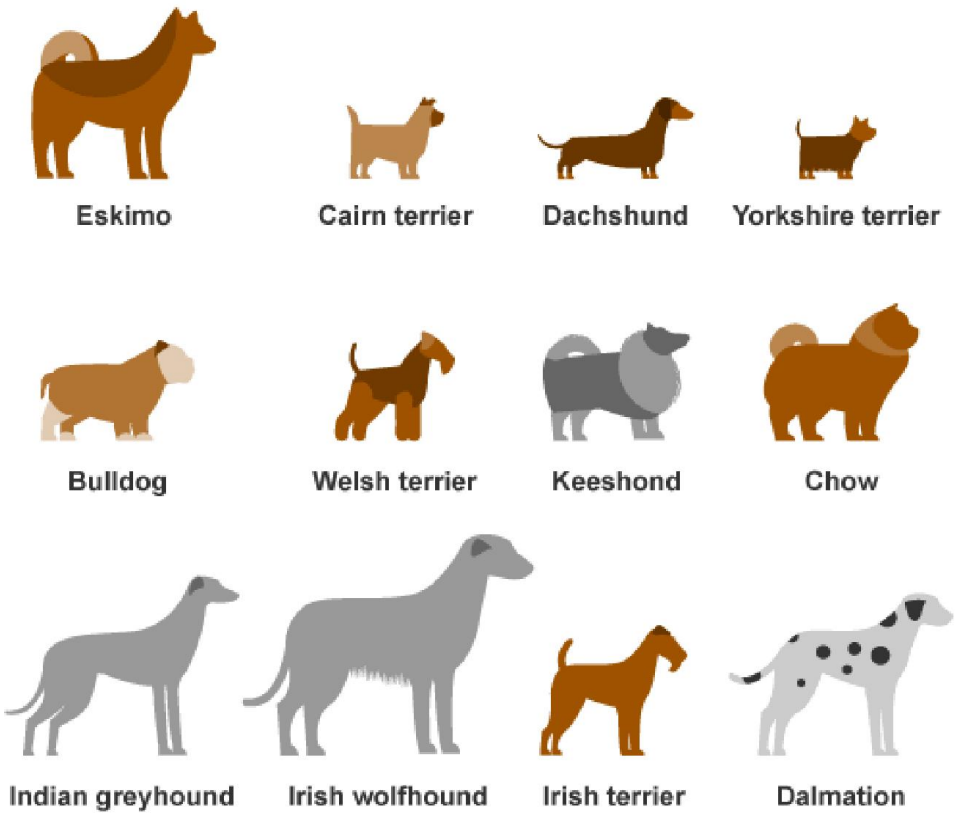
Population

Species

- A group of organisms so similar to one another that they can breed and produce fertile offspring.

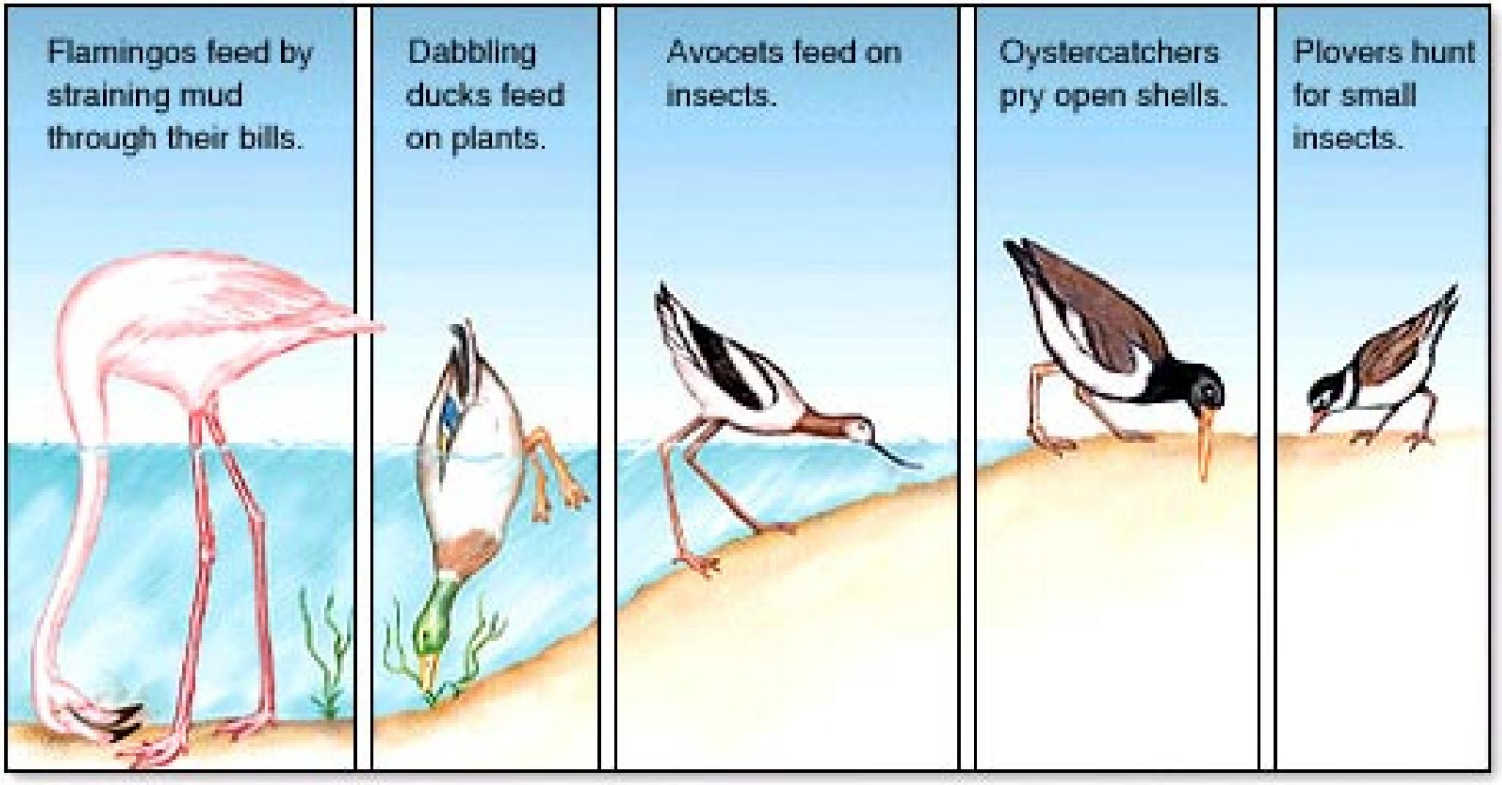


Population

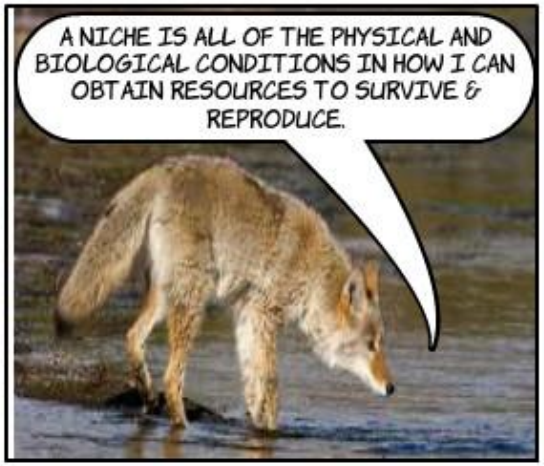
- All members of a species that live in the same geographic area.

Habitat vs. Niche

- Habitat - the area where a species lives.
- Niche – how a species lives (function) in that habitat



What is the coyote habitat and niche?



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What determines a niche?

- The niche is influenced by **biotic factors** (food, predators, mates) and **abiotic factors** (temperature, sunlight, water).
- The number of different niches is determined by the abiotic factors in an environment.

How do predators impact a niche?

- Predators increase niche diversity by decreasing prey population size.
- A predator that promotes a great niche diversity is called a **keystone predator**.
- A predator without its own predator is called an **apex predator**

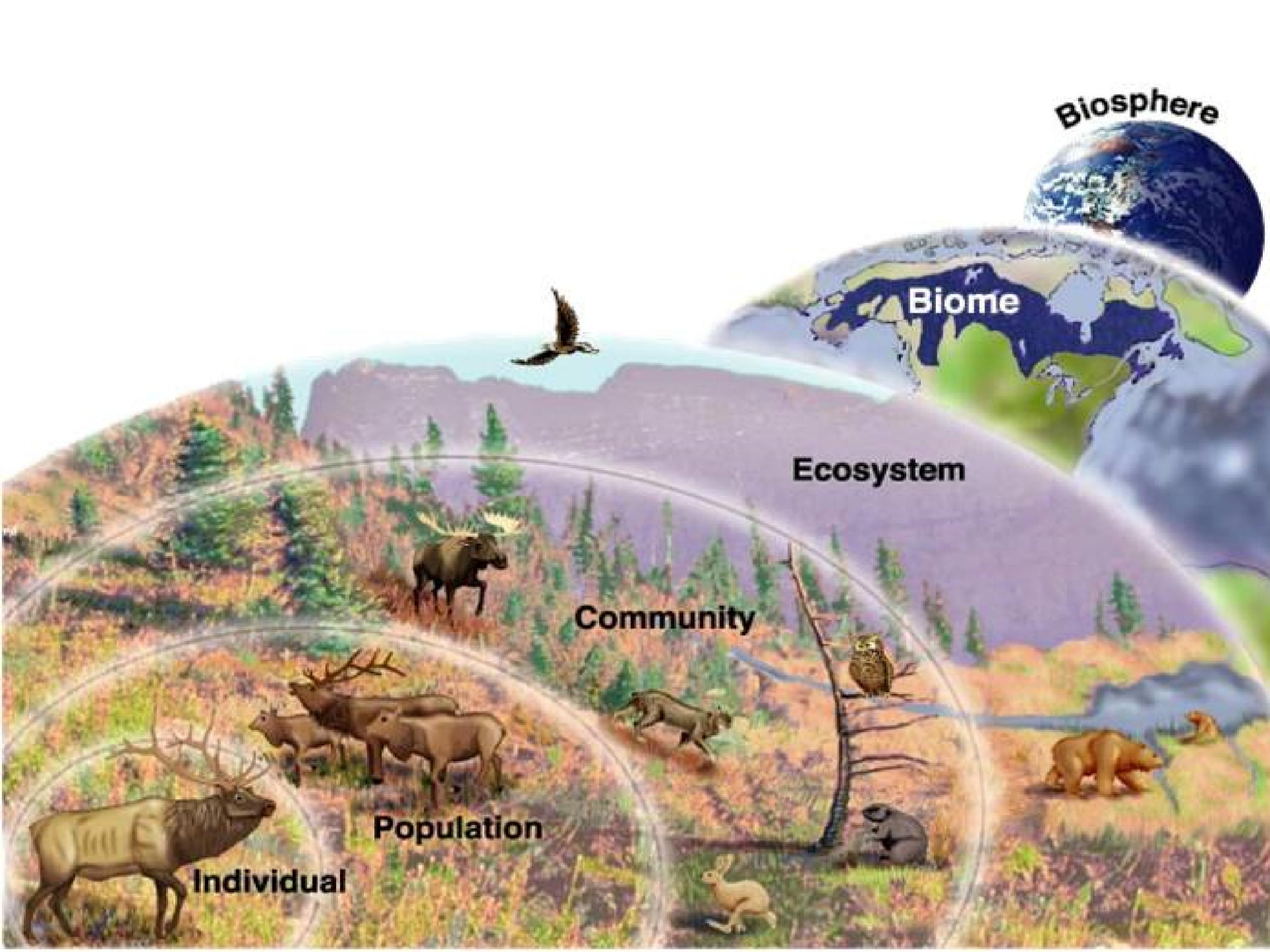
Community

- All the different populations that live and interact in the same area.

Ecosystem

- Includes all the communities in an area, as well as the abiotic factors in the environment.

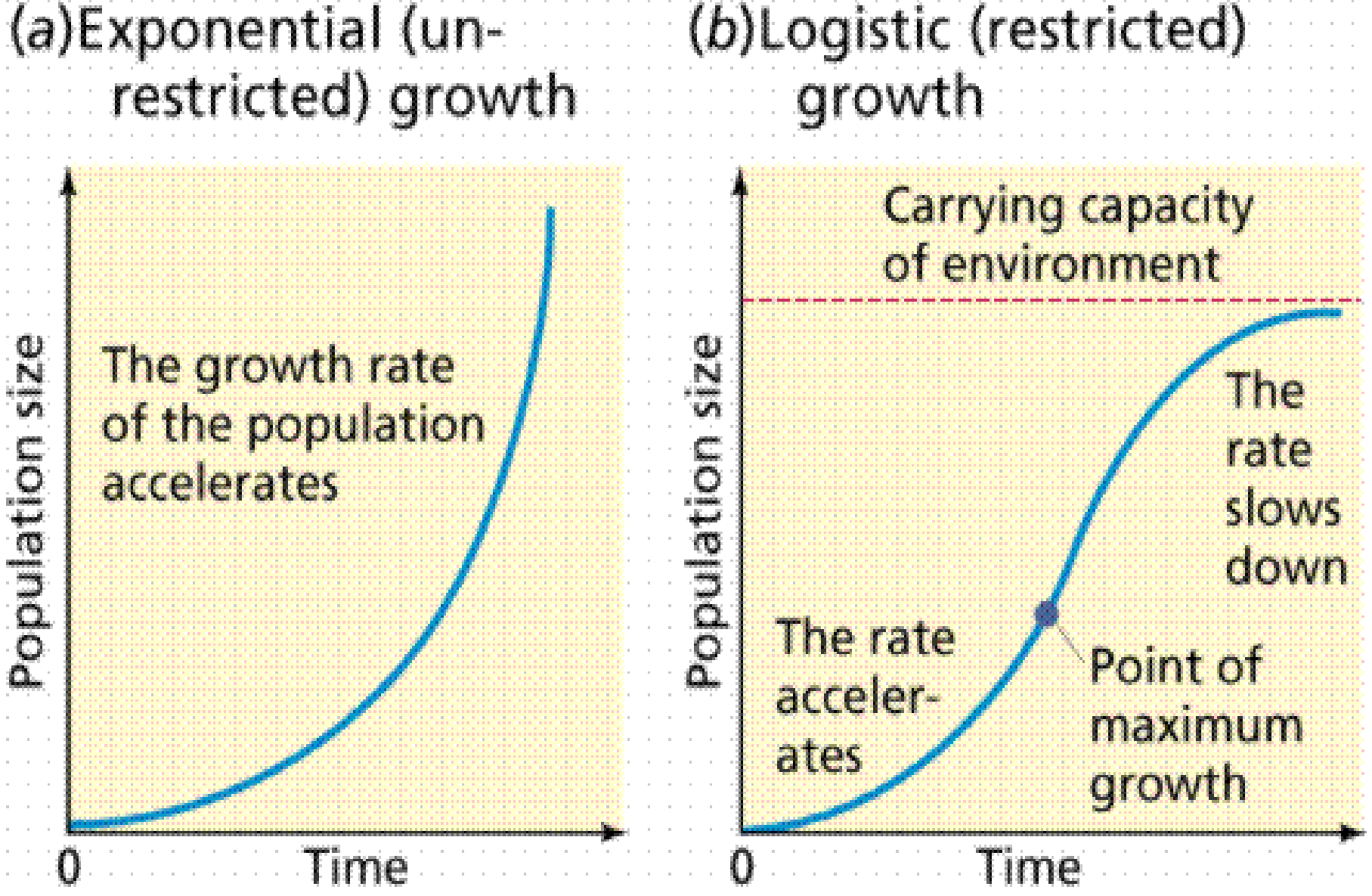
- **Biotic factors**: Living factors (predation, competition etc.)
- **Abiotic**: Non-living factors (temperature, disease etc.)


Biosphere
Biome
Ecosystem
Community
Population
Individual

Population Control

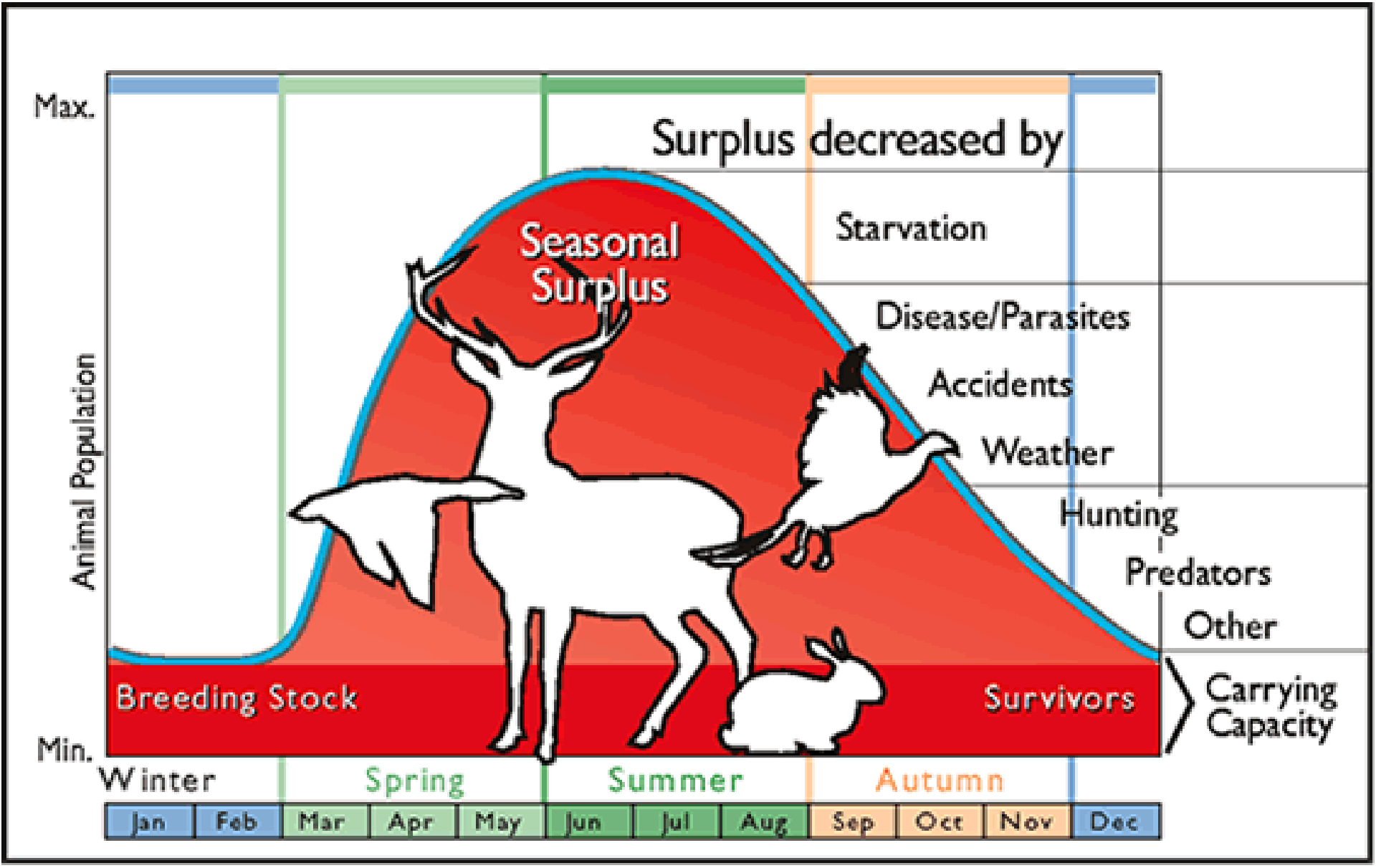
- Populations have the reproductive ability to produce unrealistically large populations.
  - This is called **exponential growth**

- Some populations sizes are restricted by a **carrying capacity** - the maximum population size of the species that the environment can sustain
  - This is called **logistic growth**


(a)Exponential (un-restricted) growth
Population size
The growth rate of the population accelerates
0
Time
(b)Logistic (restricted) growth
Carrying capacity of environment
Population size
The rate slows down
The rate acceler-ates
Point of maximum growth
0
Time

What factors limit population growth?

- **Biotic potential** is the maximum capacity of an individual or population to reproduce under optimal environmental conditions.
- Limits to the biotic potential are caused by:
  - Disease
  - Predation
  - Restricted food resources


Max.
Min.
Animal Population
Surplus decreased by
Seasonal Surplus
Starvation
Disease/Parasites
Accidents
Weather
Hunting
Predators
Other
Breeding Stock
Survivors
Carrying Capacity
Winter
Spring
Summer
Autumn
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Carrying Capacity

- Most populations stop growing when they reach their carrying capacity. Limiting factors include:
  - **Density-dependent factors**: predation, parasitism, disease, food competition, living space, water availability
  - **Density-independent factors**: climate, human disturbance, natural disasters

What are some limiting factors for human populations?

- Famine, Disease, War, Birth control
- 3 surges of human growth due to…
  - Tool development (efficient hunting)
  - Agriculture (dependable food supplies)
  - Health care, industrialization, and technology

Humans are the only species that have been able to grow so large due to our ability to manipulate the environment

Exponential Growth

Although it had taken all of human history until around 1800 for world population to reach one billion,

- the second billion was achieved in only 130 years (1930)
- the third billion in less than 30 years (1959)
- the fourth billion in 15 years (1974)
- the fifth billion in only 13 years (1987)

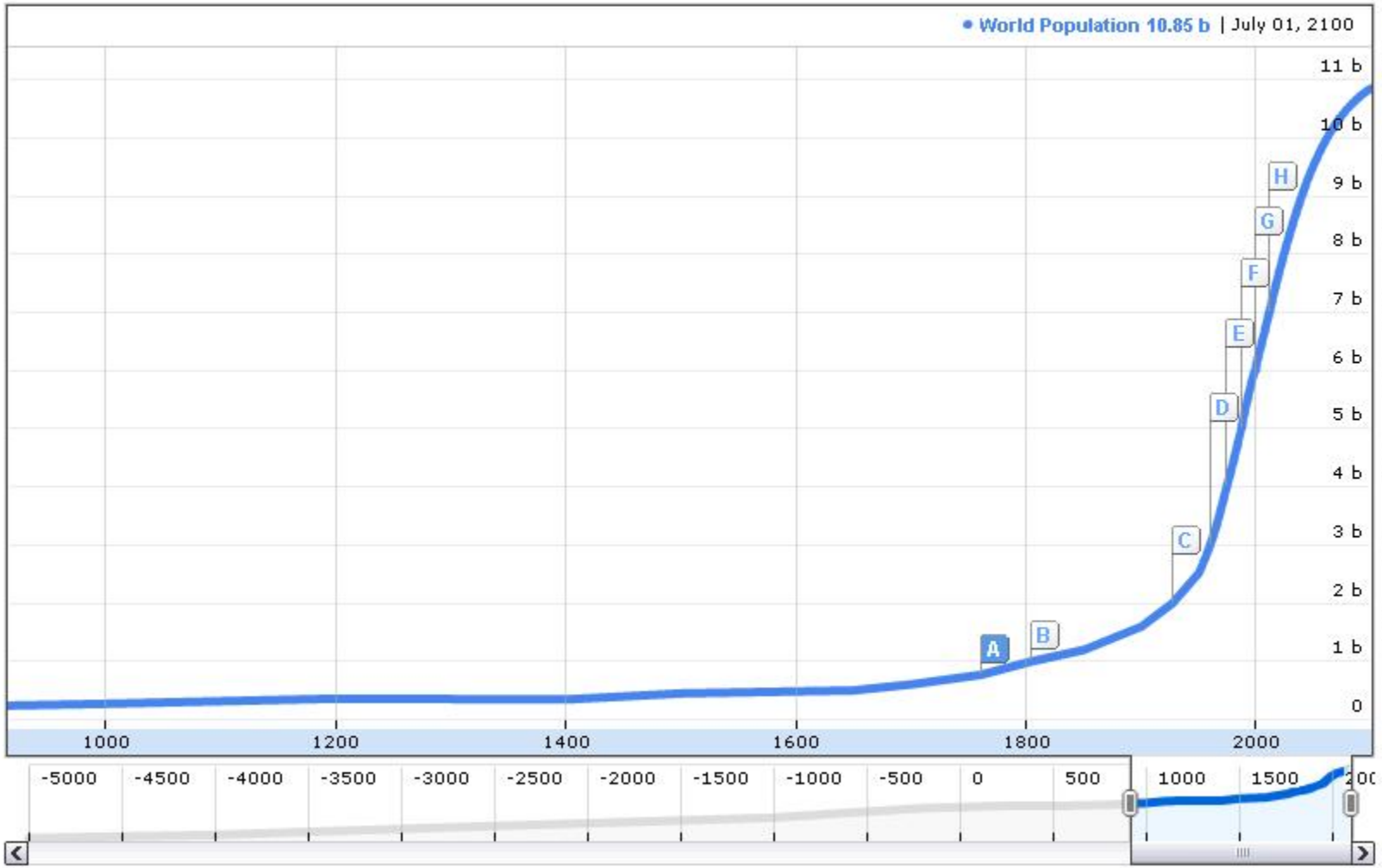
Currently at: 7,279,955,575 @ 3:30pm 12/9/14

Summary Table

	1 - 1804 (**1803 years**): 0.2 to 1 bil.						1804 - 2011 (**207 years**): from 1 billion to 7 billion																
Year	1	1000	1500	1650	1750	1804	1850	1900	1927	1950	1960	1974	1980	1987	1999	2011	2020	**2024**	2030	2040	2050	2062	2100
Pop, (billions)	0.2	0.275	0.45	0.5	0.7	**1**	1.2	1.6	**2**	2.55	**3**	**4**	4.5	**5**	**6**	**7**	7.7	**8**	8.4	**9**	9.5	**10**	10.8

World Population: Past, Present, and Future

(move and expand the bar at the bottom of the chart to navigate through time)



H. 7 Billion
2011-10-31

G. 6 Billion
1999-10-12

F. 5 Billion
1987-7-11

E. 4 Billion
1974-7-20

D. 3 Billion
1960-1-1

C. 2 Billion
1927-7-1

B. 1 Billion
1804-8-1

A. Industrial Revolution
1760-7-1

The chart above clearly illustrates how world population has changed in history.

Estimating Population Size

1. Tag and Release or Mark and Recapture

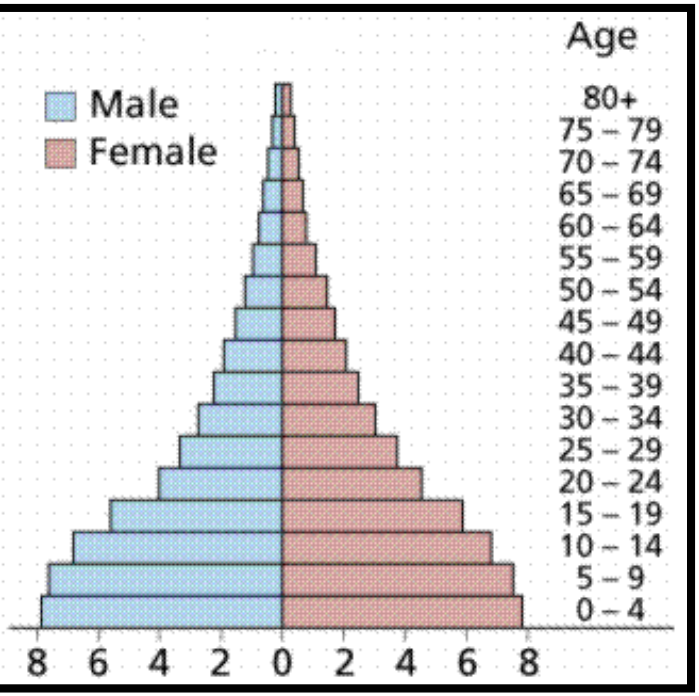
2. Quadrant Sampling
   - Random (reduce bias)
   - Representative (large so the estimate is as accurate as possible) 10 quadrants = 10% of actual area
3. Census


TAG AND RELEASE:
data tag is inserted into fish,
the fish is then released
jon schwartz photo

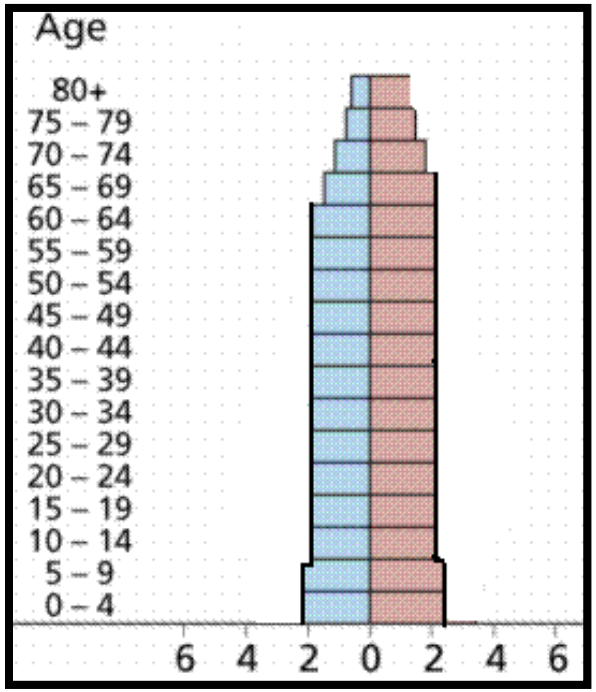
Population Histogram

Histograms - useful for studying human populations because they help us see trends in population data and they help us make predictions

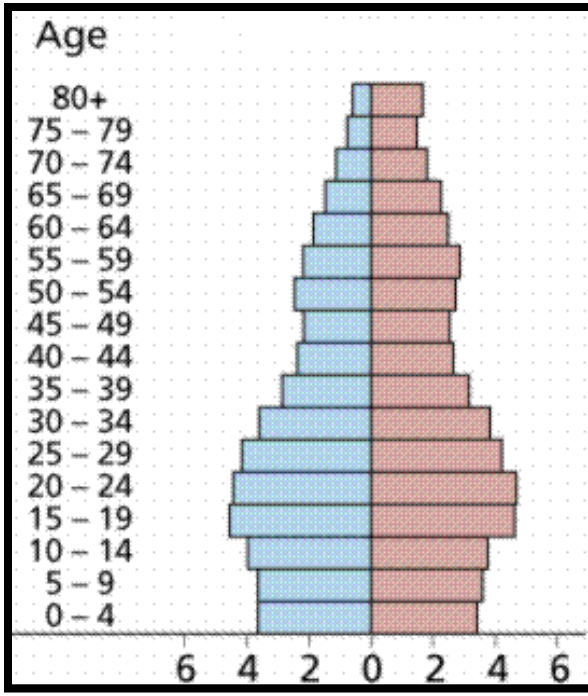
- How would you describe the following population growth?



Young population with rapid growth



Stable population with slow growth



Declining population with negative growth

World Histograms

- Check out the following link for histograms of countries around the world

http://www.worldlifeexpectancy.com/world-population-pyramid