

Carrying Capacity

Theme

Quality and Quantity of habitat determine the maximum number of animals that can be supported in an area.

Learning Objectives

Define concepts of

1. Habitat
2. Carrying capacity

Vocabulary:

habitat	catastrophic
pollution	components
carrying capacity	sustainable

Introduction

1. Describe the importance of Idaho habitats to bird species
2. Recognize some of the factors that influence or change bird populations.

- Habitat is the arrangement of food, shelter, water, and space suitable for an animals needs. Habitat is dynamic or always changing.
- Animals in a habitat are affected if any of the components are missing or are significantly changed so that the arrangement for the individual animal or populations of animals is no longer suitable.
- Depending on the nature of the impact, the effect may be minor or catastrophic.
- While habitat loss frequently accounts for drops in populations of birds and other animals, other factors threaten an animal's survival including pollution, disease and predation (predators).

Example of habitat loss:

-Housing developments in our desert lands are removing habitat for Burrowing Owls.

- **Carrying capacity** refers to the quality (food, shelter, water, and space) and quantity of habitat that determine the maximum number of animals that can be supported in an area.
- The same area may have different carrying capacity for different life forms, such as fish or insects or birds. For many species, the carrying capacity changes constantly season by season and year by year.

Examples of seasonal change:

-In winter female some American Kestrels migrate to warmer areas with less snow. This reduces competition for the reduced prey supply (insects, mice, birds). The males stay and guard their territories.

- Altering or changing a habitat may decrease the carrying capacity for a specific type of bird (species). But, that change may increase the carrying capacity for people or other animals.
- Now consider what is sustainable. What balance can we find to make a habitat continue to support different kinds of people, birds and other animals?
- Community planners, home buyers, builders and developers and voters make important decisions about our shared habitats. Everyone must look for the best ways to let our communities grow yet protect and restore our natural environment (nature).

Activity: Carrying Capacity

Materials required: Rope and clue cards.

Clue Cards for two Birds of Prey:

1. Bald Eagle
2. Burrowing Owl

Use only one set of clue cards in an activity. One side of the card has the scenario of change to a habitat. The other side has the positive or negative changes to the roped-in area and an explanation of each change. The tables at the end of this activity are used to make each set of cards.

Steps

- Use a rope with even increments marked for at least 30 spaces along the rope.
- Shape the rope into a circle.
- Ask a group of people to stand in the circle facing outwards and pick up the rope. They will be lassoed or contained inside the rope circle.
- Have each person draw a clue card and read the scenario on the card. Each card will describe a situation in which a bird of prey's relationship to the environment is altered or changed affecting the carrying capacity within the circle.
- Each participant reads their clue and the circle is expanded or contracted a certain number of increments depending on the scenario on the clue card.
- Have the participant predict if the clue has a positive, negative, or no effect on carrying capacity

Following and Test for Understanding:

- The monitor should hold the rope ends and adjust the circle accordingly.
- Ask participants to describe how they feel when too many are in a tight circle.
- Ask them to predict what choices or what fate awaits birds of prey when their environment is encroached upon or altered and the carrying capacity of the land changes.
- Students may record their predictions. Students may discuss the differences between the two types of birds of prey and their respecting habitats.
- They may be able to see how the balance of the habitat changes with the species that is focused upon in the activity.



Burrowing Owl

Carrying Capacity Activity

Scenarios	Possible Outcomes
A pest management company puts out poison to kill mice in the habitat.	Indirect mortality due to contaminated prey -3, Loose of food source -3, Large supply of dead mice +5
A conservation organization buys the habitat and begins restoration of native grasses.	Native grasses support insects that are food for mice and Borrowing Owls.+3 Artificial burrows have been used successfully in Idaho to induce preoccupancy of burrowing owl habitats +3
Pesticide is sprayed in the habitat to reduce the number of grasshoppers that are moving into nearby agricultural fields.	Survival and reproduction is impacted by direct spraying of insecticides over the nest burrows. -5
A housing development is built along the margins of the habitat, and the homeowners have many pets.	It is estimated that 20% of damage to burrows are caused by dogs and 65% by humans. Reproductive success is significantly less in these areas. -3 dogs -3cats -3humans
A new power line is built along the margins of the habitat.	Power lines provide perches for Red-tailed Hawks who prey on the Borrowing Owls. -3 Power lines mean development: golf courses, roads, airports, housing developments and less vacant land. -3
A road is constructed along the east side of the habitat.	More road kill and mice are available along the road. +8 Road development delayed until after nesting. +3 More burrowing owls run into cars. -3
A road is built through the habitat cutting the area in two.	More Burrowing Owls run into cars. -3 Roads lead to habitat fragmentation and lead to increased access to the owls' habitat by humans.
A housing development is constructed in the habitat.	Loss of habitat increases vulnerability to predation. -3 Decline in mating and nesting. -3
A warm winter and mild spring favor the production of large numbers of insects.	Burrowing owls like a dry nesting place and a ready supply of food. +10
An equestrian club decides to fill in badger and squirrel holes.	Intensive cultivation or human interference in grasslands and native prairies cause declining owl populations.-4 Control of new prairie dog towns destroys nesting habitat. -4 (In Utah but not in Idaho)



Bald Eagle

Carrying Capacity Activity

Scenarios	Possible Outcomes
Large amounts of snow fall in the early winter. Water managers decide to release water from the reservoir into the river to make way for the spring run off.	High, murky waters equal poor fishing for Bald Eagles. -3
The river freezes solid.	Eagles must move to a food source. They can tolerate extreme cold, wind and snow if food is available. -3 Weather effects reproductive output. -3
A major wind storm fells large trees along the river.	Bald Eagles nest in small patches of residual large trees and second growth. -4
The County decides to build a highway bridge over the river.	Eagles need undisturbed habitat. Eagles are crowding together more closely, and a growing number of birds are being treated for injuries suffered in turf battles. -5 (and hope they can adapt)
Raccoons increase numbers.	Raccoons may raid nests to feed on eggs and young eaglets. -3
People fishing along the river lose many fishing weights and leave loose line in the river.	Bald Eagles can ingest lead pellets from waterfowl and fish carcasses, leading to lead poisoning or they may become tangled in fishing line and other rubbish. -5 River cleanup. +5
Landowners draw up rules to protect nesting bald Eagles.	Two thirds of nests are on private land. Only about 10% of eagle nests are on lands where their habitat values could be considered secure in the absence of habitat protection laws. +5
Bacteria cause a large fish kill.	Bacteria may kill fish. Eagles being opportunistic hunters feed on the carcasses along the river. +5 But, eagles too may be affected by bacteria in the food supply. -3
A coal fired power plant is sited 20 miles from the river. The prevailing winds blow in the direction of the river.	Increases in mercury levels and salinity from pollution reach eagles through the food chain. -3 short term -15 long term