

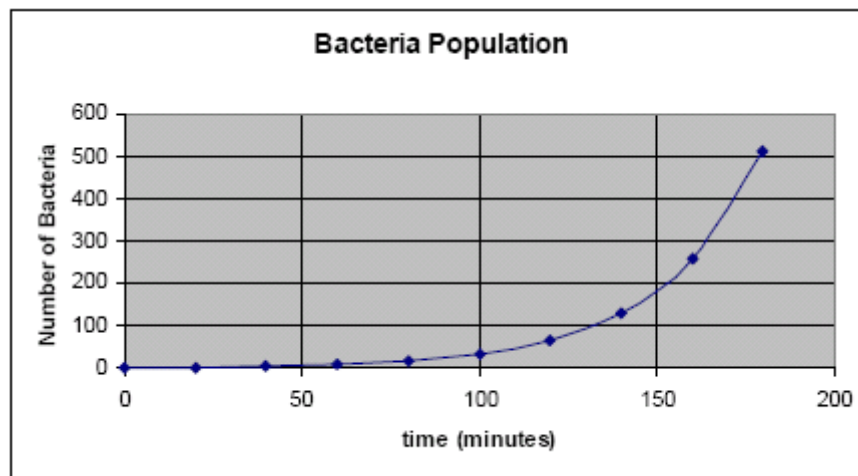
# Lab: Population Ecology Graphs

## ECOLOGY

**Introduction:** The ability to interpret graphs and tables is a necessary skill in science but also finds use in everyday life. In articles or textbooks you are likely to find graphs and tables. Understanding the article's message depends heavily on being able to interpret many different types of graphs and tables. In science tables are used to provide information. Frequently one quantity in a table depends upon or is related to another. Data from tables can be graphed to aid interpretation. Graphs give a visual representation of the data that helps to reveal regularities and patterns.

**Procedure:** Answer the following questions regarding the graphs below.

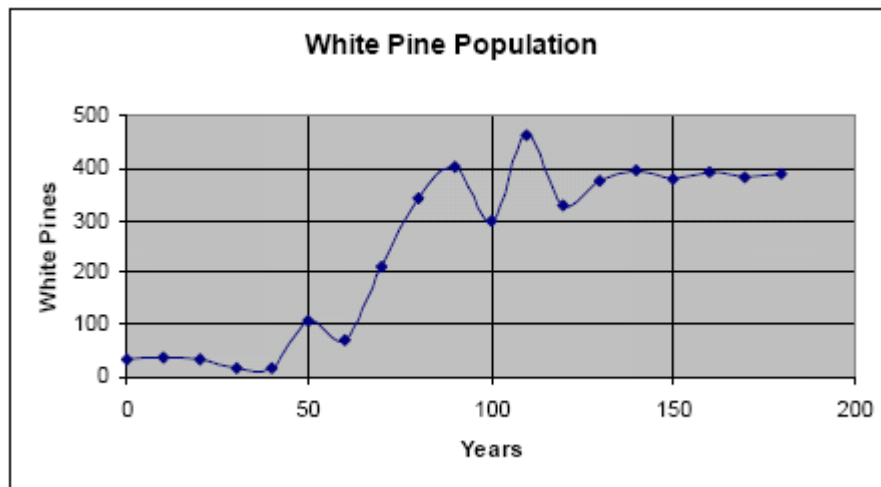
**I.** Bacteria reproduce by splitting in half. It takes about 20 minutes, under ideal conditions, for a bacteria population to double.



### Analysis Questions

1. Describe what is happening to the population of bacteria.
2. Is the rate of population growth constant or variable?
3. What do we call this type of growth?

**II.** White pine became extinct in northern Minnesota during the last period of glaciation, although it remained in southern climates such as Virginia. Once the glaciers began to retreat, the white pine began to expand northward again; it reappeared in northern Minnesota about 9400 years ago, this is time 0 in the graph



### Analysis Questions

1. What happens to the population growth after 110 years?
2. What is the carrying capacity of white pine in this ecosystem?
3. What factors would affect the carrying capacity of white pines?
4. How is it possible that the white pine population reached 462 individuals at year 110? What happens to the population from 110 years to 140 years?

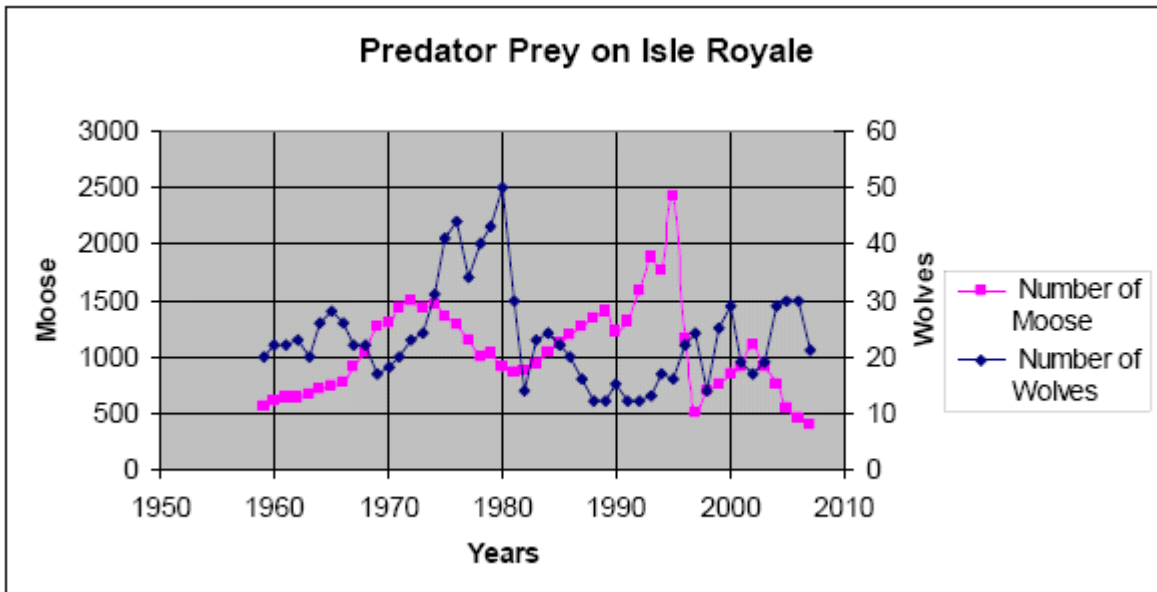
### III. Ecological Studies of Wolves and Moose on Isle Royale

Isle Royale is the largest island located in Lake Superior. The island is approximately 45 miles in length and 9 miles wide. Isle Royale consists of Isle Royale (main island) and multiple smaller islands. Isle Royale is about 12 miles south of Canada, 20 miles Southeast of Grand Portage, Minnesota and 53 miles north of Copper Harbor, Michigan. Isle Royale National Park was established in 1940, designated a wilderness area in 1976 and an International Biosphere Reserve in 1980. Isle Royale is a remote island, the only mode of transportation available is by boat or seaplane.

Moose first arrived at Isle Royale around 1900. The moose population tends to increase in years with mild winters, early spring green-up, abundant winter forage, low wolf numbers and low levels of tick infestation. Wolves first arrived at the island on an ice bridge from Canada in 1940. Disease has also influenced the wolf population. Between 1980 and 1982, the wolf population declined from 50 to 14, due to canine parvovirus.

The Isle Royale wolves and moose have been studied since 1959. This Isle Royale wolf-moose study is unique because it entails just a single predator (the wolf) and a single prey (the moose)

on a small island with very little human influence. This is the longest continuous study of a predator and its prey.



### Analysis Questions

1. What is the greatest moose population?

What year did that occur?

What was the wolf population when the moose population the greatest?

2. What would happen to the moose population if the wolf population decreases?

3. What would happen to the wolf population if the moose population decreases?

4. What would happen to the moose population if the wolves were removed from Isle Royale?

5. Describe the pattern between the wolf population in relation to the moose population.

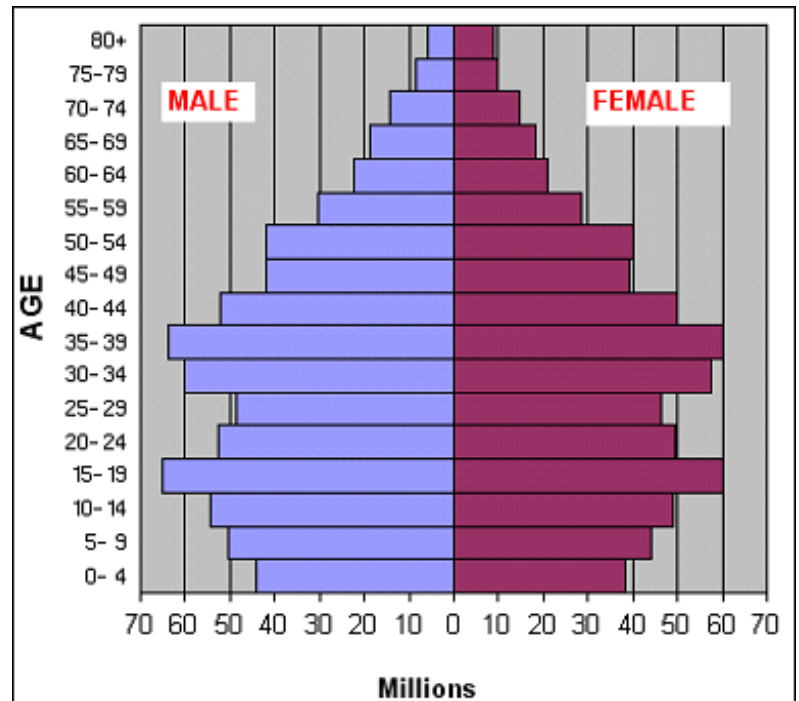
6. Identify a factor, other than moose population, that has influenced the wolf population in Isle Royale.

7. Identify two factors, other than the wolf population, that may influence the moose population.

**IV.** A population pyramid, also called an age structure diagram, is a graphical illustration that shows the distribution of various age groups in a human population (typically that of a country or region of the world), which ideally forms the shape of a pyramid when the region is healthy.

It typically consists of two back-to-back bar graphs, with the population plotted on the X-axis and age on the Y-axis, one showing the number of males and one showing females in a particular population in five-year age groups (also called cohorts). Males are conventionally shown on the left and females on the right, and they may be measured by raw number or as a percentage of the total population.

Population pyramids are often viewed as the most effective way to graphically depict the age and sex distribution of a population, partly because of the very clear image these pyramids present.



The age-structure diagram shown above was prepared for China. Answer the following questions based on these data.

### Analysis Questions

1. Normally, healthy populations produce graphs that are pyramidal in shape. What do you think caused the base of this pyramid to “shrink”?
2. If you were an exporter of goods to China, what age group(s) do you think you would focus on the most? Why?
3. What is the youngest group that shows more males than females?
4. At what age did it appear that females again outnumbered males?