

Introduction: The environment may be altered by forces within the biotic community, as well as by relationships between organisms and the physical environment. The **carrying capacity** of an ecosystem is the maximum number of organisms that an area can support on a sustained basis. The density of a population may produce such profound changes in the environment that the environment becomes unsuitable for the survival of that species. For instance, overgrazing of land may make the land unable to support the grazing of animals that lived there.

Objectives:

- Graph data on the Kaibab deer population of Arizona from 1905 to 1939
- Determine factors responsible for the changing populations
- Determine the carrying capacity of the Kaibab Plateau

Background

Before 1905, the deer on the Kaibab Plateau were estimated to number about 4000. The average carrying capacity of the range was then estimated to be about 30,000 deer. On November 28th, 1906, President Theodore Roosevelt created the Grand Canyon National Game Preserve to protect the "finest deer herd in America."

Unfortunately, by this time the Kaibab forest area had already been overgrazed by sheep, cattle, and horses. Most of the tall grasses had been eliminated. The first step to protect the deer was to ban all hunting. In addition, in 1907, The Forest Service tried to exterminate the predators of the deer. Between 1907 and 1939, 816 mountain lions, 20 wolves, 7388 coyotes and more than 500 bobcats were killed.

Signs that the deer population was out of control began to appear as early as 1920 - the range was beginning to deteriorate rapidly. The Forest Service reduced the number of livestock grazing permits. By 1923, the deer were reported to be on the verge of starvation and the range conditions were described as "deplorable."

The Kaibab Deer Investigating Committee recommended that all livestock not owned by local residents be removed immediately from the range and that the number of deer be cut in half as quickly as possible. Hunting was reopened, and during the fall of 1924, 675 deer were killed by hunters. However, these deer represented only one-tenth the number of deer that had been born that spring. Over the next two winters, it is estimated that 60,000 deer starved to death.

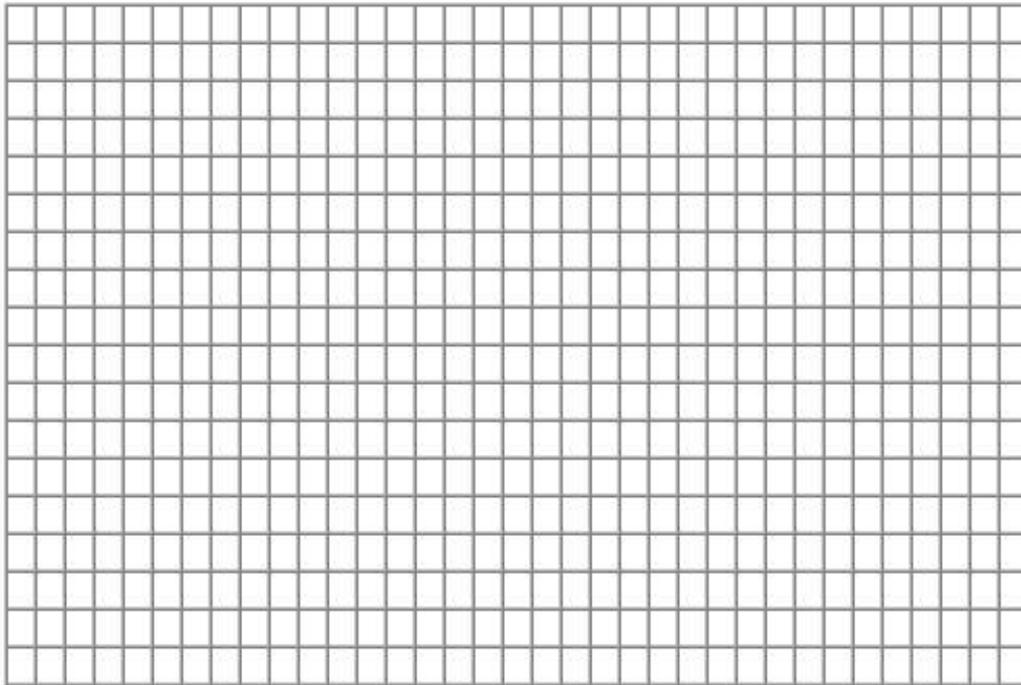
Today, the Arizona Game Commission carefully manages the Kaibab area with regulations geared to specific local needs. Hunting permits are issued to keep the deer in balance with their range. Predators are protected to help keep herds in balance with food supplies. Tragic winter losses can be checked by keeping the number of deer near the carrying capacity of the range.

Pre- Questions:

What is carrying capacity? _____

What are limiting factors? _____

DATA 1. Graph the deer population data. Place time on the X axis and number of deer on the Y axis. Label both axis. You also need a title (or lose points!)



DATA TABLE	
Year	Deer Population
1905	4,000
1910	9,000
1915	25,000
1920	65,000
1924	100,000
1925	60,000
1926	40,000
1927	37,000
1928	35,000
1929	30,000
1930	25,000
1931	20,000
1935	18,000
1939	10,000

Analysis

1. During 1906 and 1907, what two methods did the Forest Service use to protect the Kaibab deer?
2. Were these methods successful? Use the data from your graph to support your answer. (Yes or No and then EXPLAIN WHY)
3. What regulations are in place to prevent the Kaibab from going over their carrying capacity?
4. Describe 3 adaptations (characteristics that organism is born with) that allowed the Kaibab to survive their environment.
5. Describe 3 adaptations (characteristics that organism is born with) that are advantageous to predators (wolves, bobcats) hunting Kaibab.
6. If a pesticide (used to kill insects) that was used on farms accidentally spread into the woods, what do you think would happen to the Kaibab? To the upper level predators?
7. Create a food chain based on the Kaibab habitat. Label producer, primary consumer, secondary consumer, herbivore, autotroph, carnivore, decomposer, heterotroph, predator, prey