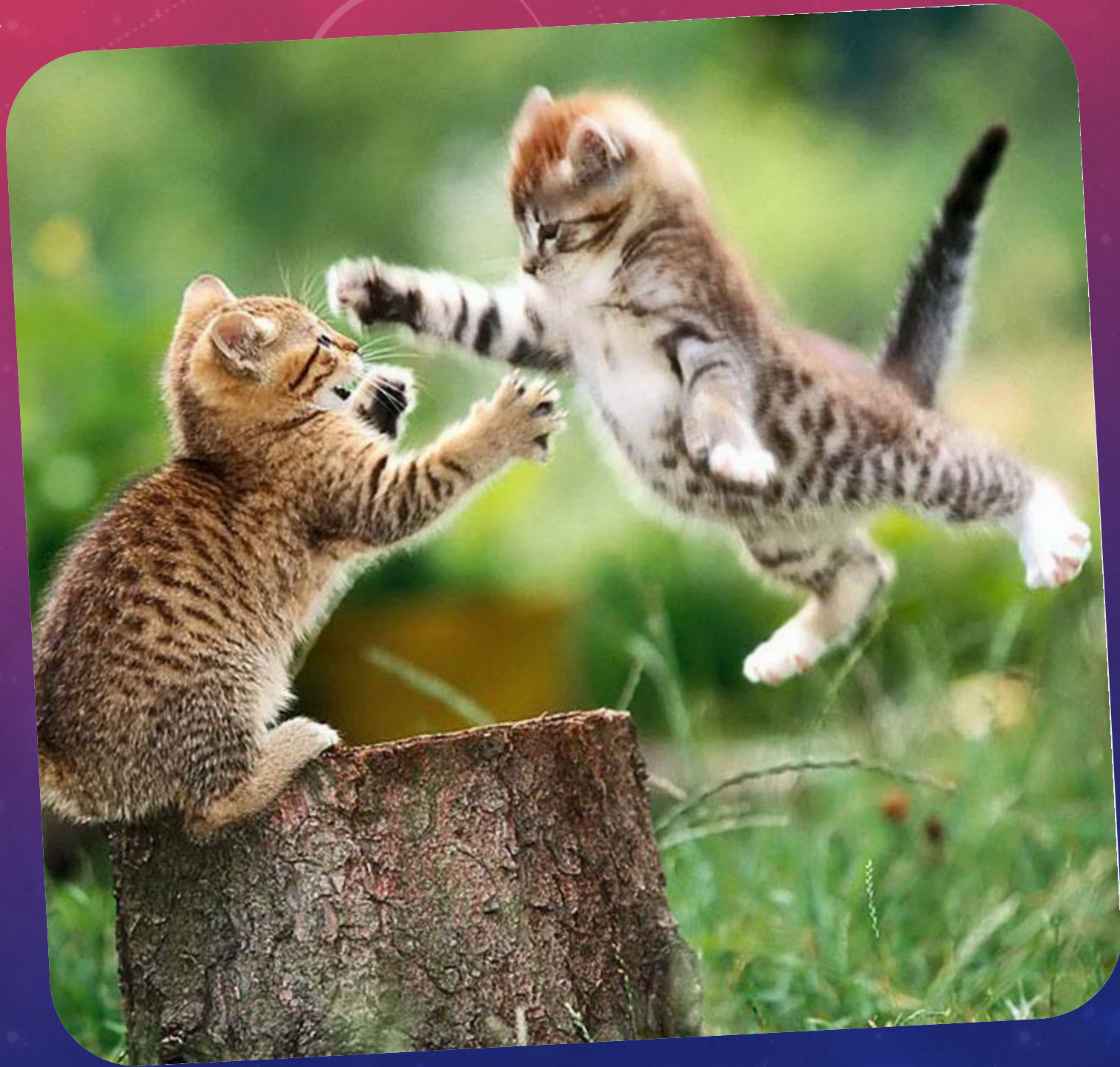


POLICE LINE DO NOT CROSS

COMPETITION

**SURVIVAL OF
the fittest!**



RATES OF POPULATION INCREASE

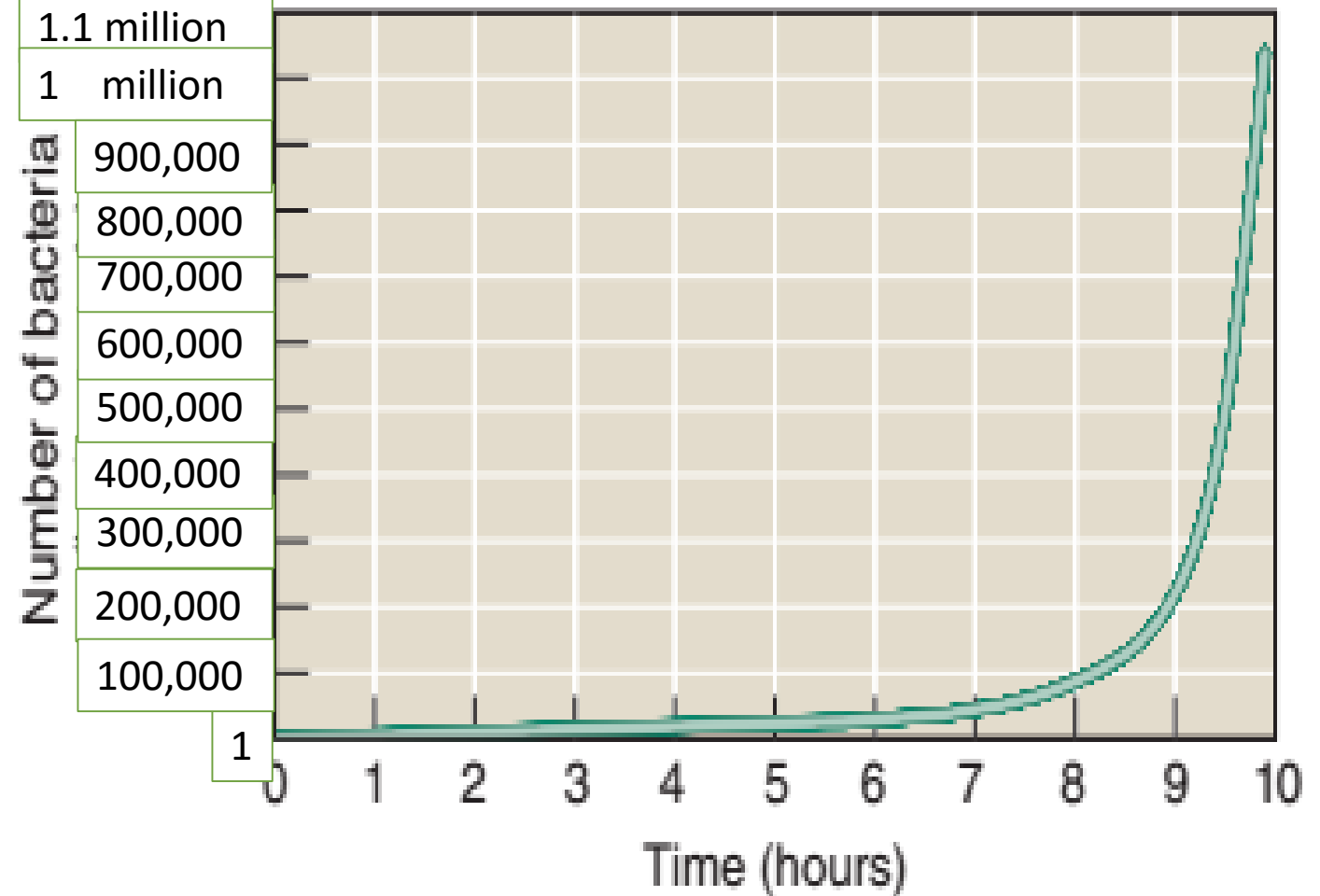
Generally, larger organisms, such as blue whales and elephants, have the smallest intrinsic rates of increase, whereas microorganisms have the greatest intrinsic rates of increase. Under ideal conditions (that is, an environment with unlimited resources), certain bacteria reproduce by dividing in half every 30 minutes.



RATES OF POPULATION INCREASE

A single bacterium would increase to a population of more than 1 million in just 10 hours (Figure 5.5a), and the population from a single individual would exceed 1 billion in 15 hours! If you plot the population number versus time, the graph has a J shape characteristic of exponential population growth (Figure 5.5b). When a population grows exponentially, the larger the population gets, the faster it grows.

<https://www.youtube.com/watch?v=gEwzDydcIWc>

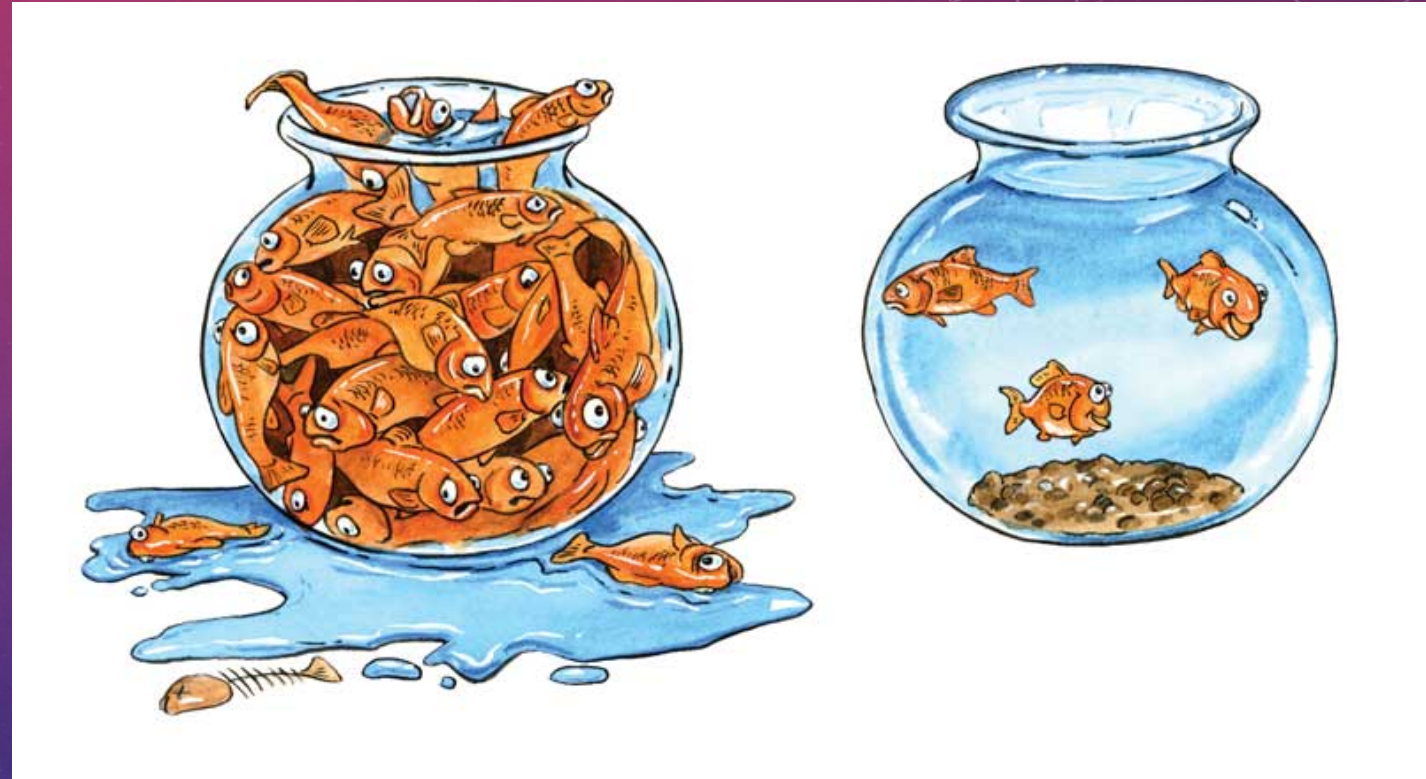


(b) When these data are graphed, the curve of exponential population growth has a characteristic J shape.

Figure 5.5 Exponential population growth.

CARRYING CAPACITY

- Some populations under the right conditions may exhibit exponential population growth for a short period.
- BUT there is a limit to how many organisms that ecosystem can support! This limit is called the CARRYING CAPACITY.
- As the population increases, unfavorable environmental conditions rise.
 - limited availability of food, water, shelter, and other essential resources (resulting in increased competition), as well as limits imposed by disease and predation.



<https://www.youtube.com/watch?v=CuwrZUTeEqM>

FACTORS THAT LIMIT POPULATION GROWTH

- Populations usually stop reproducing when they run out of food and space.
- Pollution from poisonous body wastes and would accumulate in their vicinity.
- Overcrowding facilitates the spread of infectious organisms such as harmful bacteria and viruses among individuals.
- High population densities increase the likelihood of a predator catching an individual.



FACTORS THAT LIMIT POPULATION GROWTH

<https://www.youtube.com/watch?v=sc4HxPxNrZ0>

- As the environment deteriorates,
 - Birth rates would decline
 - Death rates would increase.
 - Number of individuals in that population would decrease.

The Back Page

State population to double by 2040; babies to blame

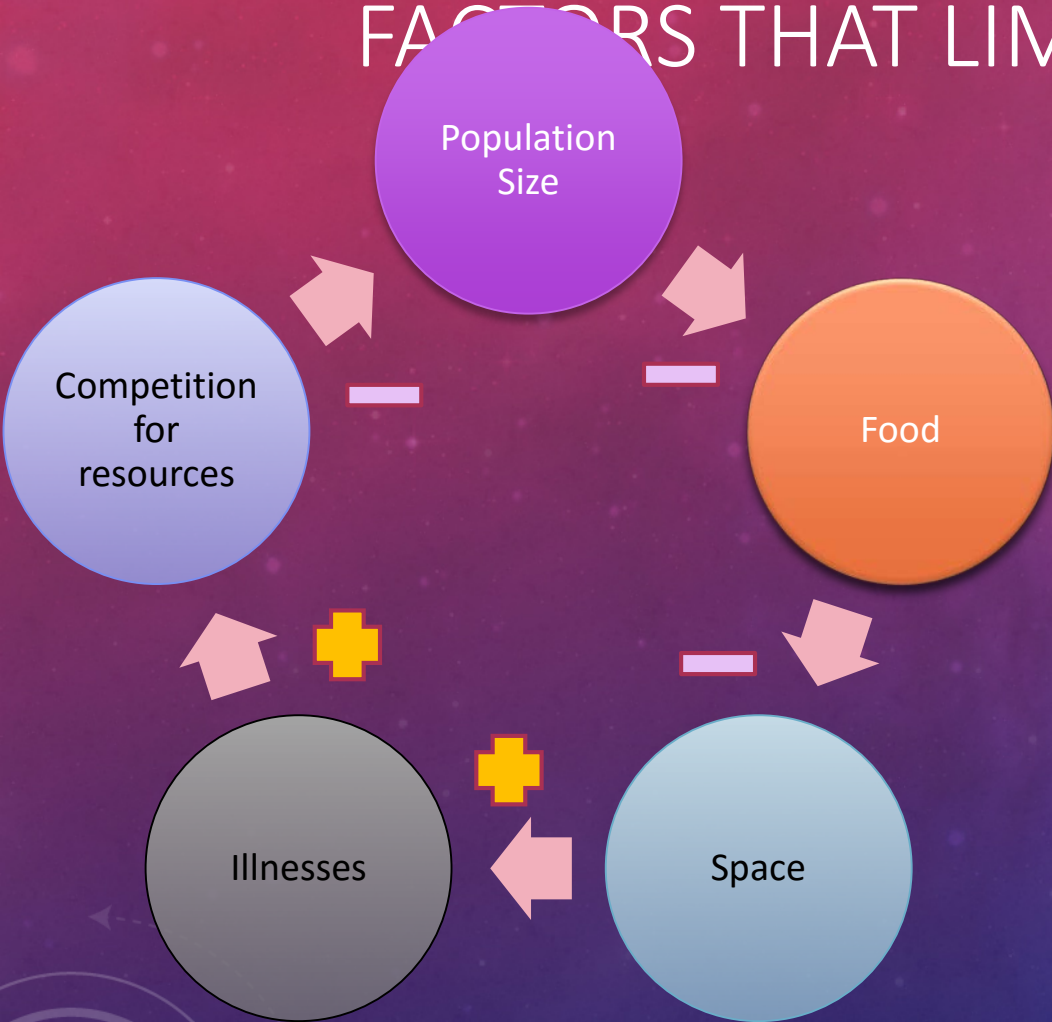
TOM PHILP
Clatchy News Service

SACRAMENTO — In their first attempt at projecting California population in the year 2040, officials Tuesday unveiled a future state with twice as many people

Area Counties

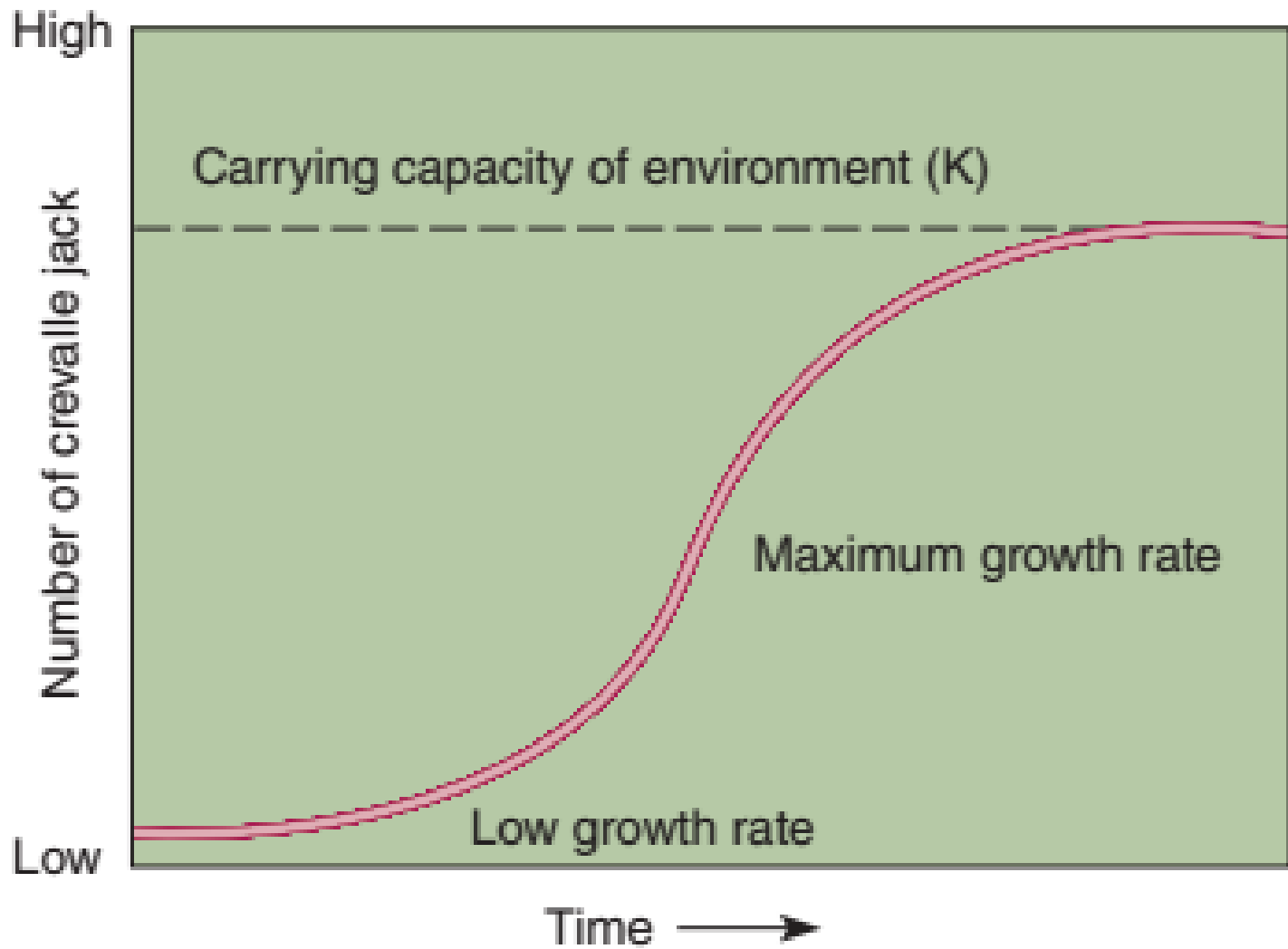
Northern San Joaquin Valley counties with their 1990 populations and projections

FACTORS THAT LIMIT POPULATION GROWTH



As the number of individuals in a population increases, so does environmental resistance, which acts to limit population growth.

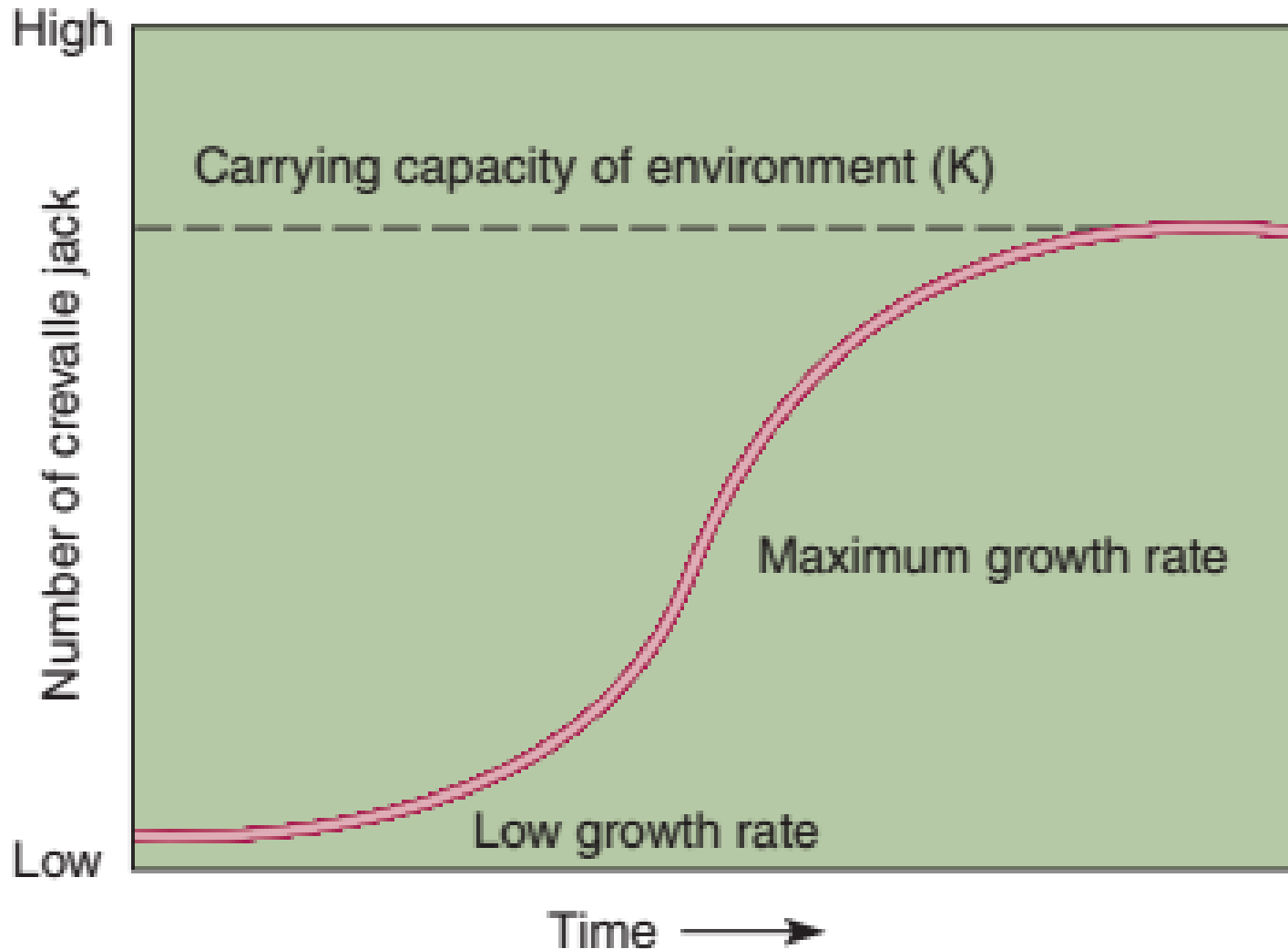
Environmental resistance is an excellent example of a negative feedback mechanism, in which a change in some condition triggers a response that counteracts, or reverses, the changed condition.



reduce the
for the carrying



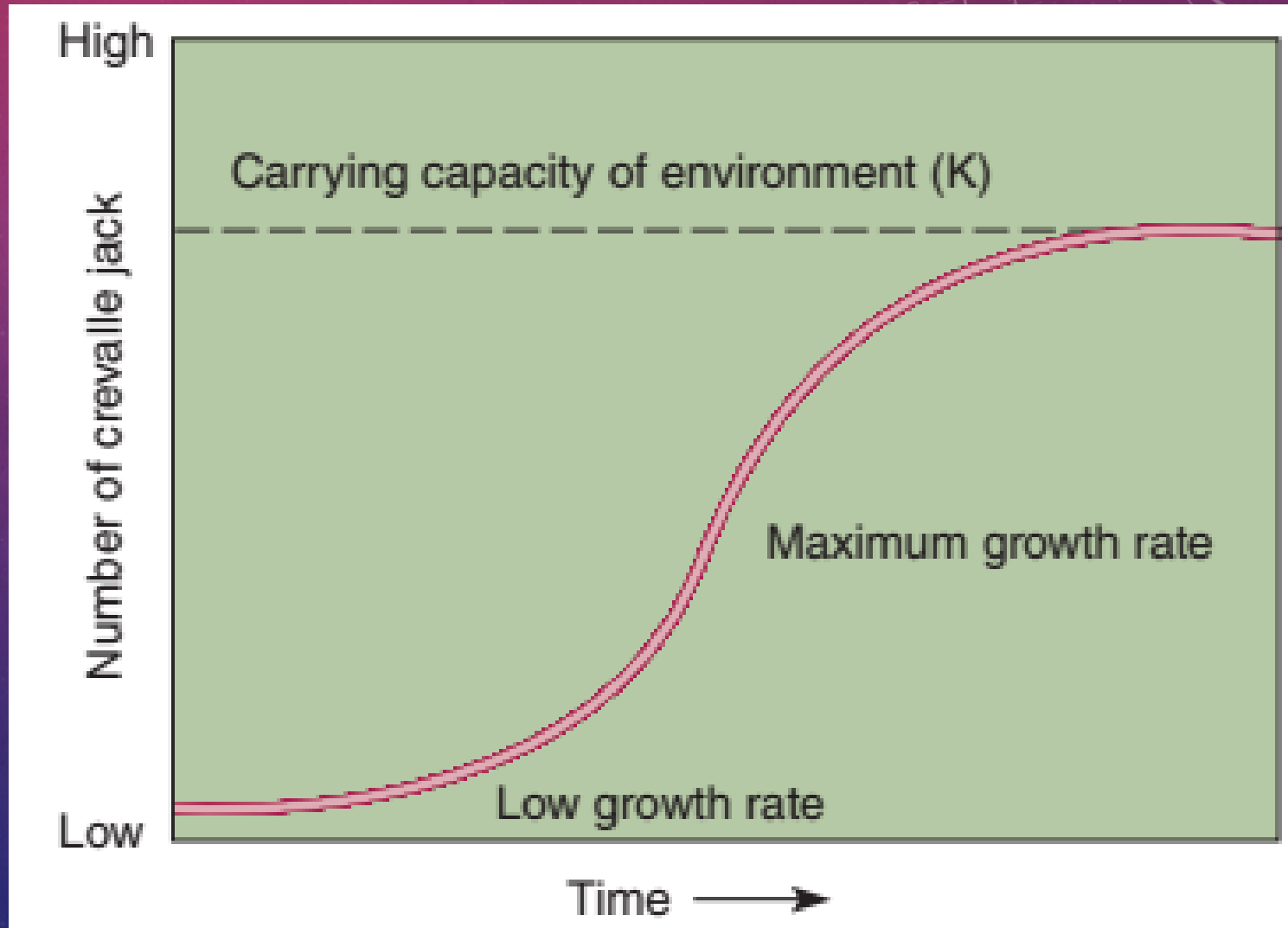
A POPULATION WILL GROW EXPONENTIALLY UNTIL THE ENVIRONMENT RESISTS



- Populations typically grow slowly when their numbers are small, but growth accelerates (to the maximum growth rate) until environmental resistance (limits to food, breeding sites, habitat, etc.) force growth to slow again, leveling off as the population approaches the carrying capacity (K).

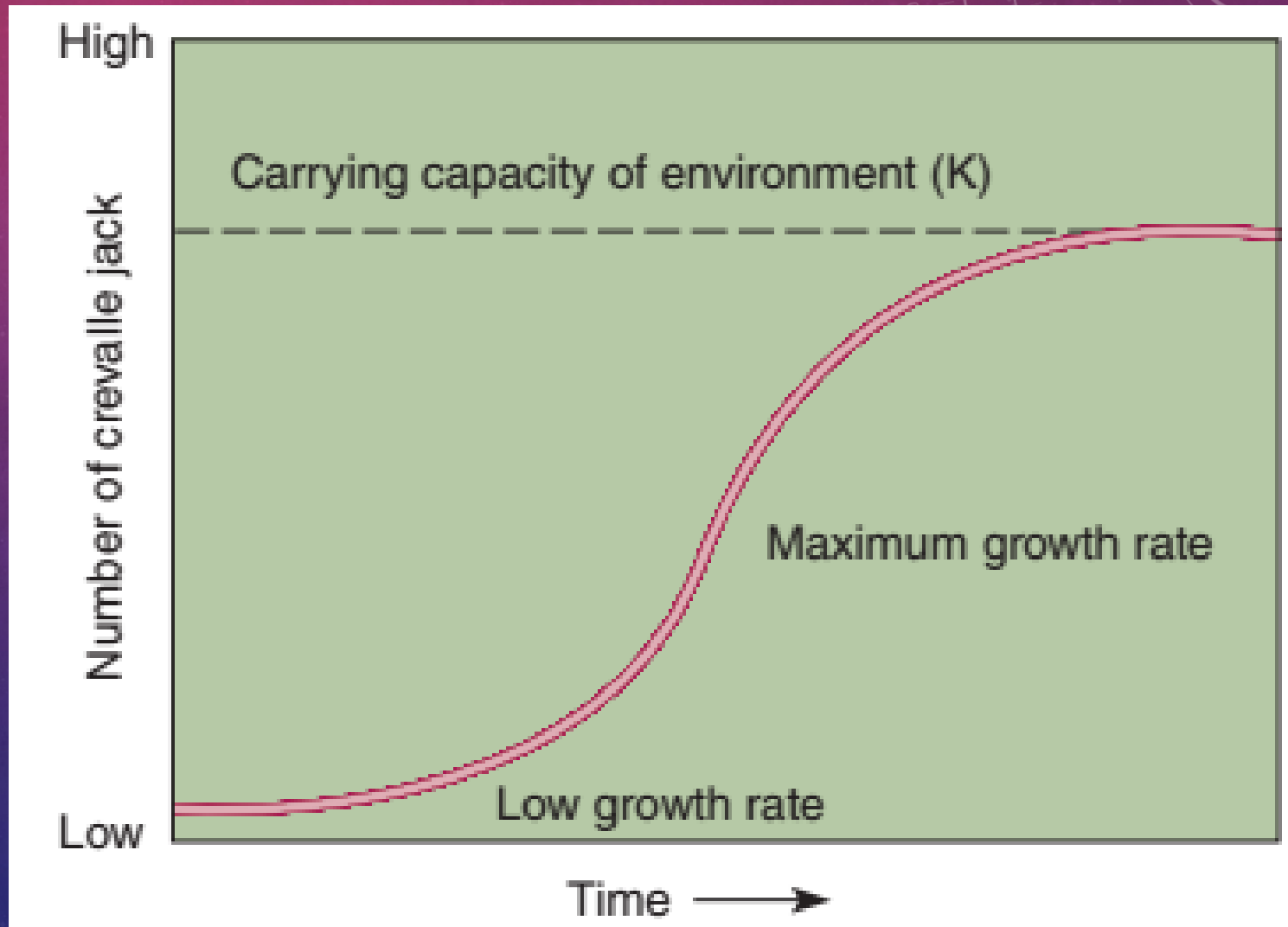
LOGISTICAL GROWTH CURVE (S-SHAPED)

- carrying capacity (K) The maximum number of individuals of a given species that a particular environment can support for an indefinite period, assuming there are no changes in the environment.



LOGISTICAL GROWTH CURVE (S-SHAPED)

- When a population affected by environmental resistance is graphed over a long period the curve has the characteristic S shape of logistic population growth.
- The curve shows an approximate exponential increase initially (note the curve's J shape at the start, when environmental resistance is low).
- The peak growth rate that occurs when the population is at half the carrying capacity, followed by a leveling out as the carrying capacity of the environment is approached.
- In logistic population growth, the rate of population growth is proportional to the amount of existing resources, and competition leads to limited population growth.



FACTORS THAT AFFECT POPULATION SIZE

Natural mechanisms that influence population size fall into two categories:

1. density-dependent factors

- Predation
- Disease
- Competition

2. density-independent factors

- Climate change



COMPETITION

- The interaction among organisms that vie for the same resources (such as food or living space) in an ecosystem.



COMPETITION

Interactions between two individuals can be defined as either

- intraspecific
 - interactions that occur between individuals of the same species
- interspecific
 - interactions that occur between two or more species



INTRASPECIFIC INTERACTION

COMPETITION

Interactions between two individuals can be defined as either

- intraspecific
 - interactions that occur between individuals of the same species
- interspecific
 - interactions that occur between two or more species





- **Competition** is an interaction of individuals wanting the same resource(s).
- It is usually a common resource that is in limited supply.

COMPETITION OVER FOOD



COMPETITION OVER SPACE

- Competition may not be so obvious in some cases.
- It can also be defined more broadly as the direct or indirect interaction of organisms that leads to a change in fitness when the organisms share the same resource.

THERE ARE THREE MAJOR FORMS OF COMPETITION.



- 1)interference competition**
- 2)exploitation competition**
- 3)apparent competition**

k/Evelyn Luo

THERE ARE TWO MAJOR FORMS OF REAL COMPETITION.

1) Interference competition

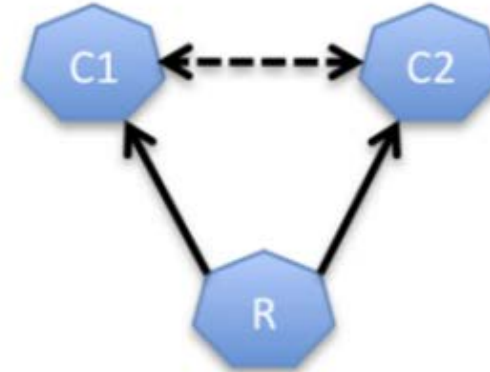
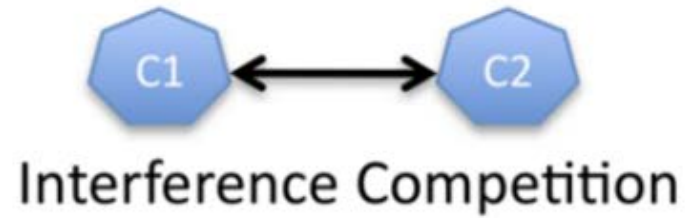
- Interference competition occurs directly between individuals

2) Exploitation competition

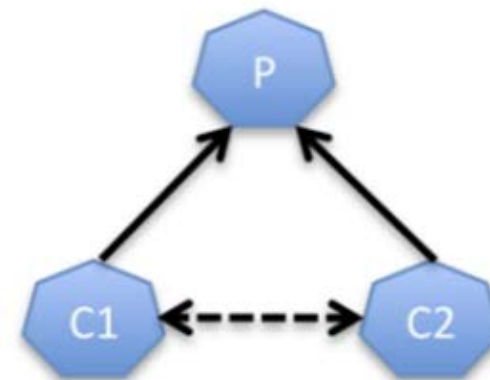
- Exploitation competition occurs indirectly between individuals

3) Apparent competition

- Apparent competition occurs indirectly between individuals that are both prey to a predator and not considered to be "real"



Exploitative Competition



Apparent Competition

Real Competition

INTERFERENCE COMPETITION

- We observe **interference competition** when individuals interact directly by fighting for resources.
- For example, when a male gorilla prohibits other males from accessing a mate by using physical aggression or displays of aggression, the dominant male is directly altering the mating behavior of other males.

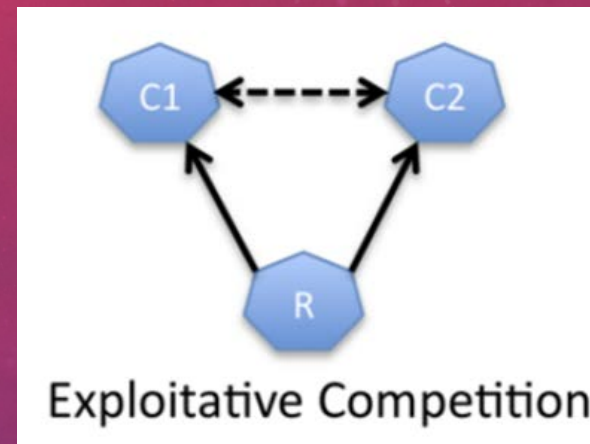


Interference Competition



EXPLOITATION COMPETITION

<https://www.youtube.com/watch?v=oArzMWiW8Pg>



- **Exploitation competition** is when individuals utilize the same resource(s) in a given area. In this interaction, they are not confronting one another with aggression.
- The use of the resource by one individual will decrease the amount available for other individuals.





COMPETITIVE EXCLUSION

What is competitive exclusion?

- Over time a superior competitor can OUT COMPETE an inferior competitor from an area.
- The better competitor takes over the area and the resources and the loser must find other territory or resources or go extinct.
- This phenomenon is called **competitive exclusion**.

COMPETITION DOES NOT ALWAYS HAVE TO LEAD TO COMPETITIVE EXCLUSION!

- There are 2 possible outcomes of competition.
 - 1) Competitive exclusion
 - One species takes over the territory and resources and excludes the other.
 - 2) Coexistence through Resource Partitioning
 - Allocates one set of resources in an area to one species and another set of resources to the other species.



RESOURCE PARTITIONING – COEXIST!

<https://www.youtube.com/watch?v=0w5-UfEi470>



- If an organism has a trait which provides them with a selective advantage (i.e. has an adaptive significance) in its environment, then natural selection can potentially favor it. Adaptive significance therefore refers to the beneficial qualities (such as in terms of increased survival and reproduction), any given modified trait conveys. For example, genetic differences between individuals may lead to behavioral differences, some of which in turn may drive differences in reproductive success, and ultimately over generations, the increased dominance of individuals with those favoured traits, i.e. evolution.

- Individuals are always in competition with others for limited resources, including food, territories, and mates. Conflict will occur between predators and prey, between rivals for mates, between siblings, mates, and even between parents and their offspring.