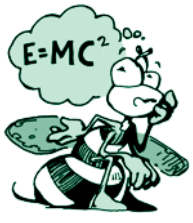
Time Will Tell:

Does Wildfire Damage the Prairie?

Meet Dr. Ford:

I like being a scientist because I love to read, write, and explore, and I have fun learning about our planet Earth and how it works.



Thinking About Science

There are many ways to investigate a question or problem. When a scientist decides to study a problem, he or she must make many decisions. One decision a natural resource scientist must make has to do with time. Over how long a period should the problem be studied? Should the problem be studied over an hour's time? For 1 week? Or, should the problem be studied over a period of years? The scientist in this study observed the impact of her experiment on the natural environment immediately after the experiment was over. She also observed the same natural area 1 year later. Then, she observed it again after more than 12 months. Do you think that the natural area had changed during the time that she observed it? Do you think that her conclusions about the experiment changed over that period of time? Why or why not?

Glossary

ecosystem (e̲ ko̲ sis tem): Community of plant and animal species interacting with one another and with the nonliving environment.

prairie (**prair** e̲): Large areas of grasslands with fertile soils and few trees.

forage (**for** ij): Food for animals usually taken by browsing or grazing; Act of taking such food.

wildfire (**wild** fir̲): An uncontrolled wildland fire started naturally or by careless human action.

sample (**sam** pul): Part or piece that shows what the whole group or thing is like.

species (**spe̲** se̲z): Groups of organisms that resemble one another in appearance, behavior, chemical processes, and genetic structure.

rodent (**ro̲** dent): An animal having sharp front teeth for gnawing.

live-traps (**li̲v** traps): Devices used to trap an animal without harming it.

evolved (e̲ **volvd**): Developed by gradual changes.

land managers (land **man** ij ürs): Skilled individuals that take care of natural resources.

Pronunciation Guide

a̲	as in ape	ô	as in for
ä	as in car	u̲	as in use
e̲	as in me	ü	as in fur
i̲	as in ice	oo̲	as in tool
o̲	as in go	*ng*	as in sing

Accented syllables are in **bold**.

Fire Facts

Fire was a normal occurrence in most plant-based ecosystems in the United States. The plants in these ecosystems *evolved* to resist fire, and even thrive under the effects of fire. An example of an ecosystem that needs fire is the tallgrass prairie. The tallgrass prairie grew in parts of Nebraska, Illinois, Iowa, and Kansas. The tallgrass prairie is mostly grasses and forbs. Forbs are low-growing plants with broad leaves. In the past, every 5 to 10 years a fire would naturally occur. These fires were probably started by lightning. The fire would kill the woody plants that had begun to grow, such as trees, shrubs, and most vines. These woody plants, had they grown, would have shaded out and killed the grasses and forbs. When fires are not allowed to burn in a tallgrass prairie, woody plants grow and replace the grasses and forbs. *Land managers* purposely set fire to prairie ecosystems about every 2 or 3 years. They set these fires in April, so that the grasses will grow back during the summer growing season. That way, the prairie ecosystem will continue into the future.

Thinking About the Environment

One possible characteristic of an *ecosystem* is the ability to withstand a sudden crisis without changing very much. This characteristic is called resilience (re **zil** yentz). An example of a resilient (re **zil** yent) ecosystem is a natural sandy beach. When a storm or a hurricane hits, the beach may change its shape by losing or gaining sand. Overall, however, a sandy beach is resilient to storms and does not change very much in the long run. Another example is a flood plain, the flat land area on either side of a river. When the flood plain is not disturbed by human activities, in the long run it does not change very much when the river overflows its banks during a flood. The scientist in this study wanted to know whether a *prairie* is resilient to fire. Ecosystems are not the only things that may be resilient to a sudden crisis. What are other examples of resilience?

Introduction

Prairies are grasslands that are often used as *forage* for cattle (figure 1). When a *wildfire* burns across a prairie, the grass is killed immediately and there is no forage for cattle. Because of this, many people thought that prairies were changed by fire. The scientist in this study believed that prairies are resilient to fire. She thought that people did not wait long enough after a fire had burned to determine whether the fire had changed the prairie. The questions the scientist wanted to answer are: 1) How does wildfire change a prairie? 2) How long does it take a prairie to recover after a wildfire? 3) In addition to immediately killing the prairie's plants, does a wildfire affect the type of animals that live on the prairie?

Figure 1. *A prairie.*

Reflection Section

- If you were thescientist, how would you study the resilience of a prairie to fire?
- Do you think that prairies are resilient to fire? Why or why not?

Method

The scientist studied an area of prairie in New Mexico that covered 160 hectares (figure 2). (To find out how many acres this is, multiply 160 X

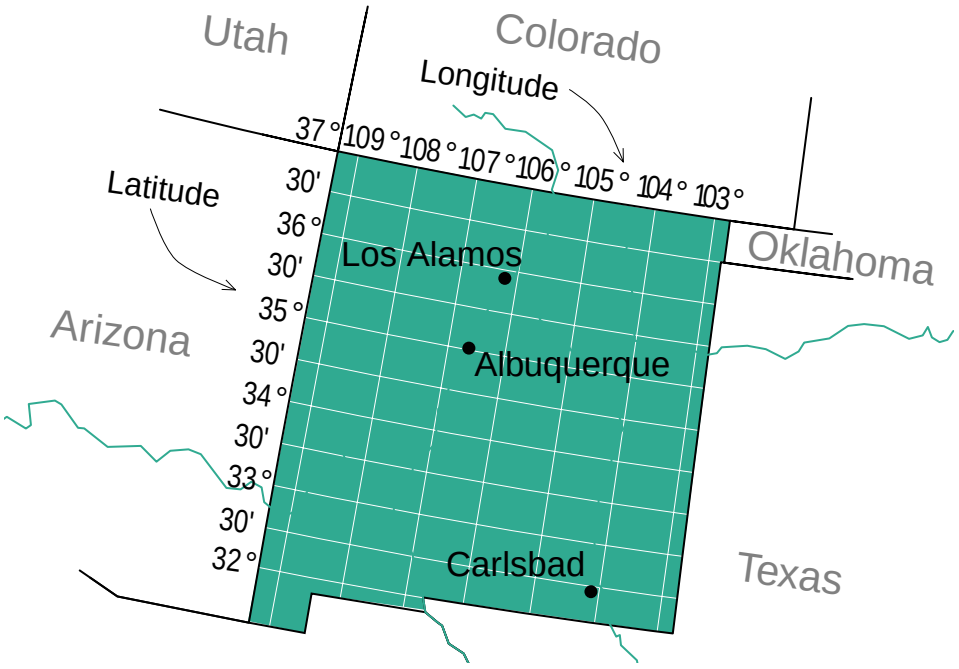


Figure 2. *Map of New Mexico with lines of latitude and longitude. Latitude consists of imaginary lines around the Earth from the equator to the poles. Longitude also consists of imaginary lines around the Earth. Each line of longitude circles the Earth through both the North and South Pole. These lines are used to identify locations on the Earth. Both latitude and longitude are identified by degrees (°), minutes ('), and seconds (\"). The study area for this project was 36°, 31' latitude north, 103° 3' longitude west. See if you can locate where in New Mexico the scientist conducted her study.*

2.47.) Within this area, the scientist marked off 12 separate *sample* areas that covered 2 hectares each. Four of these areas were purposely burned in April of 1997 (figure 3). This was before the prairie grasses had begun their spring growth. Four more areas were burned in July. In July, the grasses were in the middle of their growing season. The last four areas were left unburned. The scientist used these unburned areas to compare with the burned areas. When the scientist burned the areas, she did not allow the fire to burn more than the sample area.

The scientist observed and measured six things. The six things she measured were: 1) What percentage of the ground was covered by prairie grass, 2) What kind of grasses were growing in the area, 3) How many different *species* of beetles were living in the area (figure 4), 4) How many beetles of each species were living there, 5) How many different species of *rodents* were living in the area (figure 5), How many rodents of each species were living there. The scientist measured these six things five different times (table 1).

Figure 3. *A research assistant purposely setting fire to an area of prairie.*

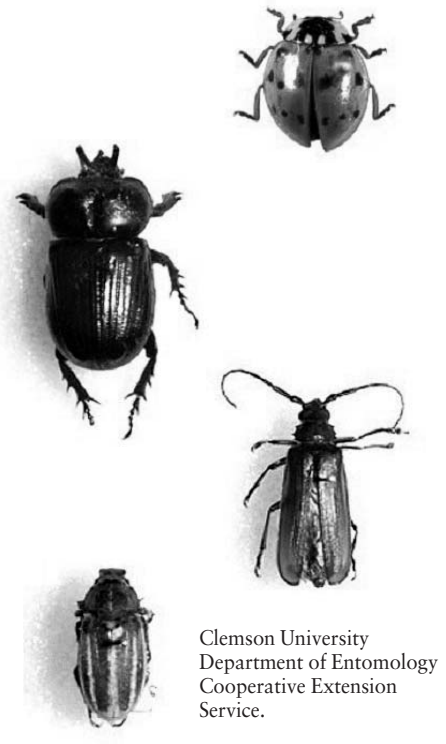


Figure 4. *Beetles that can be found living on the prairie.*

The scientist used *live-traps* to catch the rodents. After she put a numbered tag on the rodent's ear and took body measurements (such as weight, color, and sex), she released the rodent back into the area.

Table 1. *The dates that the scientist took measurements.*

Period	Date
1	March 1997 (Before any areas were burned)
2	April-June 1997 (After the first set of areas were burned)
3	July-October 1997 (After the second set of areas were burned)
4	July-October 1998 (1 year after the second set of areas were burned)
5	October 1999 (Over 2 years after the second set of areas were burned)

Reflection Section

- Why do you think that the scientist put a numbered tag on each rodent's ear before releasing him or her?
- Why do you think that the scientist took measurements after 1 year and after 2 years?

Findings

Before any areas were burned, the scientist found that 10 species of beetles made up 90 percent of the beetles living there. Overall, however, there were 115 species of beetles living in the areas. (How many beetle species made up the last 10 percent?) Although the scientist found nine total species of rodents living in the areas, most of the rodents were northern grasshopper mice, thirteen-lined ground squirrels, or plains harvest mice (figure 5). Each of the 12 areas had about the same number and variety of beetles and rodents.

Immediately after the April fires, the grass cover in the burned areas was killed. By July, however, the grass in those areas had grown back and looked like the grass in unburned areas. The areas that were burned in July also lost their grass cover after the fire. For 2 years following the fire, there was still much less grass cover in those areas than in unburned areas. However, by 2.5 years after the fire, those areas once again looked like unburned areas.

Immediately after the fires, the scientist noted that the number and variety of rodents had been reduced. By 1.5 years after the fires, however, the number and variety of rodents was similar to the unburned areas. Up to 1.5 years following the fires, the number of beetles increased. By 2.5 years following the fires, the number and variety of beetles was the same as the unburned areas.

Reflection Section

- By 2.5 years after the fires, what had happened to the areas of prairie that had been burned?
- What happened to the areas immediately after the fires?

Bill Gannon

Bill Gannon

Figure 5. *Thirteen-lined ground squirrel, plains harvest mouse, and grasshopper mouse.*

- Why do you think that vegetation in the areas that were burned before the growing season regrew faster than vegetation in the areas burned during the growing season?

Implications

The judgments that people make about something may depend upon the length of time between the event and their judgment about it. This is the case for judging whether prairies are resilient to fire. Immediately after a fire, the prairie looks very different. Its grasses are gone and there are few rodents living there. After 2.5 years, the prairie has recovered so much that a person can hardly tell that a fire ever occurred. If a person's timeframe for judging resilience is a few months, the prairie is not resilient to fire. If a person's timeframe for judging resilience is a few years, the prairie is resilient to fire. Since wildfires are a natural part of what happens on a prairie, it is no surprise that over time the prairie is resilient to fire. Think about your own judgments. When you have an argument with a friend or you make a lower grade than you expected, you immediately judge the event one way. Later, after you have had time to think about it, your judgment may change. Thus, when making a judgment about an event, people should always remember that the judgment may change, depending on how long after the event it is made.

Reflection Section

- Are your fingernails resilient to breakage? How do you know? Do they seem resilient immediately after being broken?
- How are broken fingernails like a prairie that has been burned by a wildfire? How are they different?

Discovery FACTivity

The question you will answer through this FACTivity is: What are some similarities and differences in examples of resilience? The method you will use to answer this question is: Divide your classroom into three or four groups. Each group will take 10 minutes to observe examples of resilience in your classroom and outside your classroom window. For example, remember that your fingernails are resilient to breakage. Another example might be the grass outside, which is resilient to being cut. In each case, estimate the amount of time it takes for the resilience to show, or for the thing to appear as it did before the sudden change occurred. Record your observations using the form on the next page.

Now, compare the lists that each group developed. What are the similarities between all of the resilient objects? How are they different? Compare the amount of time it takes for the resilient items to show resilience. What does this exercise tell you about the characteristic of resilience?

For more information about fire resilience in Yellowstone National Park, visit www.discovery.com/stories/nature/yellowstone/yellowstone.html.

From Ford, P. L. (2001). Scale, ecosystem resilience, and fire in shortgrass steppe. Pp. 447-456. In: *Ecosystems and Sustainable Development III*. C.A. Brebbia, Y. Villacampa, and J-L Uso (eds.). Series: Advances in Ecological Sciences, Vol 10. WITPress Southampton, Boston. 824 pp.

Form for Recording Resilience.

Object	Sudden change event	Time needed for resilience to show

Fire Safety Tips from Smokey and His Friends at the Texas Forest Service

Sometimes people want to burn trash or other debris (duh **br**e) in the out of doors. It is important to be careful when burning debris. If such fires get out of control, a wildland fire may result and homes may be damaged or destroyed. Local governments may have restrictions on when or if trash and debris can be burned outdoors. Only adults should burn trash or other debris. Before the adults in your household start any outdoor fires, they should check with their local government. If an outdoor fire is allowed, here are tips for safe outdoor burning:

1. Never burn trash or debris on dry, windy days.
2. Check to see if weather changes are expected, especially if windy conditions are likely to occur.
3. Before burning, clear the area around the place where the fire will be, up to 5 feet, of any burnable materials, such as leaves and sticks. Larger fires will require larger areas to be cleared out.
4. Stay with all outdoor fires until they are completely put out.
5. Never attempt to burn aerosol cans. Heated cans will explode and may cause human injury.