

LESSON**Representing and Making Meaning from Data**

Students visualize and interpret data from Dr. Epps' research.

What We Are Hoping For: Learning Goals

- Populations
- Habitats
- Inbreeding
- DNA is a scientific tool
- Human Impact
 - A, B, C
- Nature of Science
 - A-E
- Data Representation
 - A-D

Learning Goals:

- Representing the Data
- Big roads make big isolation
- Patterns in data can lead to scientific discoveries

CHECKLIST

Representing and Making Meaning from Data

In this lesson, students will:

1. Continue to use genetic data and rulers to represent data on the maps. **(10 min)**
2. Transfer data onto a larger class size map. **(10 min)**
3. Use data to back up their claims about highways and bighorn sheep populations. **(15 min)**
4. Complete the *Making Meaning from Data* section of the Investigation Booklet. **(10 min)**

(Times indicated are approximate.)

Representing Data on a Map

Have students transfer their data to a larger class-sized map.

The best way to make a large map is to make an overhead transparency copy of the map of the bighorn sheep range, which is available in the Downloads box on this page. It is also the first slide of the *Representing the Data on a Map* slide show.

1. Each group transfers the data from one of their maps to the class size map.
(Make sure students draw in highways)
2. Have groups check each other's work on the overview map to eliminate mistakes.

The last slide of the *Representing the Data on a Map* slide show shows where the highways are actually located in the Southern California region. Compare the students' highway predictions with the actual highways on this map.

Using Data to Make Claims

1. Remind students of the original questions that Clinton Epps wondered about as he was studying the bighorn sheep, “How might highways built to connect people in Los Angeles and Las Vegas affect the bighorn sheep?” or “How might being able to drive between Los Angeles to Las Vegas in just four hours affect the bighorn sheep?”
2. Distribute to students a map with the highways included.
3. Compare it to the display overview map that the students completed.
4. Ask the students to examine their data and think about what claims they can make regarding this guiding question.

Discussion

Key Idea: DNA provides evidence that highways impact bighorn sheep breeding.

Question: Does the class overview map match the official map? How was it possible to create a map with highways based upon your data?

Answer: By analyzing the DNA evidence, it was possible to predict where some of the highways would be. If there was little evidence of breeding between two populations that were close geographically, it was possible to predict that there was a highway that isolated the populations from each other.

Question: How was the Hackberry Mountain dataset different than all of the others?

Answer: Hackberry Mountain was not separated by a highway from the other mountains with bighorn sheep populations.

Question: Why was it important to include a case without highways?

Answer: The Hackberry population represents how bighorn sheep populations bred before the introduction of highways.

Discussion

Key Idea: Highways isolate bighorn sheep populations leading to inbreeding.

Question: What patterns do you see in your data with respect to highways and bighorn sheep mountaintop populations? In other words, what **claim(s)** can you make based on your data.

Answer: Roads isolate mountaintop sheep populations

Question: What **evidence** do you have to support this claim that roads isolate mountaintop sheep populations?

Answer: Mountaintop populations share fewer genes than expected based upon geographic distance alone.

Question: Can you develop an **explanation** for your claim that highways isolate sheep populations?

Answer: Highways make it difficult or impossible for sheep to travel to mountains on the other side of the highway. They therefore cannot breed with sheep on the other side of the highway. This isolation can be seen in the fewer than expected genes that are shared between sheep that live on opposite sides of highways.