U.S. Fish & Wildlife Service

GO FURTHER!

Explore Grassland Ecosystems

The Sevilleta National Wildlife Refuge (SNWR) is near Socorro, New Mexico. It is a semi-arid grassland in the Chihuahuan desert in New Mexico. Almost 98 percent of Gunnison's prairie dog (Cynomys gunnisoni) disappeared in the last century. Since 2010 biologists have tried to bring them back

The unique behaviors of the prairie dog change the ecosystem. At SNWR, various grassland species may benefit from prairie dogs. Kangaroo rats and burrowing owls use their abandoned burrows for homes. Prairie dog burrows prevent erosion and help increase the variety of grasses in the soil.

Because the prairie dog has played an important role in shaping grasslands, it is often called a keystone species. For many years their numbers were reduced. Now biologists are re-introducing this small mammal and studying how the increased numbers affect the other species in the prairie.

Ariel D. Elliott's study is designed to determine whether the reintroduction of the prairie dog increases the biodiversity of other small mammals in the refuge.

To understand her hypothesis and the research done at Sevilleta National Wildlife Refuge you must first think about the organisms that live there.

Make a list of the organisms (various species of plants & animals) that you see or hear about in the video on the lines below.

While you may not see them on the video, Ariel's cameras also occasionally found pronghorn antelope and lizards. After the reintroduction of the prairie dog, the cameras also caught some predators like coyotes and badgers.

Ariel did her study in two different 16 hectare plots that were very similar. On plot G, there were artificial burrows, old burrows from the original prairie dogs and kangaroo rat mounds, They called this the treatment plot. On plot H there were only kangaroo rat mounds. This was called the control.

Ariel set up 169 small mammal traps in each plot on a 13 x 13 grid that looked like this illustration (Figure 1).

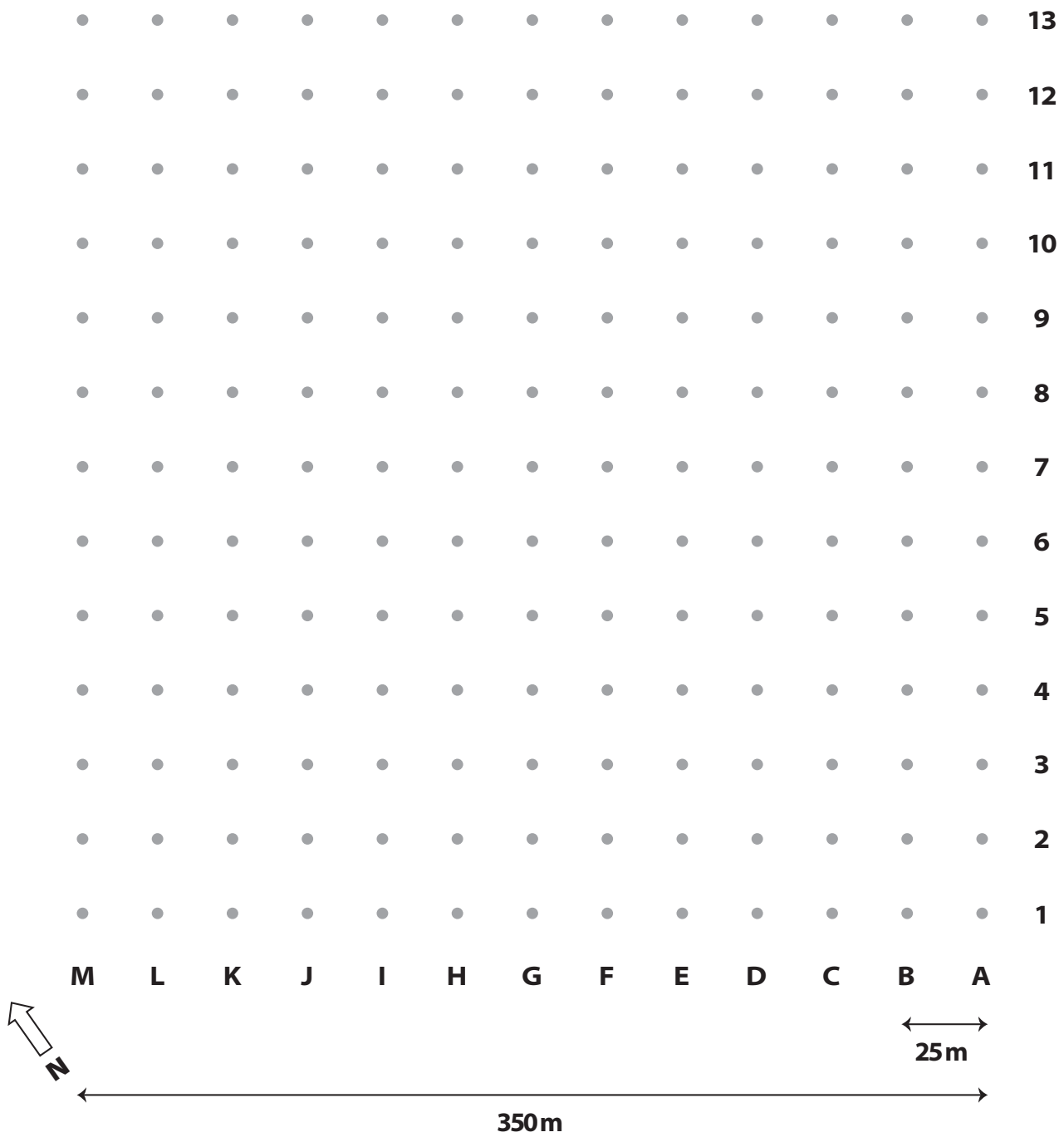


Figure 1. Diagram showing the grid layout of the small mammal traps (•) in plots G and H

RESULTS

Plot G

Species	What is it?	Number before Reintroduction	Number after Reintroduction
Perognathus flavus (PGFV)	Silky pocket mouse	243	448
Dipodomys ordii (DIOR)	Ord's Kangaroo Rat	10	11
Onychomys leucogaster (ONLE)	Northern grasshopper mouse	18	14
Onychomys arenicola (ONAR)	Mearn's grasshopper mouse	12	-
Onychomys(ONSP)	Grasshopper mouse	2	1
Dipodomys spectabilis (DISP)	Banner-tailed kangaroo rat	1	1
Perognathus flavescens (PGFL)	Plains pocket mouse	1	-
Peromyscus leucopus (PMLE)	White footed mouse	1	2
Peromyscus maniculatus (PMMA)	Deer mouse	-	-
Spermophilus spilosoma (SPSP)	Spotted ground squirrel	-	3
Neotoma micropus (NEMI)	Woodrat	-	-

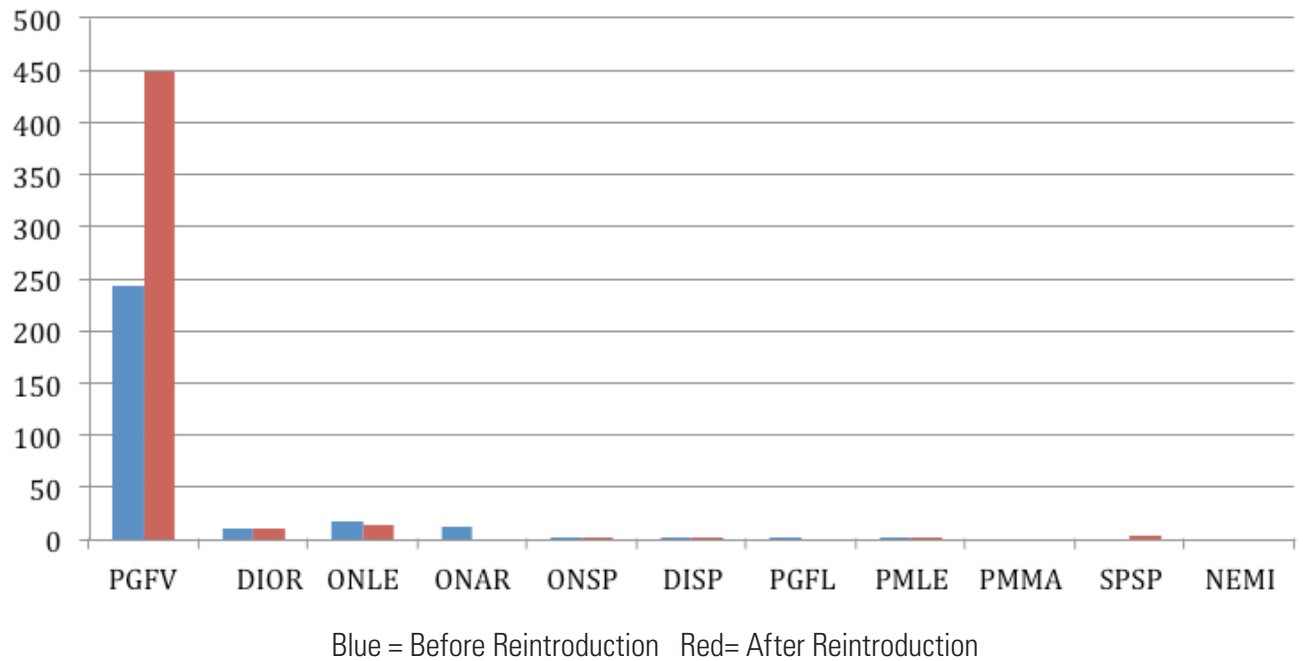
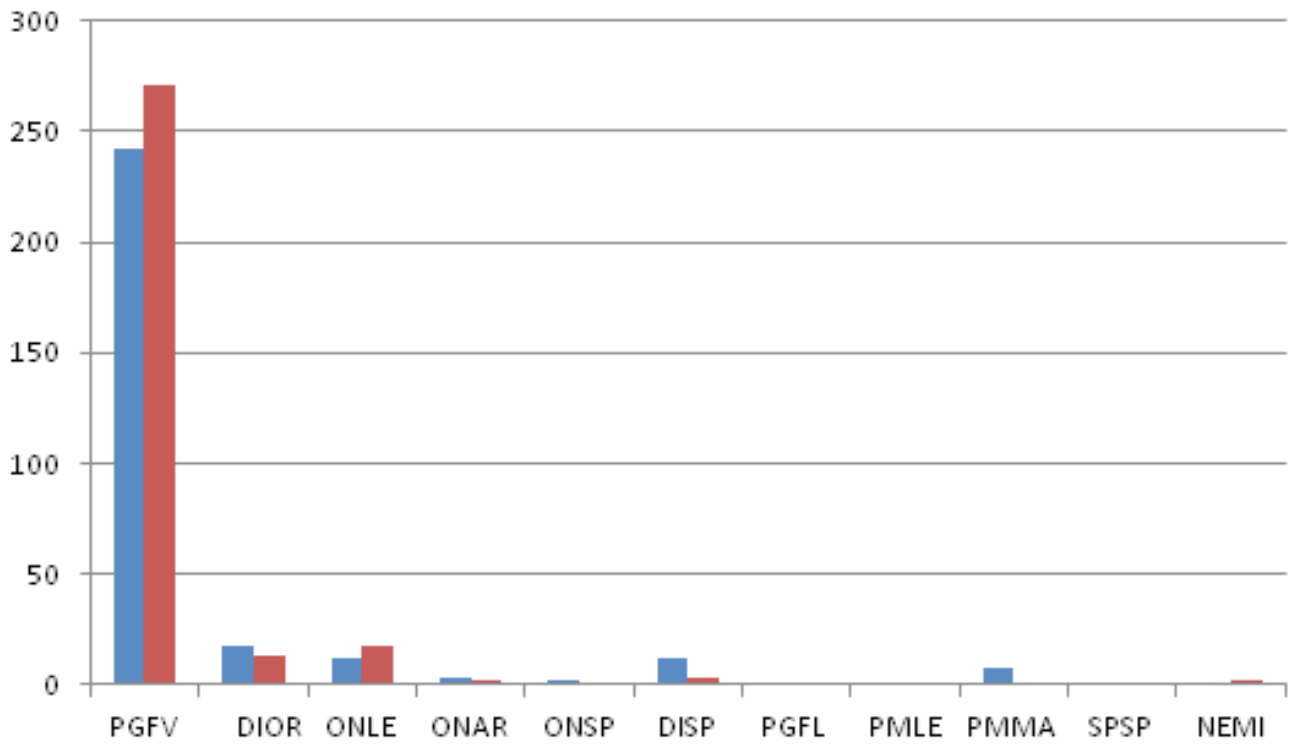


Figure 2. Plot G data table and graphic representation of data

Plot H

Species	What is it?	Number before Reintroduction	Number after Reintroduction
Perognathus flavus (PGFV)	Silky pocket mouse	242	271
Dipodomys ordii (DIOR)	Ord's Kangaroo Rat	18	13
Onychomys leucogaster (ONLE)	Northern grasshopper mouse	12	17
Onychomys arenicola (ONAR)	Mearn's grasshopper mouse	3	2
Onychomys (ONSP)	Grasshopper mouse	2	
Dipodomys spectabilis (DISP)	Banner-tailed kangaroo rat	12	3
Perognathus flavescens (PGFL)	Plains pocket mouse	-	-
Peromyscus leucopus (PMLE)	White footed mouse	-	-
Peromyscus maniculatus (PMMA)	Deer mouse	7	1
Spermophilus spilosoma (SPSP)	Spotted ground squirrel	1	1
Neotoma micropus (NEMI)	Woodrat	1	2



Blue = Before Reintroduction Red= After Reintroduction

Figure 3. Plot H data table and graphic representation of data

THINK!

After you have watched the video and read the text and charts:

Think about these two questions and write down your answers

1. What was the difference between Plot G and Plot H? _____

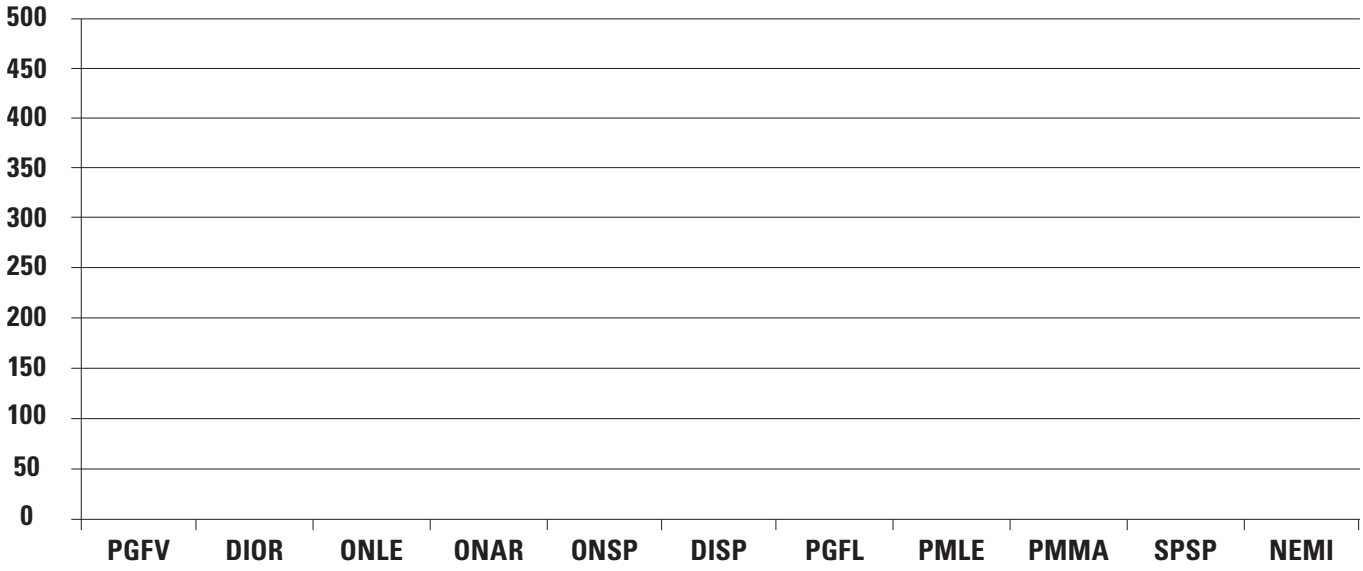
2. Which organism showed the greatest difference? _____

Make Your Case

Imagine you are talking to a friend. The friend doesn't like prairie dogs because she believes that they make dangerous holes in the prairie that could harm horses. Use the data to argue that prairie dogs can be good for grasslands.

Graph on Your Own

Imagine the area in Plot G in 5 years. How many of each of the small mammal species do you think will be there? Complete the graph to show the numbers you have predicted will be there. (This graph illustrates your hypothesis regarding the increase or decrease in numbers of small mammals in Plot G five years from now):



Why did you make this guess?

What data did you use to make this hypothesis ?

GO FURTHER!

Draw a food web for the grassland being studied (Plot G). Put as many organisms (plants, animals, decomposers and etc.) in your web as you can. Then think about at least two possible explanations of why there is a difference between Plot G and Plot H; refer to Figures 2 & 3 for differences. You may need to do some research regarding small mammal diets and predator-prey relationships in this grassland ecosystem.

Why might prairie dogs help other small mammals that eat the same kinds of food?

Teacher Page

About the activities

Summary: After watching the video about biologist Ariel Elliott studying the effects of reintroducing prairie dogs, students use the data provided to answer questions, create a pro prairie dog argument, and imagine (as Ariel does) what one of the study plots might look like in 5 years. To "Go Further", students research the grassland ecosystem and create plot-specific food webs that might explain the differences in data sets.

Learning Objective: After completing "Explore Grassland Ecosystems" core activities, students will be able to

1) compare data sets, 2) use differences in data sets to formulate a persuasive argument and 3) extrapolate data to create a hypothesis

Method: The core activities center on students watching the video episode and completing the activities: 1) listing small mammals seen in the video, 2) reading the data tables & associated graphs provided to answer questions and develop an argument, and 3) generate data (based on extrapolation) to form a new data set and use the blank framework in the worksheet to create their own graph illustrating this data and developing a hypothesis for a future condition. The "Go Further" activity requires students to research the various species that inhabit the grassland in order to create food webs (for the two study plots) that provide possible explanations for differences in the data sets. Completing these activities can help students achieve expectations and standards in mathematics, science and language arts.

Considerations: Student access to library/websites or other resources to conduct the research to "Go Further".

Possible Answers

1. What was the difference between Plot G and Plot H? Increase in silky pocket mouse greater where burrows were introduced.
2. Which organism showed the greatest difference? Pocket mice
3. Imagine you are talking to a friend. The friend doesn't like prairie dogs because she believes that they make dangerous holes in the prairie that could harm horses. Use the data to argue that prairie dogs can be good for grasslands (Answers will vary)

For the "Going Further" section, remind students that good investigations often lead to even more questions. Their ideas should be logical (that is, related to some big of evidence they've collected) but there is no "right answer"—not even for the researchers. Here are two ideas that have been suggested by the team:

- Prairie dogs eat grass and clip down grass, but don't eat too much seeds or grains. So, it is possible that as prairie dogs were clipping down grass, they were making seeds and grains more available for the silky pocket mouse. They also prevent erosion and encourage more diversity of grasses.
- Predators could have an effect. Prairie dogs and silky pocket mice probably don't have the same predators, but there could be something more complex happening.
- For instance, the predators that would focus on prairie dogs (badgers) could be more active on the prairie dog site and disturb and "chase away" predators of the pocket mice (owls, other night predators) from the site.

Integrate!

Integrating literature with math and science lessons enhances academic achievement in all areas. The National Science Teachers Association (NSTA) Recommends review team identifies great books to use, and provides a searchable database for K-12 educators. The system includes Outstanding Science Trade Books. Educators may choose these or other related materials to supplement the episodes to deepen the learning experience for students. Learn more about wildlife species and habitats using keyword searches in the NSTA Recommends database, which has more than 10,000 reviews, at http://www.nsta. org/recommends/. Use the key word "Prairie Dog" in the "word in title" to find content that relates to this educational resource.

Common Core Mathematics

5.G.A.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

Next Generation Science Standards

Core Idea: LS2.A: Interdependent Relationships in Ecosystems

A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2-1)

Practice: Engaging in Argument from Evidence

Support an argument with evidence, data, or a model. (5-LS1-1)

Crosscutting Concept: Systems and System Models

A system can be described in terms of its components and their interactions. (5-LS2-1)

Common Core Language Arts

CRI.5.8 Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s).