Decomposers recycle nutrients (matter) but ENERGY IS ALWAYS LOST

What does this mean to us

- Stable ecosystems have a continual input of energy
- And more producers than consumers

- It takes less energy to produce plants than it does animals

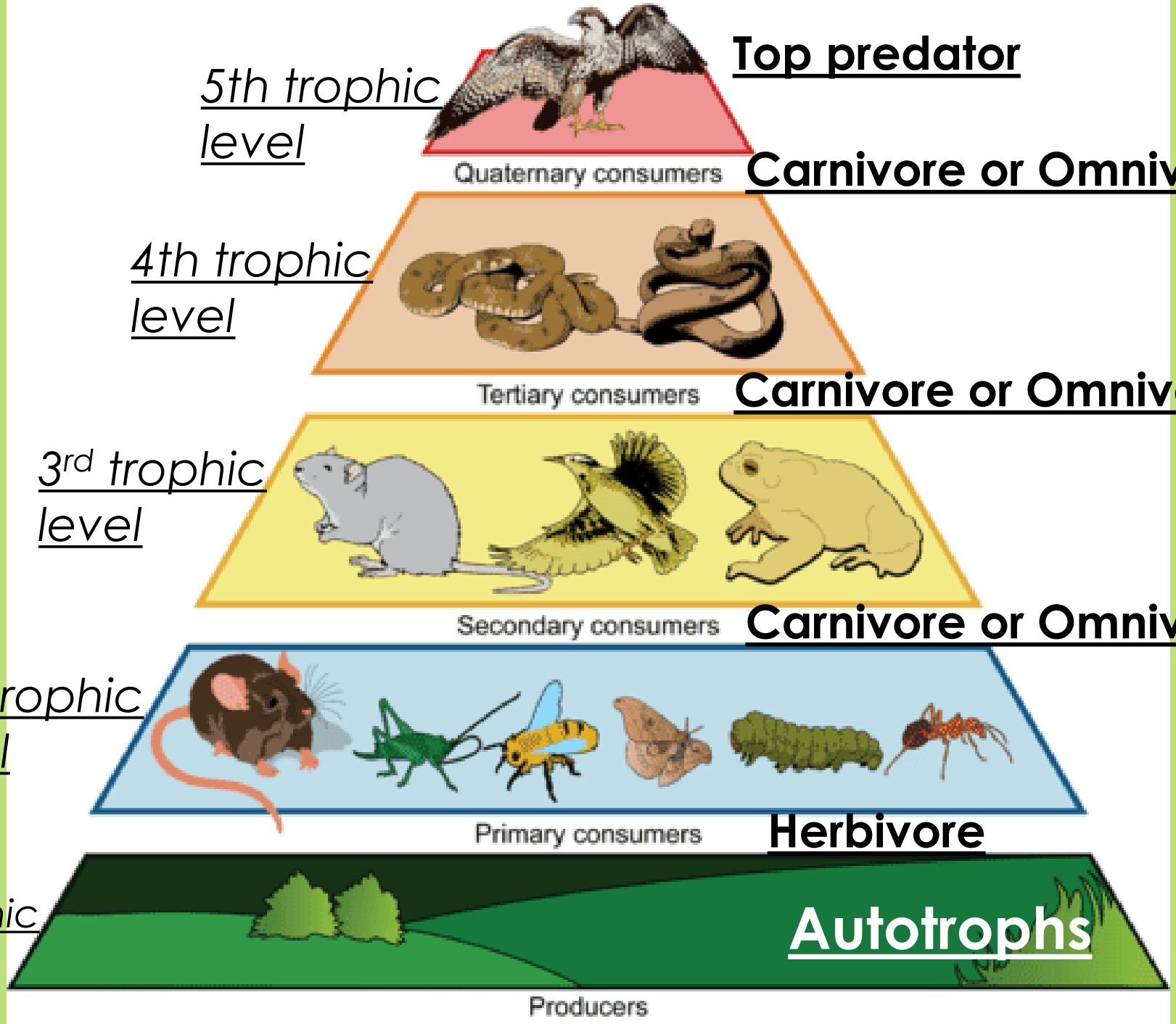
- Eating diet containing a lot of meat uses more energy and more land space to produce

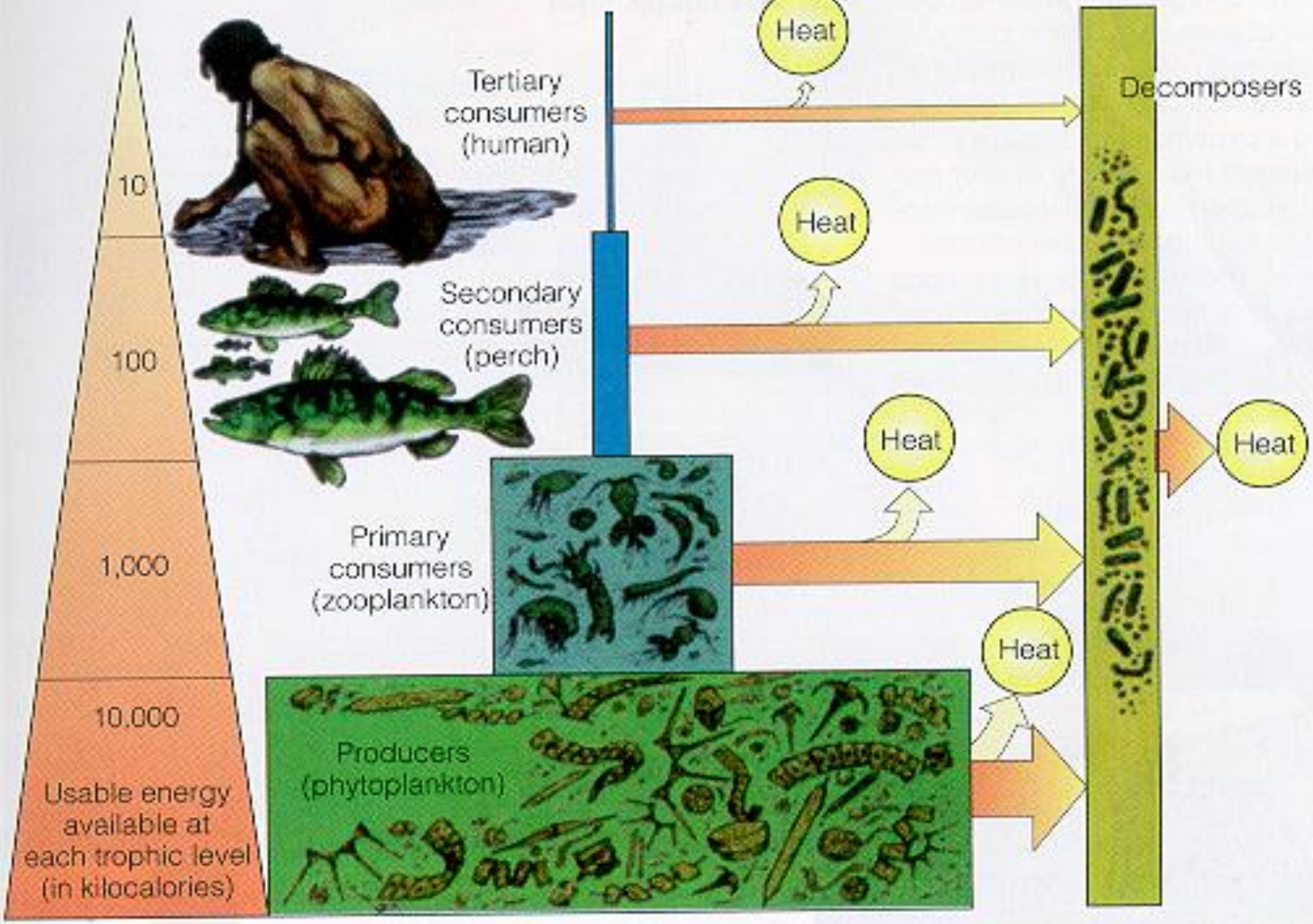
What do the next 3 organisms have in common?


TOP PREDATORS

WHAT MAKES SOMETHING A TOP PREDATOR?

No natural enemies


5th trophic level
Top predator
Quaternary consumers
Carnivore or Omnivore
4th trophic level
Tertiary consumers
Carnivore or Omnivore
3rd trophic level
Secondary consumers
Carnivore or Omnivore
2nd trophic level
Primary consumers
Herbivore
1st trophic level
Autotrophs
Producers


Heat
Tertiary consumers (human)
Decomposers
10
Heat
Secondary consumers (perch)
100
Heat
Heat
Primary consumers (zooplankton)
1,000
Heat
10,000
Producers (phytoplankton)
Usable energy available at each trophic level (in kilocalories)

Energy is lost as you go up the food chain

Decomposers recycle nutrients but

ENERGY IS ALWAYS LOST


Stable ecosystems have a
continual input of energy


Stable ecosystems have more producers than consumers
It takes less energy to produce plants than it does animals

WHY?

Need to grow energy and more land space to produce food for the animal → meat

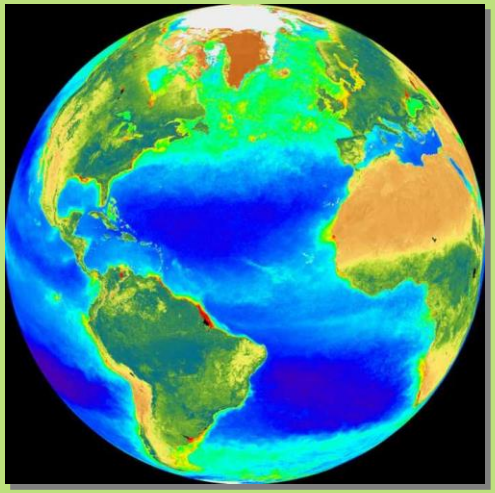
LET’S GET BACK TO ENERGY

MAKE A MODEL of how you think PHOTOSYNTHESIS works.

HOW DO PLANTS PRODUCE ENERGY?

Unit 2: part 3
Population Ecology

Smallest to biggest

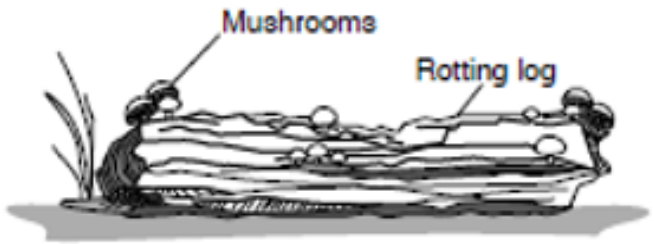


- Population →
- Community →
- Ecosystem →
- Biosphere

2. Which cell structure would be found in plant cells, but not in animal cells?

a) Cell membrane
b) Nucleus
c) Mitochondria
d) Chloroplast

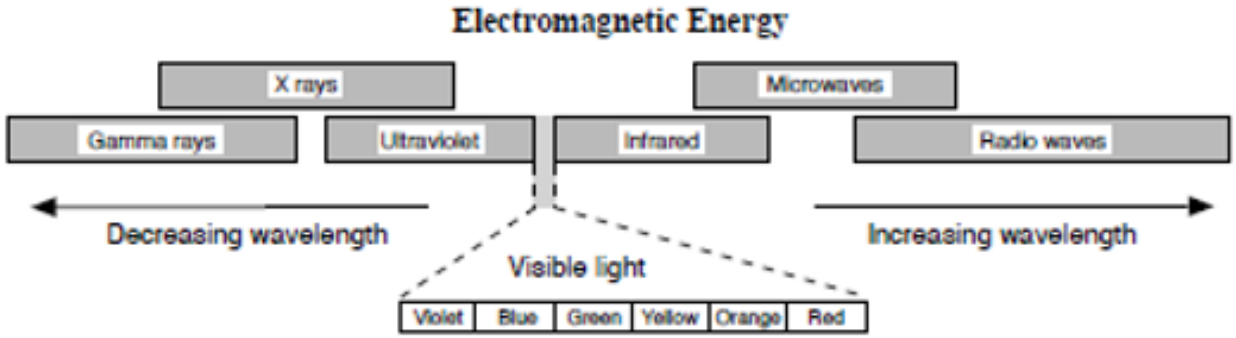
3) The diagram below shows mushrooms, a type of decomposer, growing on a rotting log.



Which is true about the relationship between the mushroom and the log

a. The log uses the mushrooms as a source of oxygen
b. The log uses the mushrooms as a food source
c. The mushrooms use the log as a source of oxygen
d. The mushrooms use the log as a food source

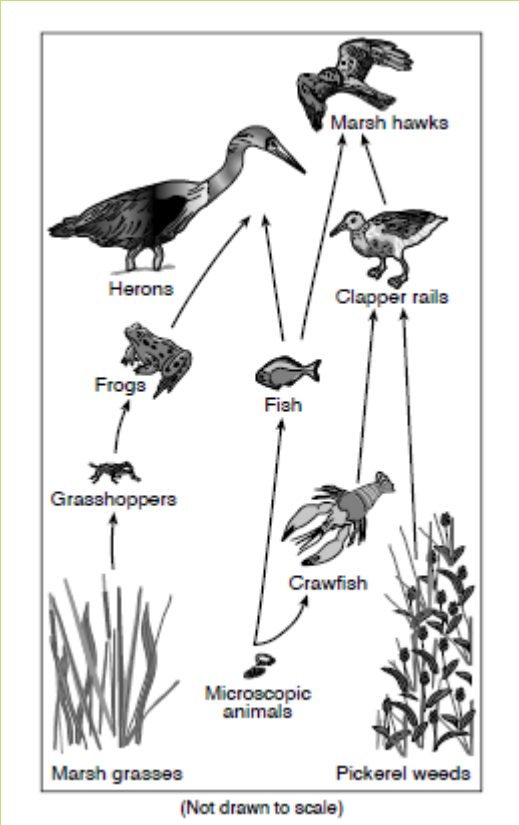
4) The model below represents the relative wavelengths of different forms of electromagnetic energy.



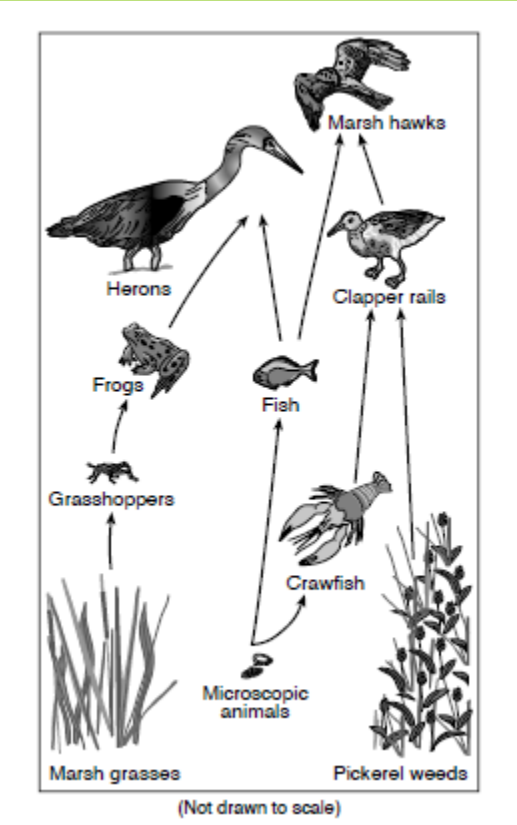
List two forms of electromagnetic energy that have shorter wavelengths than visible light.

a. _____

b. _____



- Identify 2 organisms that belong to the plant kingdom



- Explain one reason why the population of marsh grass might increase if the populations of herons decreased

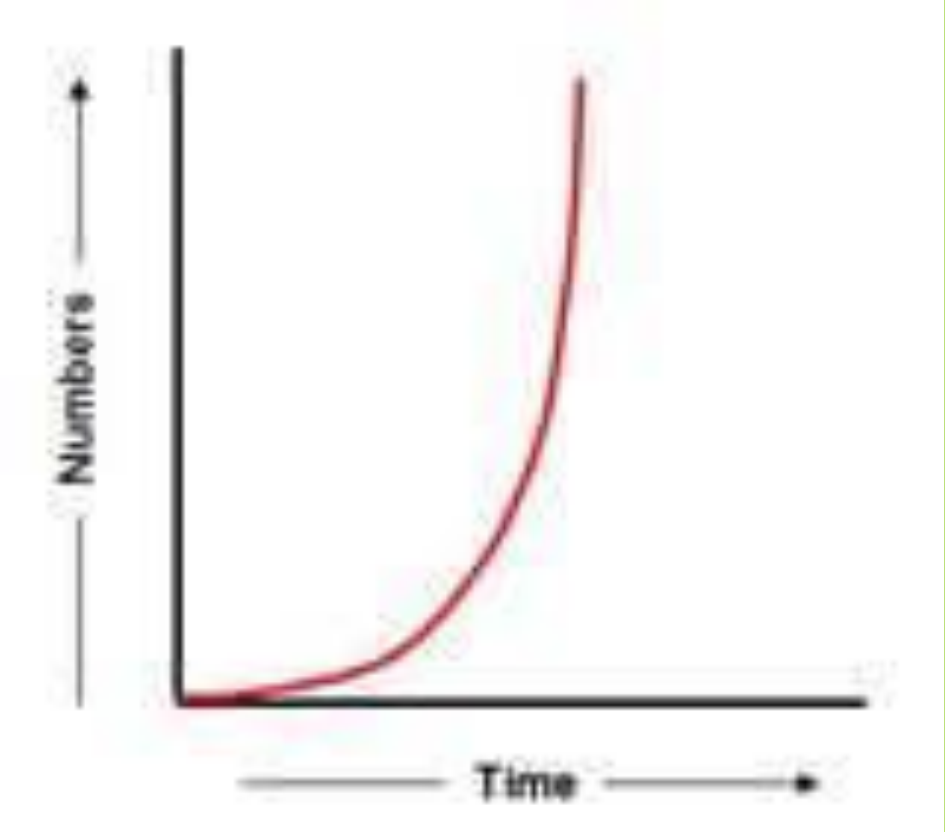
Review

1. Food chains show energy flow through ecosystems
2. Energy goes in one direction in ecosystems
3. Energy is always lost as it flows through ecosystems
4. To be stable energy always has to be added to ecosystems
5. Energy for most ecosystems comes from the sun

Population Dynamics

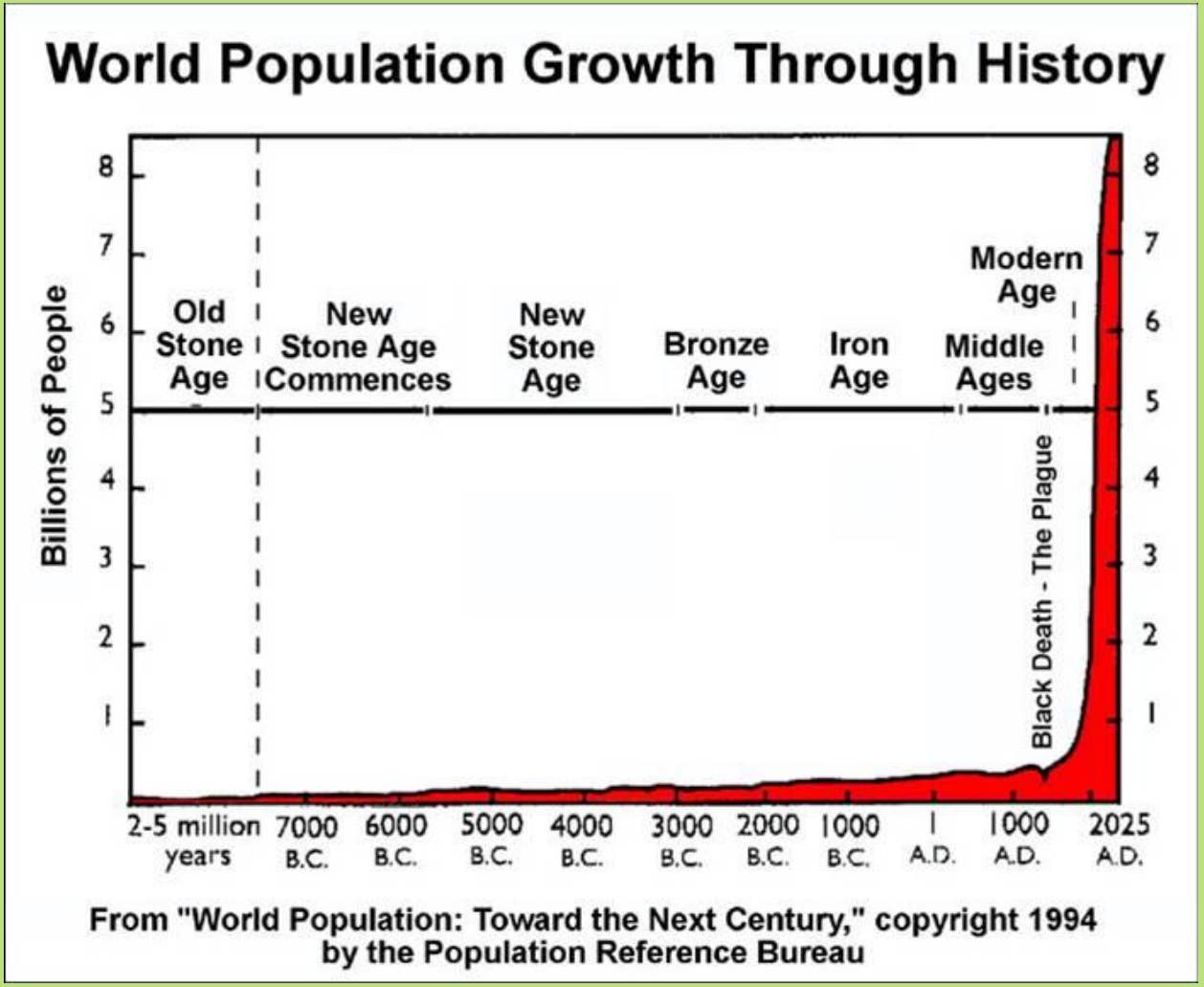
All populations have the potential for exponential growth

- 1→
- 2→
- 4→
- 8→
- 16→
- 32→
- 64→…

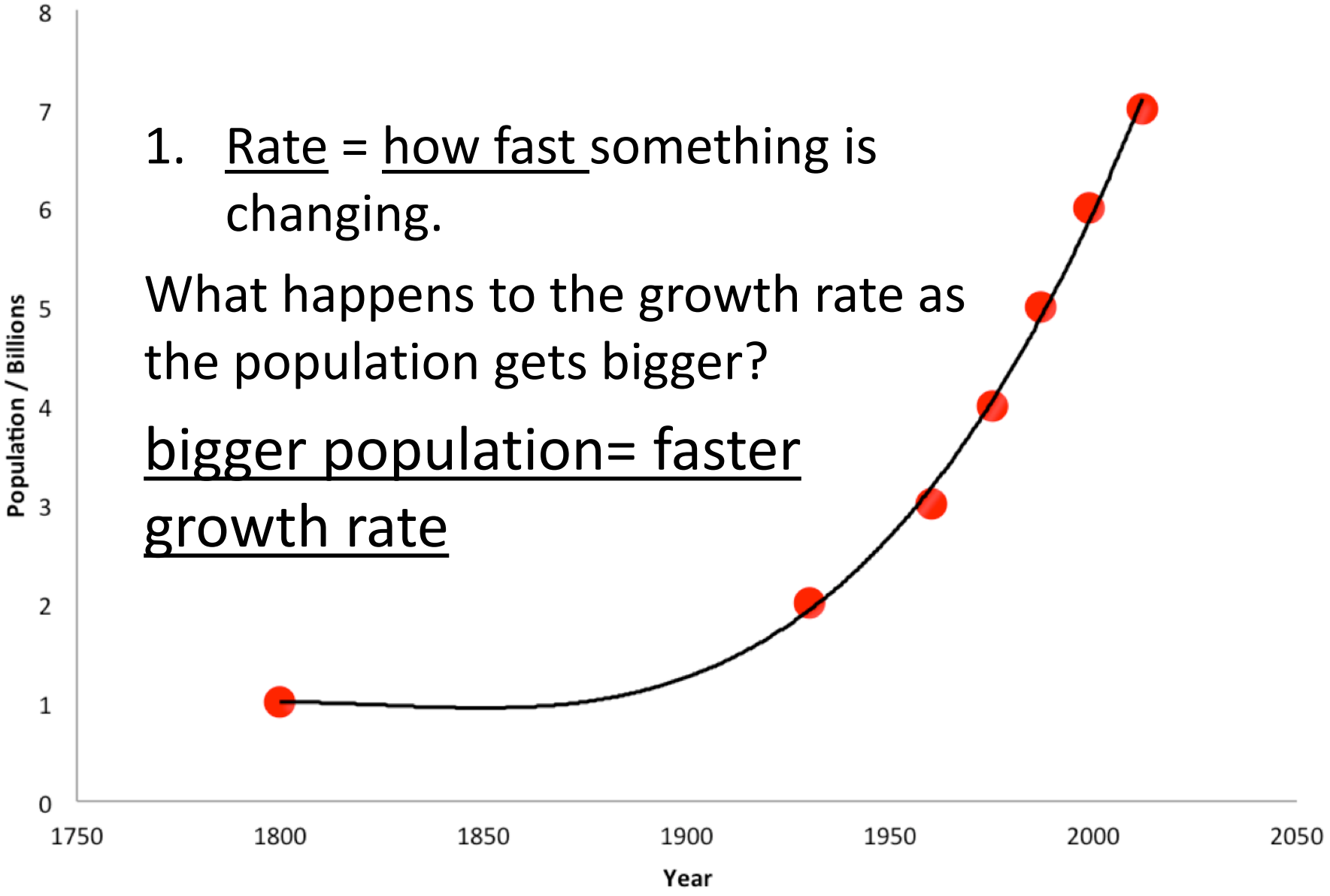


Human Population Growth

- World population
- 1 bil 1804
- 2 bil 1927 (123yrs)
- 3 bil 1960 (33 yrs)
- 4 bil 1974 (14 yrs)
- 5 bil 1987 (13 yrs)
- 6 bil 1999 (12 yrs)
- 7 bil 2012 (13 yrs)



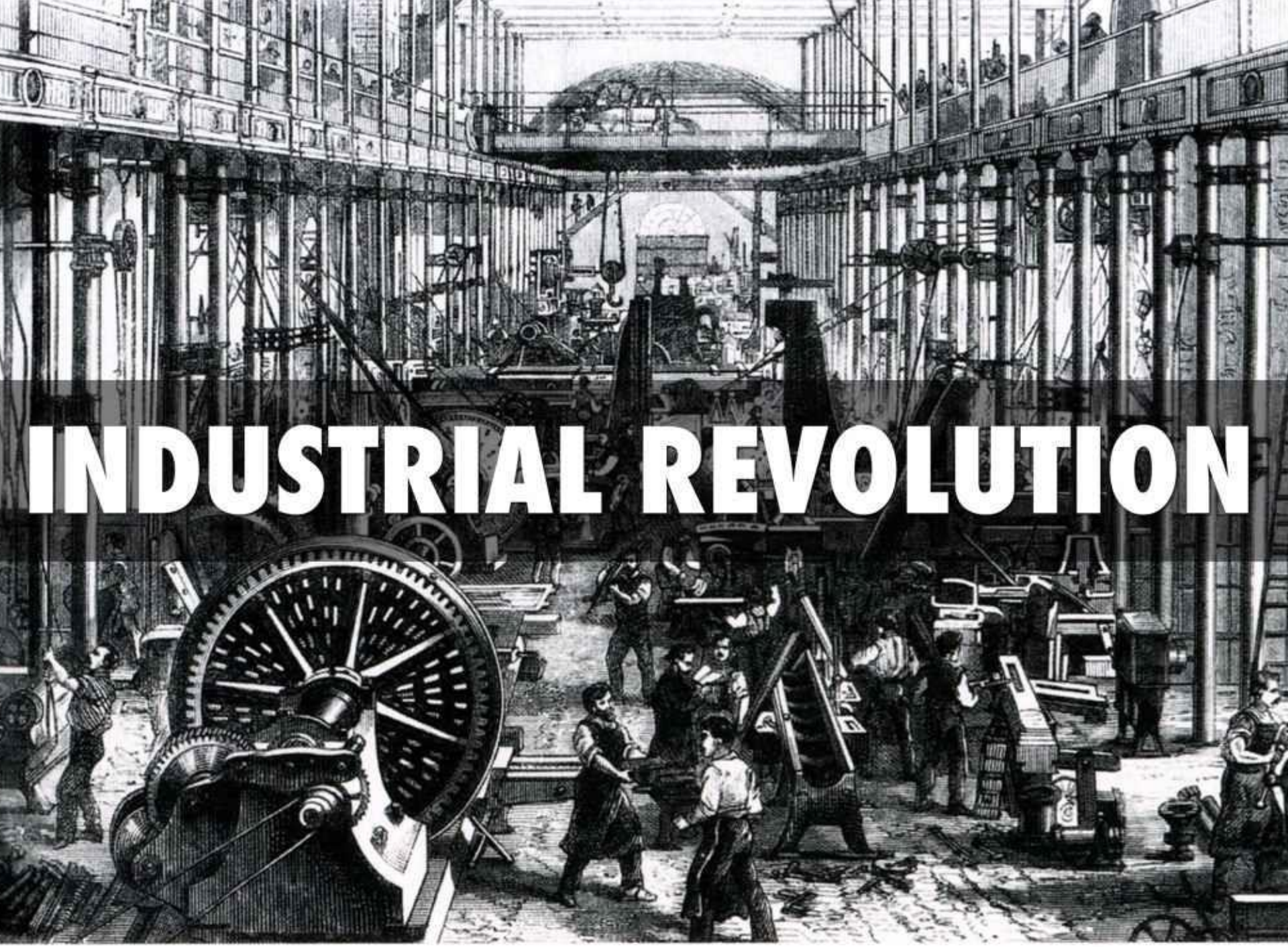
Human Population Growth



1. Rate = how fast something is changing.

What happens to the growth rate as the population gets bigger?

bigger population= faster growth rate



INDUSTRIAL REVOLUTION

3. Then again in the 1950's the growth rate increased again. What might have been the cause of this spike?
   – <u>better sanitation and medicines</u>

Limiting factors anything that prevents a population from growing too large

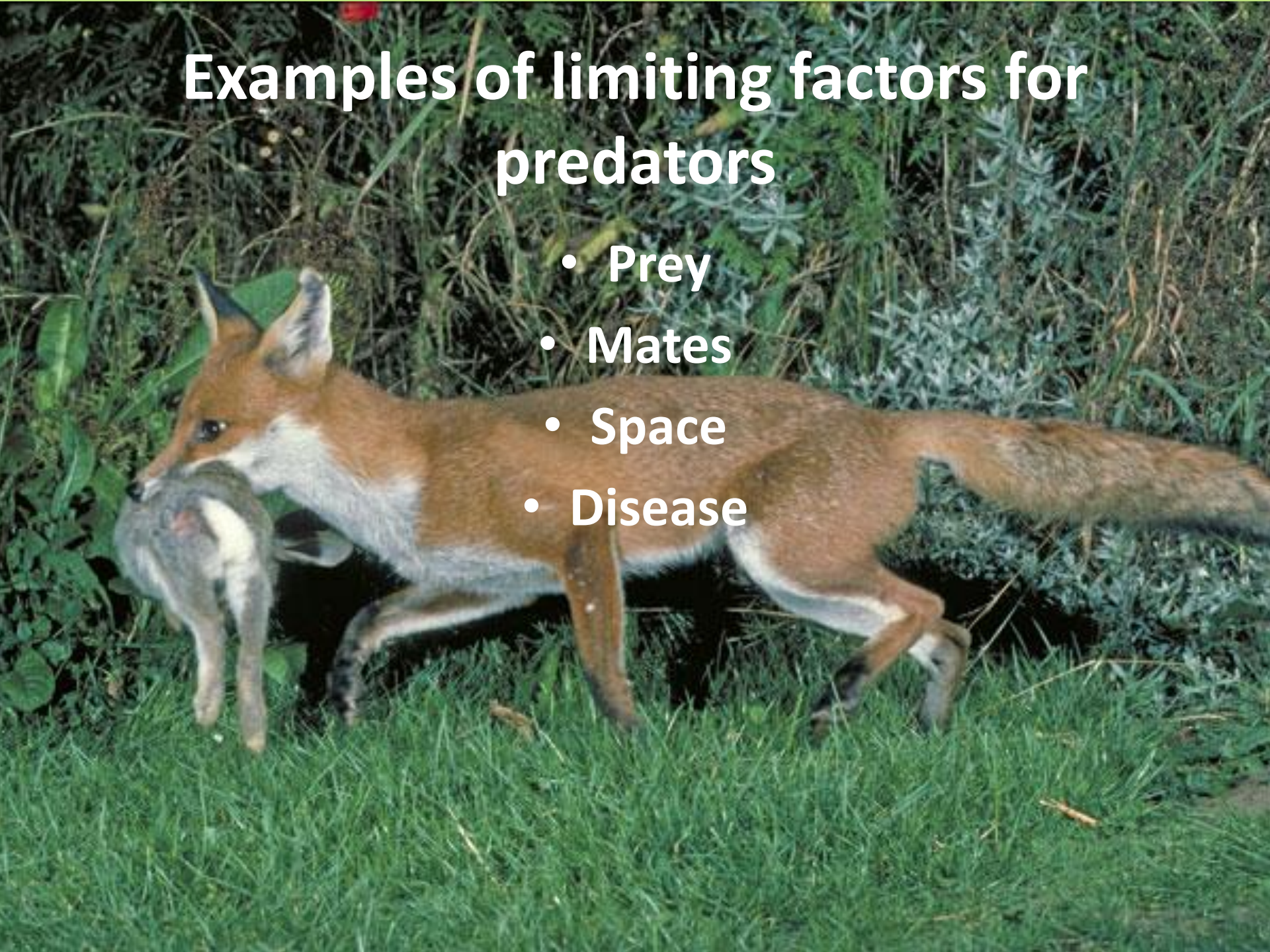
- Examples:
  - Food
  - Space
  - Oxygen
  - Nutrients
  - Disease
  - Light (for plants)

Examples of limiting factors for algae

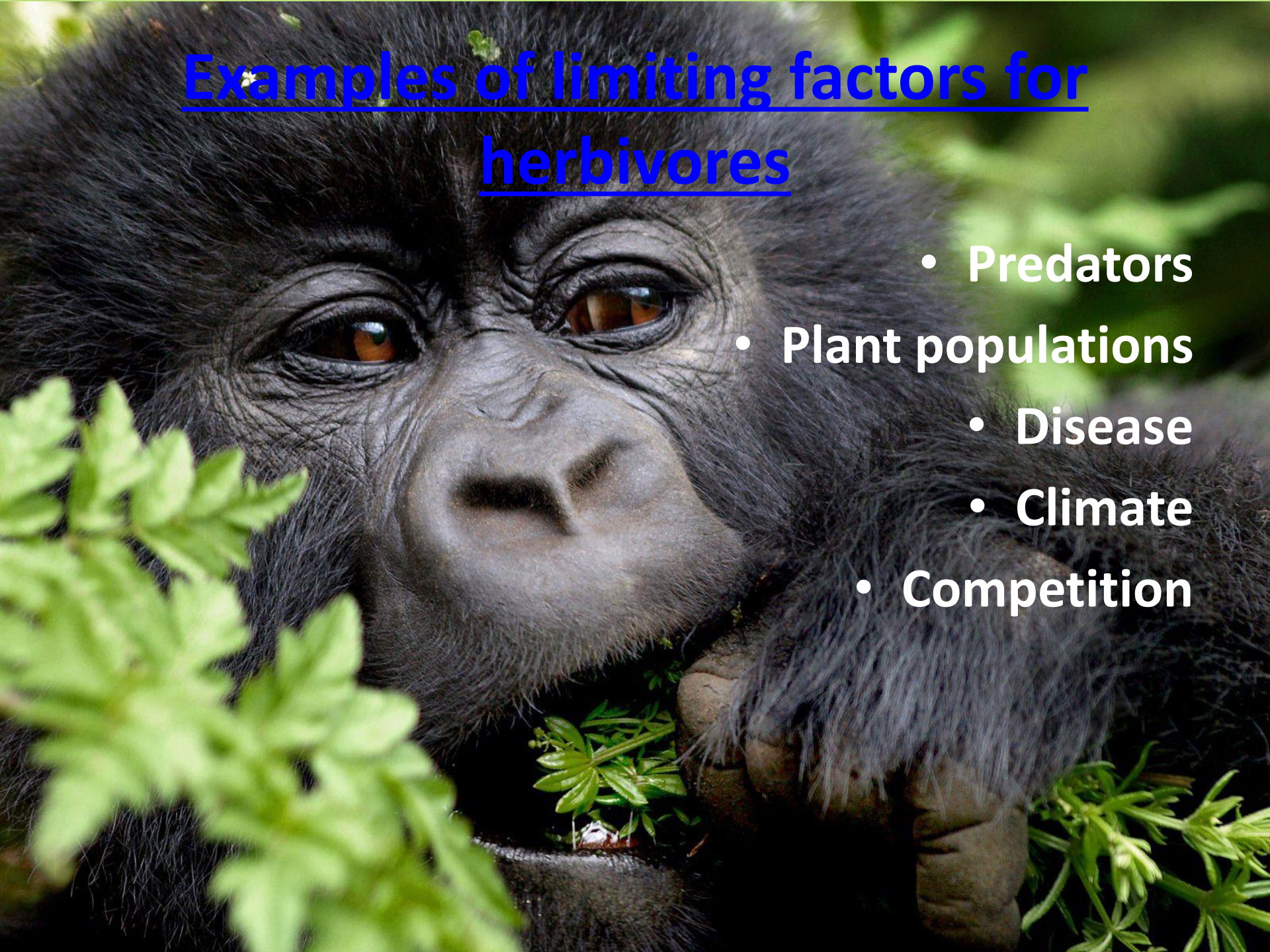
- Sunlight
- N and P
- Salt
- Water
- Temperature

Examples of limiting factors for predators

- Prey
- Mates
- Space
- Disease



Examples of limiting factors for herbivores



- Predators
- Plant populations
- Disease
- Climate
- Competition

Vocabulary

Moose habitat

Penguin habitat

Define habitat

- Where an organism lives

Niche = an organisms job or role

Examples

Bees pollinate flowers


Worms aerate soils

Predators control prey populations

Decomposers recycle nutrients

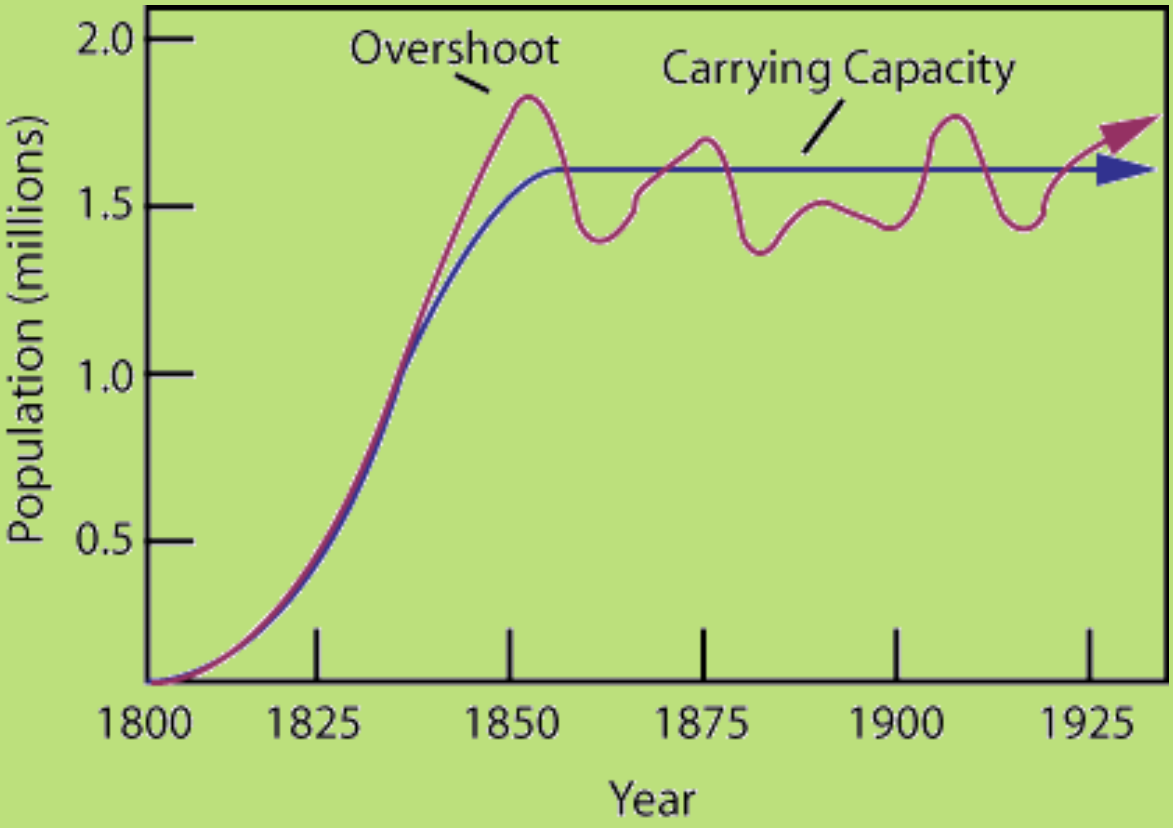
What happens when organisms live in the same habitat and occupy the same niche?


8

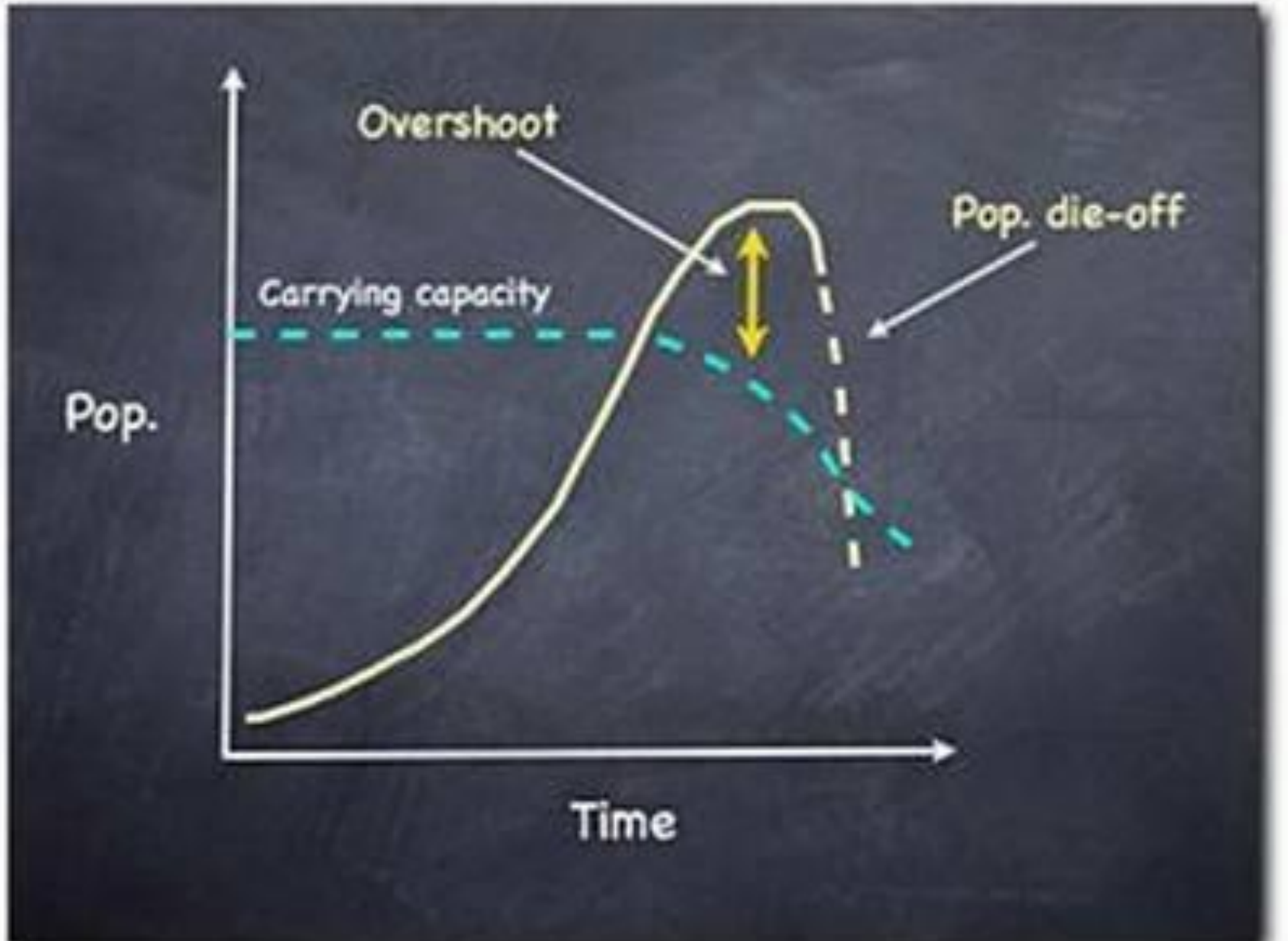

Competition = fight for resources

Carrying capacity

- Maximum # individuals an ecosystem can support



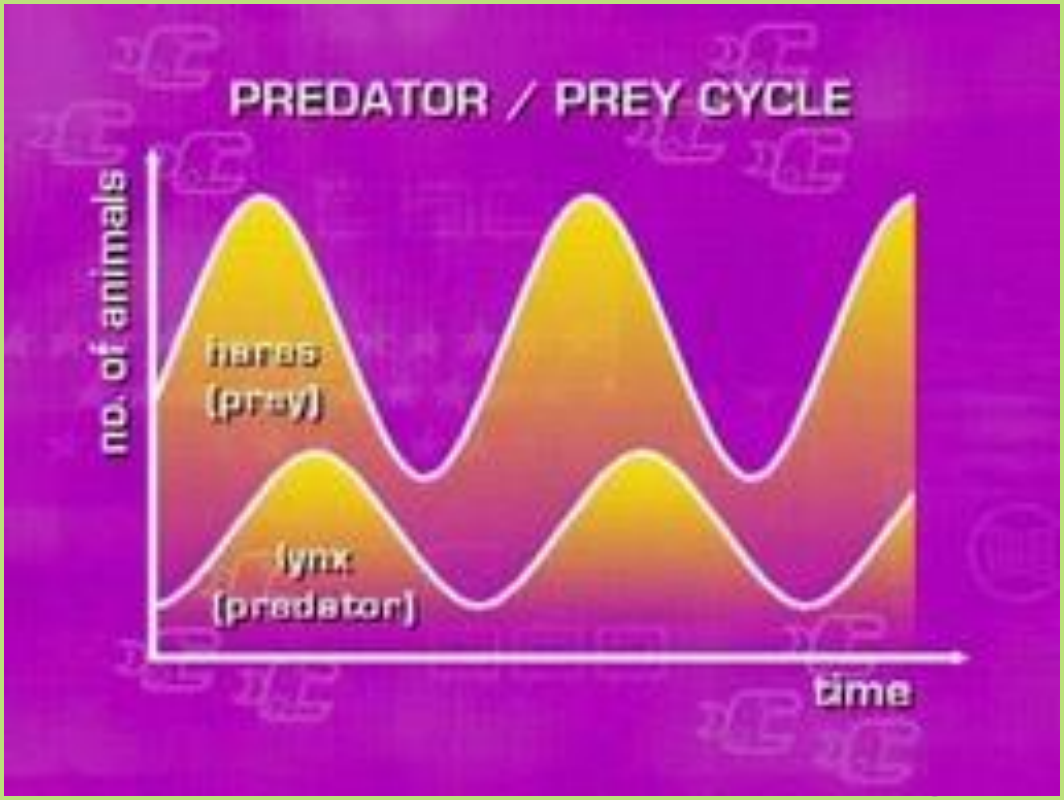
What happens when populations go past the carrying capacity???


Overshoot
Pop. die-off
Carrying capacity
Pop.
Time

Living things interact with each other → community

Relationships between species

- Predator / Prey
  - Predator = hunter
  - Prey = hunted
  - Need to have more prey then predators to be stable



http://www.bbc.co.uk/wales/eclips/pages/eng_11to14_bio_livingthings_prey.shtml

Symbiotic Relationships

- Close association of 2 species
  - Direct Contact
  - At least one organism benefits

- 3 types
  - Mutualism,
  - commensalism,
  - parasitism

Mutualism

- Mutualism (+,+)
- Both organisms benefit

http://www.sciencephoto.com/media/13087/enlarge

Examples: nitrogen fixing bacteria on roots of plants


Anemone/Clownfish
Clownfish gets protection
Anemone gets food

Commensalism

- <u>Commensalism (+, 0)</u>
- One organism benefits, other organism remains unharmed
- Example:

<u>Barnacles/ Whale</u>

Barnacles Of A Humpback Whale © PhotoJour

Example Commensalism:

- Epiphytes on trees in the rainforest

Parasitism

- Parasitism (+, -)
- One sided relationship
- Parasite benefits, the other (HOST) is harmed
- Example

Dog/tick

Lamprey on a fish

Insects can carry parasitic disease causing organisms

- Examples
- Mosquitoes carry West Nile Virus and malaria parasites
- Deer ticks carry bacteria → lyme disease

Pathogen

- Pathogen = disease causing organism
- Examples
  - Virus = influenza virus, HIV, ebola virus
  - Bacteria = Streptoccocus bacillus, E. Coli
  - Protist = Plasmodium → Malaria, Giardia

Key ideas

- Plants and animals depend on each other and their physical environment.

- Human decisions and activities have had a profound impact on the physical and living environment.

Key vocabulary

- Adaptations =
- Any characteristic or trait that helps an organism survive

Review Questions

1. What is the difference between a population and a community?
2. Define limiting factor and give an example
3. Draw an example of a food web for the following community
   - mice, rabbits and deer are both eating grasses in a field, mice are the main food for owls and kestrels, coyotes eat mainly deer but will also feed on mice and rabbits
4. State what will happen to this community if the coyotes are removed