Modeling a Habitat

Once field researchers have collected data about an area, that information will go into a geographic information system, or GIS. Scientists can then use that data to build maps and models of habitats, or even the individual resources available in an ecosystem. In this activity, students will use field data to build a model that demonstrates which parts of a wild area would be most appropriate for the ecological needs of jaguar.

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Objectives:

Students will be able to
- Build a geographical model of a habitat using field data
- Use mathematical thinking to analyze the human impact on an ecosystem

Materials:

- [Arizona Jaguar Habitat Map](#)
- [Arizona Ecosystem Data](#)
- [Human Impact Data Sheet](#)
- [Modeling a Habitat Math Worksheet](#)
- [Answer Key](#)
- Colored Pencils or Markers (Red, Blue, Green, Black)

Process:

1) Explain that geospatial analysis is the process of combining geographical data with other data about a particular place in order to build informational maps or applications that help answer a particular question.
2) Remind students that jaguars used to be native to parts of the United States, including New Mexico and Arizona, and a few individuals have been seen there in the last five years. In this activity, students are going to use spatial data that was collected about a particular part of Arizona, along with information that WCS researchers have collected about jaguars, to determine whether jaguars are likely to live in this habitat.
3) Distribute the Arizona Jaguar Habitat map, and tell students that this map is a topographic representation of a section of Arizona. Check for student understanding of the definition of topography.

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4) Inform students that the width of each column represents 200 kilometers, and the height of each row represents 100 kilometers. Ask students to calculate the length of each side of the map and write that information below and to the right of the map, and to calculate the total square kilometers of the map. They should record their results below the map.

5) Explain to students that, using satellite imagery, GIS researchers have been able to determine the average tree cover, the average elevation, and whether water is present for each cell of this map. Field researchers have also discovered what kind of habitat jaguars prefer for each of those factors. The jaguar habitat preferences are displayed below the map. Explain that students will now use the data for tree cover, elevation, and water to determine where jaguars are most likely to live in this part of Arizona.

6) Distribute the Arizona Ecosystem Data sheet. Direct students to compare this to the jaguar preference data in order to determine which cells of the map are appropriate for jaguars. Students should color in cells where the elevation is appropriate in red, cells where the tree cover is appropriate in green, and cells where water availability is appropriate in blue.

7) Allow students to fill in the cells for each of the three environmental factors. Once they complete that, direct students to outline the cells where all three factors support the presence of jaguars in black. Students should then calculate the total number of square kilometers that would be appropriate habitat for jaguars. They can also calculate what percentage of the total area would be appropriate habitat.

8) Check for student understanding that the boxes containing all three colors represent the habitat most suitable for jaguars. What do they notice about the model that they have created? Is more or less of the area acceptable for jaguars than they expected?

9) Once students have completed the initial habitat modelling, distribute the Human Impact Data Sheet.

10) Explain to the students that jaguars avoid places where humans have constructed roads or buildings, and this part of Arizona has a road that runs through the center of it. Direct students to place a large black X through the cells that are now unacceptable to jaguars based on this new information.

11) Ask students to calculate the new area available to jaguars after adding the road to their model. How much of the jaguar's habitat was lost because of construction? What do they notice now about the distribution of the available jaguar habitats?

12) Explain that human actions often impact wild places through habitat fragmentation, with severe impacts on the amount of space left for animals.