Teacher Notes and Answers

BACKGROUND
From tiger sharks and turtles, to dugongs and pufferfish, the vertebrate diversity in the waters of Shark Bay is both unmatched and untouched. But in the desert environment on land, it is a different story. The land animals are ancient, unique, and under threat from invaders. There used to be a lot more diversity before foxes, rabbits, goats, and cats arrived and almost wiped out indigenous marsupials and their habitat. Twenty-two species of mammals in Australia didn’t make it. One invader species is particularly devastating. Domestic cats were brought over by the colonizers and inadvertently released into the wild. Cats are remarkably efficient hunters and have been killing the local species in droves. But now there is hope. The Department of Environment and Conservations (DEC) is taking bold steps to restore a portion of Shark Bay as a safe haven for its endemic animals living on land.

In this video, Mike Heithaus teams up with Nicole Godfrey to help in these efforts. Mike gets a behind-the-scenes look at the captive breeding facility; there some of the rarest animals on Earth are held and then released back into the wild, to help bring the habitat back to its natural state. Also, Mike assists in the trapping effort of the elusive feral cats. These cats are far from your cuddling pets—they are strong, wild, and very dangerous. Mike reveals how, in just a few generations, domesticated cats revert back to their wild ways with devastating consequences.

INVESTIGATION

1.

![Track Counts of Foxes and Cats at Nanga Station](image)
2. Yes, it appears that when fox population numbers are high, cat population numbers are low. When fox population numbers decline, cat population numbers go up. However, the relationship is not perfect. It appears that other factors might be important. For example, both track counts were high for sampling period 4, and both were low for sampling period 12.

**Note.** There is a reasonable degree of seasonal variation in cat and fox numbers, as well as variation among years, because of differences in the favorability of weather conditions.

Data in Figure 1 were selected to show general patterns. Real data show a high degree of variability (seasonal variation and inter-annual variation due to differences in rainfall and other conditions).

3. The DEC’s efforts are mostly a success. Cat population numbers declined inside the fence, but stayed high outside the fence. However, they have not gotten rid of all of the cats.

4. Cat population numbers increased because foxes were removed. Because predators of cats were removed, the cat numbers increased until DEC control methods started to cause their numbers to decrease.

5. At sampling period 3, DEC removal efforts started working.

**Note.** Figure 2 data are pulled from much larger datasets that show animal numbers increasing and decreasing seasonally. The data presented above are matched so that sampling period 4 is the same month and year in both locations. Each sample was taken at about the same time of year so changes are most likely due to differences among years.

6. Native mammal populations have generally increased inside the control area and remained nearly the same outside of the control area. There is a lot of variation in both locations, though that may be due to other factors such as weather.

7. Yes, their populations have increased since the removal of feral animals.

8. Comparing the populations inside and outside of the control area allows the DEC to determine whether the changes in populations are a result of their control of invasive predators or a result of other factors, such as natural changes in the environment.
9.

Population Sizes of Three Native Species on Peron Peninsula

10. Yes and no—it is a success for bilbies and malleefowl. Their populations are still increasing up through period 12. For hare-wallabies, it is not a success. They all disappeared.

11. Bilby and malleefowl populations grew despite the cats, while the banded hare-wallaby population declined. Banded hare-wallabies disappeared, most likely because they don’t have anywhere to hide from cats, whereas bilbies can burrow and malleefowl can hide in a tree.

Note. Students may wonder why the two species that are doing well had been driven off the peninsula if cats were present then and are still around. Foxes would dig up bilby burrows and nests of malleefowl (they build large mounds on the ground) and contributed to their declines; also there were many more cats.

CONCLUSION

12. Accept all reasonable answers. House cats are hunters. They have a major impact on local wildlife and have been linked to declines in songbirds in North America.

13. Accept all reasonable answers. Students may suggest monitoring populations of small mammals and birds in an area where domestic cats are allowed to roam freely and areas were domestic cats are not allowed to roam freely.
Problem
What happens when cats go wild? There is no question that domestic cats can survive—and thrive—in the wild. In Australia, they are such impressive predators that they have established large populations. As cat populations grew, many native Australian species started to disappear. But cats aren’t the only invaders. Foxes, goats, sheep, camels, and rabbits also established themselves in the wild. So, are cats solely to blame for the disappearance of native species?

INVESTIGATION
The Department of Environment and Conservation (DEC) has been trying to restore the native habitat and native animals (in Shark Bay). So, they’ve put up the Feral-Proof Fence to isolate the peninsula, and they are trying to get rid of invaders within the fence. Use their data below to investigate whether cats might be the major culprit in the decline of native species populations.

Foxes are introduced predators in Australia and eat native mammals, but also eat cats. The data in Table 1 provide track counts of foxes and cats at a location outside the fence where neither is controlled.

Table 1. Track counts (per 100 km) of foxes and cats at Nanga Station

<table>
<thead>
<tr>
<th>Sampling period</th>
<th>Foxes</th>
<th>Cats</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>17</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>27</td>
<td>11</td>
</tr>
<tr>
<td>4</td>
<td>30</td>
<td>27</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td>28</td>
</tr>
<tr>
<td>6</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>7</td>
<td>16</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>11</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>13</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>15</td>
<td>5</td>
<td>25</td>
</tr>
</tbody>
</table>
1. **Data Analysis** Draw a line graph of the number of tracks per 100 km through time for foxes and cats.

2. **Data Analysis** Based on your graph, do you think that foxes might affect the number of cats in an area? Do other factors appear to affect the number of cats? Explain.

   _______________________________________________________________________
   _______________________________________________________________________
   _______________________________________________________________________
   _______________________________________________________________________
   _______________________________________________________________________
   _______________________________________________________________________

One of the first things DEC did in Shark Bay was to get rid of the foxes. The effort was very effective and nearly all the foxes were removed within a short period of time after starting control efforts. Cats have been much harder to control than foxes, as shown in Figure 1 on the next page.
3. **Data Analysis** Is the Department of Environment and Conservation’s effort to remove cats from Peron Peninsula a success? Why or why not? Use the data to support your answer.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

4. Why do you think cat numbers went up inside the fenced area in sampling periods 2 and 3?

________________________________________________________________________

________________________________________________________________________

5. Why do you think cat numbers declined inside the fenced area beginning at sampling period 3 and onward?

________________________________________________________________________

________________________________________________________________________

With foxes and other introduced mammals almost completely removed from Peron Peninsula and decreased cat population numbers, we can explore the effects of cats on an ecosystem. Use the graphs on the next page to answer the following questions.
6. **Data Analysis** Describe the trends you see in native Australian animal populations in the area where cats are controlled compared to where they are not controlled. What do you think is responsible for these trends?

---

© Houghton Mifflin Harcourt Publishing Company

Holt McDougal Biology
That's Amazing! Worksheet

Section 4: Threats to Biodiversity

Human Impact on Ecosystems
Killer Kitties continued

7. **Data Analysis** Has the removal of introduced animals helped these two native mammal populations? Explain your answer.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

8. Why is it important that DEC measured populations inside and outside the control area?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

DEC has been trying to reintroduce species of mammals to Peron Peninsula that were driven to extinction, or greatly reduced in numbers, on the mainland of Australia. The bilby is a burrower, the malleefowl sleeps in trees, and the banded hare-wallaby sleeps under bushes. All of these species thrived in Western Australia before feral animals arrived.

| Table 2. Population sizes of three species of native animals on Peron Peninsula |
|---------------------------------|--------------|-----------------|----------------|
| Sampling period | Bilby | Malleefowl | Banded hare-wallaby |
| 1 | 0 | 8 | 0 |
| 2 | 0 | 8 | 0 |
| 3 | 0 | 8 | 0 |
| 4 | 0 | 8 | 0 |
| 5 | 0 | 8 | 0 |
| 6 | 0 | 12 | 0 |
| 7 | 30 | 42 | 30 |
| 8 | 32 | 40 | 32 |
| 9 | 28 | 42 | 18 |
| 10 | 29 | 46 | 11 |
| 11 | 33 | 50 | 4 |
| 12 | 36 | 54 | 0 |
Killer Kitties continued

9. **Data Analysis** Use the data in Table 2 to create a line graph showing the changes in populations of bilbies, malleefowl, and banded hare-wallabies through time. Put an arrow on your graph at Sampling Period 7. This is the time period when 30 individuals of each species (15 males, 15 females) were introduced to the peninsula.

![Graph](image)

10. **Data Analysis** Has the reintroduction program been a success on Peron Peninsula? Why or why not? Use the data to justify your answer.

   __________________________________________________________

   __________________________________________________________

   __________________________________________________________

11. **Data Analysis** Compare and contrast the effects of cats on each of the three species. Develop a hypothesis for why you see similarities and differences.

   __________________________________________________________

   __________________________________________________________

   __________________________________________________________

   __________________________________________________________

   __________________________________________________________
Killer Kitties continued

CONCLUSION

12. What do you think house cats that spend time outside in the United States do? Do you think they might have an effect on local wildlife? Why or why not?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

13. Extension What further studies would you propose to do to help answer this question?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________