Hispanic ranchers are angry and hope the issue can be resolved. Students should also conclude that Forest Service workers said they feel the Forest Service can take some action to help with the problem, but only Congress can resolve the issue.

Should the suggestions made by Forest Service workers be tried? Why?

Students will have individual answers to this question. They should realize, however, that trying these suggestions may help the situation and probably will not make it worse. It would be worthwhile, therefore, to try at least some of the suggestions.

Have you ever heard people say that better communication will help resolve a problem? Is this true? Why?

Students will have individual answers to this question. This is an opportunity to discuss the importance of open communication and how communication can help resolve problems.

Discussion

Do you think the United States Congress should consider the land grant issue in northern New Mexico? Why or why not?

Students will have individual answers to this question. You may use this question in a class discussion about whether Congress should address an historic loss of land over 150 years ago by some cultures on behalf of the descendants of those former landowners.

Many mistakes were made over 100 years ago in places all over the world. Because these mistakes were made before anyone alive today was born, no one living today is responsible. Even so, the descendants of people who were wronged feel the wrongs should be made right. How do you feel about this problem? Hold a class discussion about both sides of this issue. Identify other examples.

Students will have individual positions, and will probably be able to understand both sides of this dilemma. This is a good opportunity to discuss how people are able to understand both sides of a problem, and how this understanding can help people resolve problems. Other examples of similar actions taken over 100 years ago include American slavery and the demand for reparations and the Native Americans' loss of land at the hands of American colonists.

