

Conservation Management: Protection and Reintroduction

In this activity, your students will be taking on the role of conservationists as they assess real world data and determine the value of a habitat range as a protected area for three species (snow leopard, red panda, and argali). Each of these species have habitat ranges within Eastern Asia and are suffering from declining population size. Conservation management is concerned with increasing and maintaining population size, but also with the genetic health of a population. As a result, students should consider the amount of genetic diversity when designating a protected area and determining a potential captive-bred individual to release. A genetically diverse population is necessary for that population to be able to adapt and respond to environmental changes.

Objectives:

Students will be able to:

- Analyze habitat range data to determine one beneficial protected range for all species.
- Analyze genotypic and phenotypic data to determine a protected range that contains a healthy and viable population.
- Analyze genotypic and phenotypic data to determine the captive bred individuals that should be released into the protected range.
- Use evidence to support their claims and develop their reasoning.

Materials:

- [Captive Individuals Data Sheet](#)
- [Genotypic and Phenotypic Data](#)
- [Habitat Range & Human Population Maps](#)
- Conservation Management Application Worksheet
 - [PDF version](#)
 - [Editable version](#)

Process:

1. You can either have students work in small groups of two to three or on their own. This activity will be completed ideally over a series of days and not all in one class period.
2. Provide the range and human population maps to each individual or group. They will have to analyze the range maps to determine which of the three highlighted ranges would be the best protected area for all three species together. Please emphasize that the ranges circled on the maps (including the human population map) are in the same area for all species. Students will be completing Section 1 of the activity sheet.

3. Provide the population range data to each individual or group. For Section 2 of the activity sheet, students will start by analyzing the genotypic data for all three species in all three ranges. The genotypic data the students are analyzing is haplotype data. Haplotypes are sets of DNA variations and are written in the form of a nucleotide base sequence. There are four variations of the particular haplotype for each species, and those variations are color coded (to make genetic diversity more visible). Suggest that students count the numbers for each variation within the population. Higher genetic diversity is marked by an equal number of each variation and low genetic diversity is marked by a higher amount of one or two of the variations. Have students think about why we should analyze genetic data; after collaboration let them share out their ideas. Emphasize the importance of genetic diversity in a population.
4. For Section 3, students will use the same handout that contained the genotypic data, however, they will now be analyzing the phenotypic data for each species in each range. The phenotypic data includes the biological sex of the species as well as a physical characteristic that could affect their ability to live within that range successfully. Have students think about why biological sex matters in these populations (reproduction and heredity of beneficial genetic traits). Have students share their ideas and write them on the board or somewhere they can refer back to. Also have them think about how these other phenotypic factors could affect their ability to survive in a habitat.
 - Snow Leopard: Climate change has encouraged the growth and development of forests at higher altitudes. Snow leopards live in the grass/shrubland of alpine environments. The growth of new forests in higher altitudes causes snow leopard (and their prey) habitat to decrease and therefore increases competition.
 - Red Panda: Humans are increasing the amount of red panda habitat they use for livestock grazing. Red pandas and livestock do not compete for the same food, but grazing prevents bamboo from growing to the necessary height for red pandas to eat. Red pandas avoid eating low-growth bamboo because they are vulnerable to animals such as leopards while on the ground.
 - Argali: Humans are increasing the amount of argali habitat they use for livestock grazing. This has caused competition for food between argali and livestock.
5. Section 4 of the activity sheet requires the students to put all evidence together to determine the range that should be chosen as the protected area for all three species. Remind the students that they need to take into account all data given and choose ONE range. Ask them to be thinking about what factors or pieces of evidence they believe hold more importance.
6. Provide the captive Individual data sheets for Section 5 of the activity sheet. Students individually or in their groups will analyze the data to determine which individual should be released from a captive population into their chosen protected range. They will choose one individual for each species to be released into that protected area.

7. Note: As an alternative, you could split the class into 3 groups:
- Assign one group of students to complete Section 1.
 - Assign the second group of students to complete Section 2.
 - Assign the third group of students to complete Section 3.

Each group will work through their section of the Conservation Management Activity Sheet. Group one will use the habitat range and human population maps to determine which of the three ranges they would recommend as the protected area. Group two will use the genotypic data for each species to determine the protected area, and group three will use the phenotypic data to make their decision.

After each group has made their habitat recommendation based on their set of data, the class can debate the range that should be considered for the protected area for all three species. For the debate you can encourage each group to develop an argument, based on evidence, for why their range of choice should be the protected area. Then give each group five minutes to give their initial argument. Allow groups to rebut the other arguments. Encourage students to think about the fact that they were not looking at every piece of the data and so should consider carefully what other groups have argued. Have the class vote on or choose the area they will protect and then they can complete sections four and five. Highlight at the end of the debate that it is important that conservationists consider multiple pieces of evidence and work together to determine the most beneficial decision for the species involved!