

A close-up, high-angle photograph of a herd of elephants. The elephants are packed closely together, with their heads and tusks visible. The tusks are a light, yellowish-white color, contrasting with the dark brown, wrinkled skin of the elephants. The lighting is somewhat dim, creating a sense of a natural, perhaps shaded, environment.

UNIT 8

Chapter 14

Interactions in Ecosystems

UNIT 5: ECOLOGY

Chapter 14: Interactions in Ecosystems

I. Habitat and Niche (14.1)

A. A habitat differs from a niche

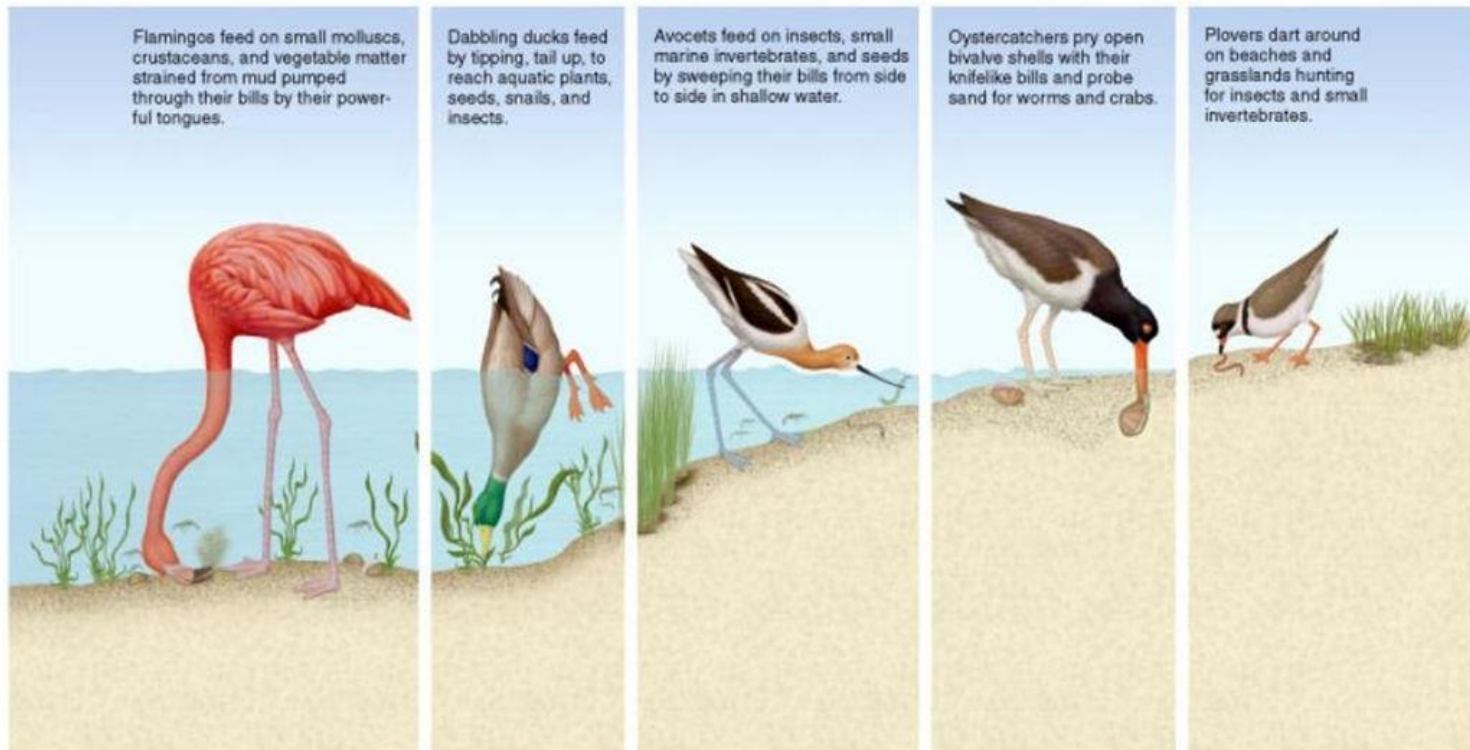
1. **habitat**- all of the **biotic** and **abiotic** factors in the area where an organism lives. (*where a species lives*)



2. **niche**- composed of all the physical, chemical and biological factors that a species needs to survive, stay healthy, and reproduce. (*how it lives within the habitat*)

Niche – each member of this community gathers food in a unique way

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a. **Food**- type of food species eats, how it competes for food, and where it fits in the food web.

b. **Abiotic conditions**- includes range of conditions such as air temperature, amount of water

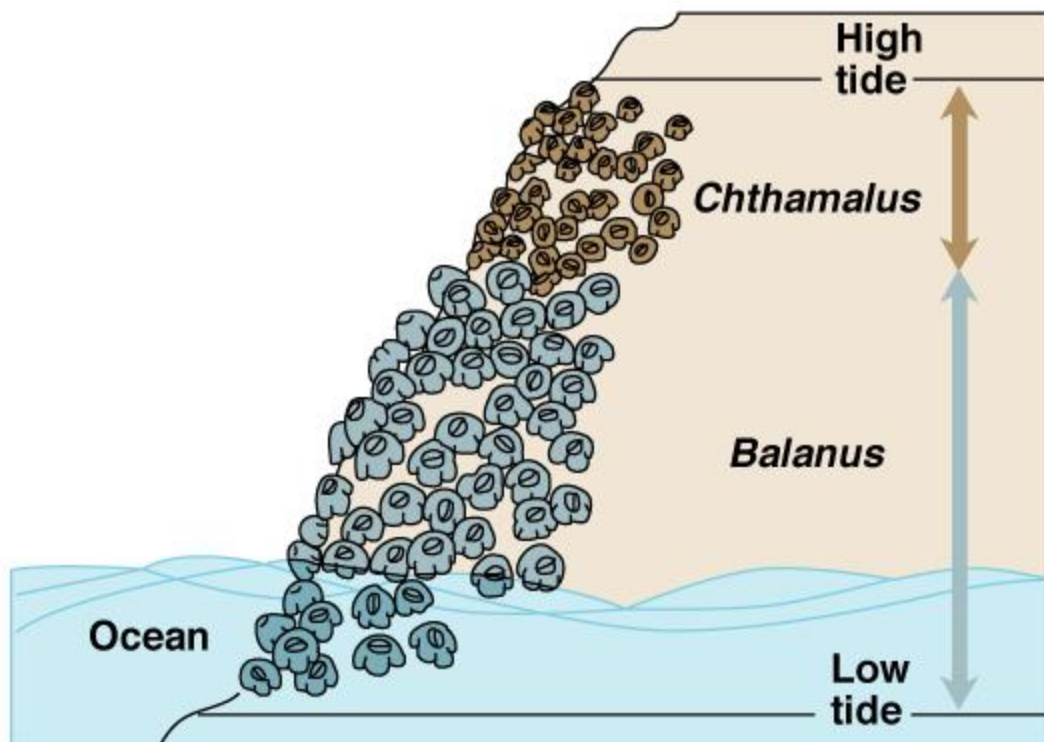
c. **Behavior**- time of day species is active, where and when reproduces, etc.



B. Resource availability gives structure to a community.

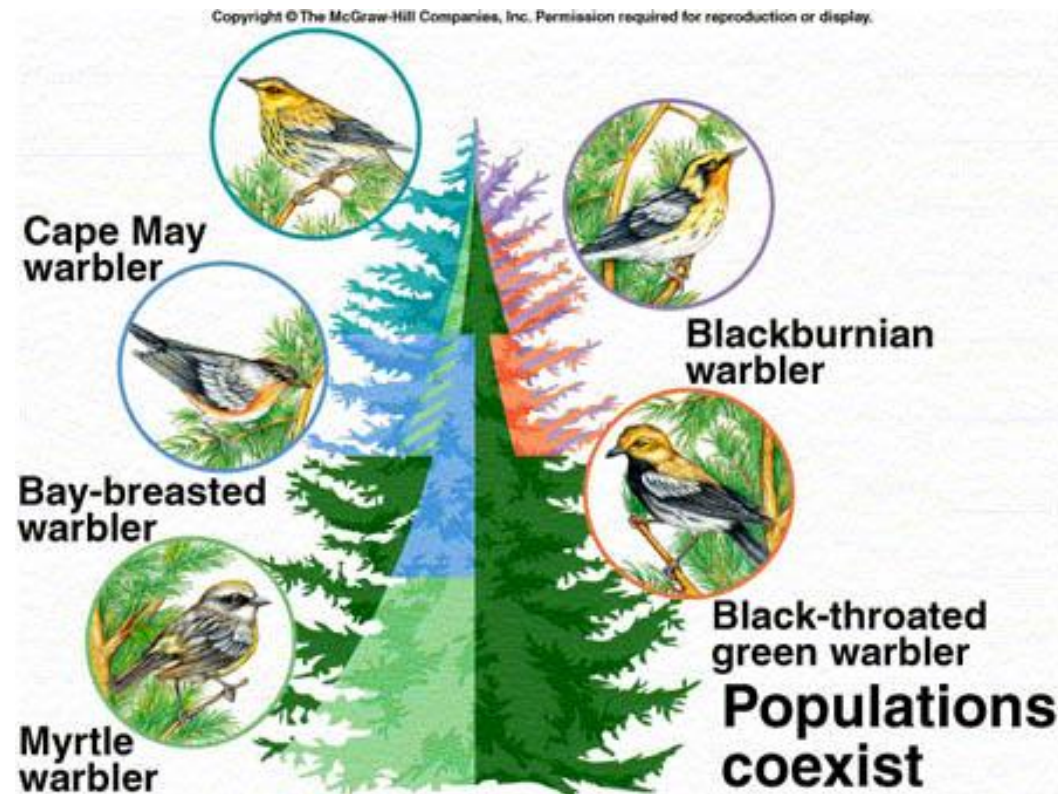
1. **Competitive exclusion**- when two species are competing for same resources, one species will be better suited to the niche,

and other species will be pushed into another niche or become extinct.



2. Competitive exclusion can result in other outcomes

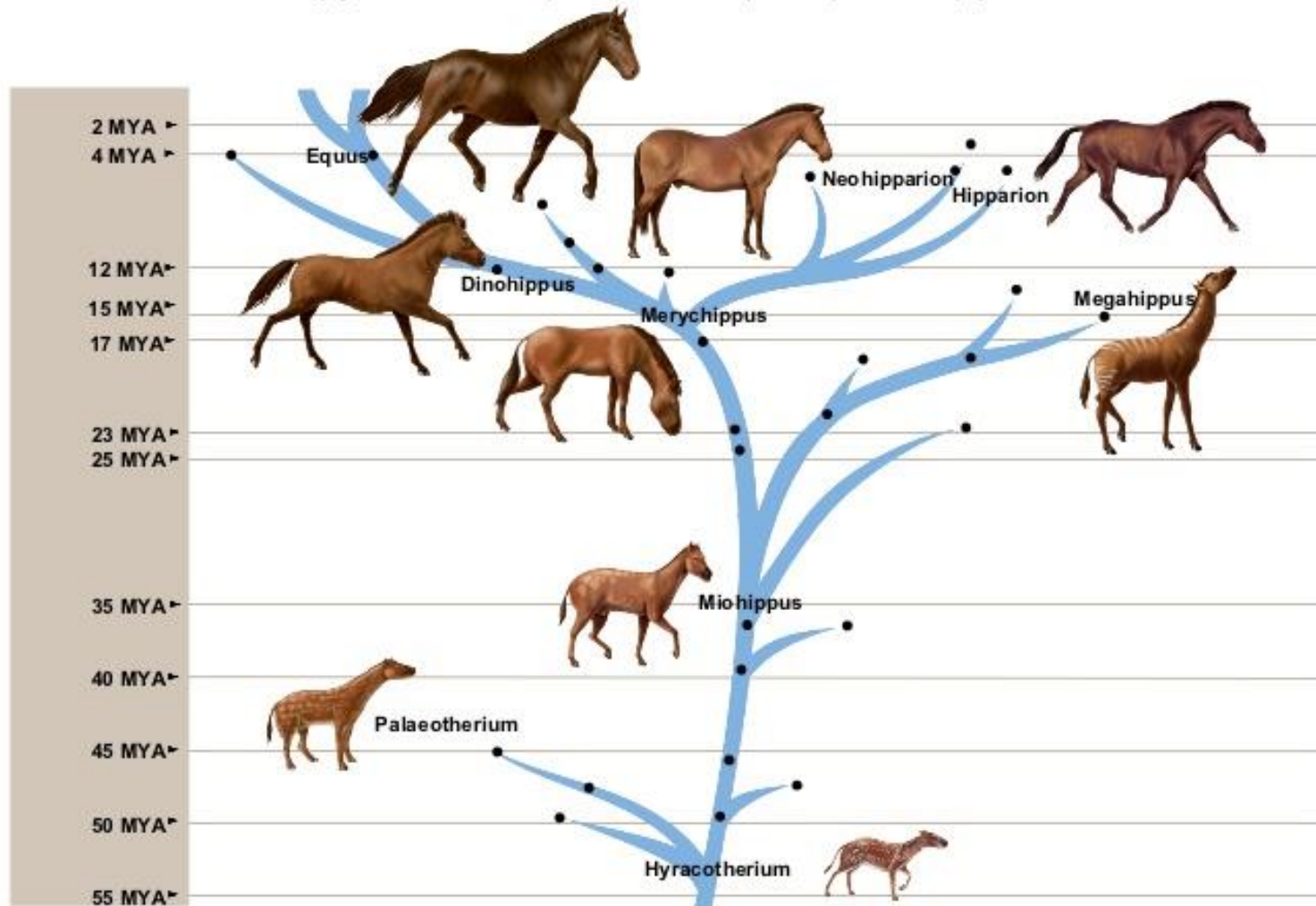
- a. **niche partitioning**- dividing of niche by two competing species (e.g. top or tree, or bottom of tree)



b . **Evolutionary response-** divergent evolution resulting in selection of different successful traits.

Figure 14.8 Simplified family tree of *Equus*. Every dot is a genus.

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c. **Ecological Equivalents**- species that occupy similar niches but live in different geographical regions.



II. Community Interactions (14.2)

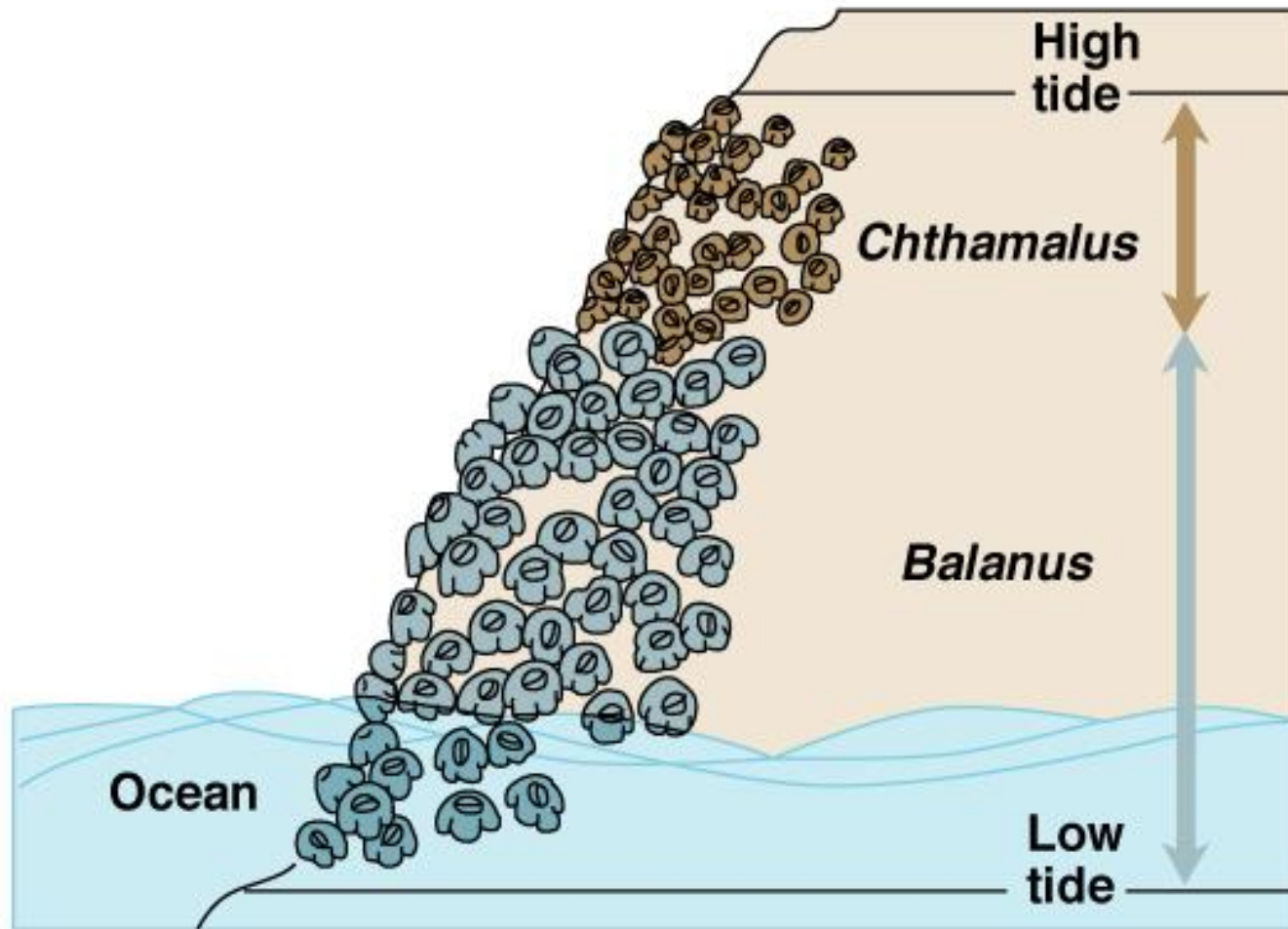
A. **Competition** and **predation** are two important ways in which organisms interact.



1. **Competition**- occurs when two organisms fight for the same limited resources.



a. **Interspecific competition**- competition between different species



b. **Intraspecific competition** - competition between organisms of same species



2. **Predation**- process by which one organism captures and feeds upon another organism.



B. **Symbiosis** is a close relationship between species (**symbiosis**- close ecological relationship between two or more organisms of different species that live in direct contact with one another)



1. **Mutualism**- both species benefit from one another



2. **Commensalism**- one receives an ecological benefit from another, while the other neither benefits nor is harmed.



Human Our eyelashes are home to tiny mites that feast on oil secretions and dead skin. Without harming us, up to 20 mites may be living in one eyelash follicle.



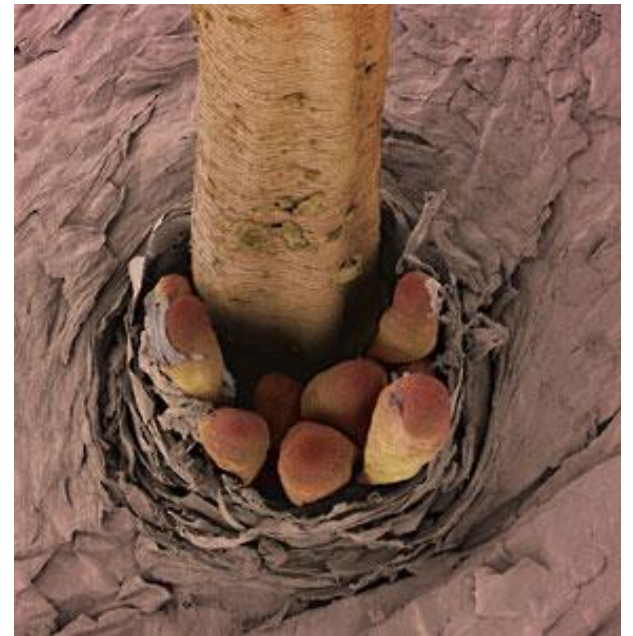
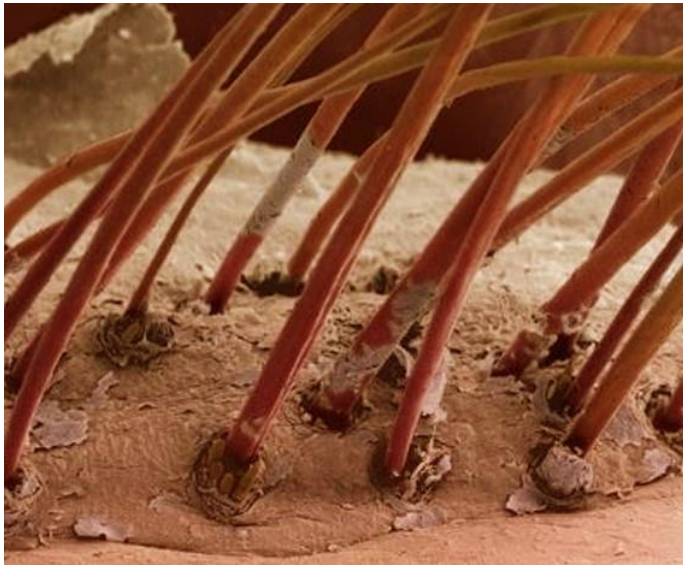
Demodex Eyelash mites find all they need to survive in the tiny follicles of eyelashes. Magnified here 225 times, these creatures measure 0.4 mm in length and can be seen only with a microscope.



Organism is not affected

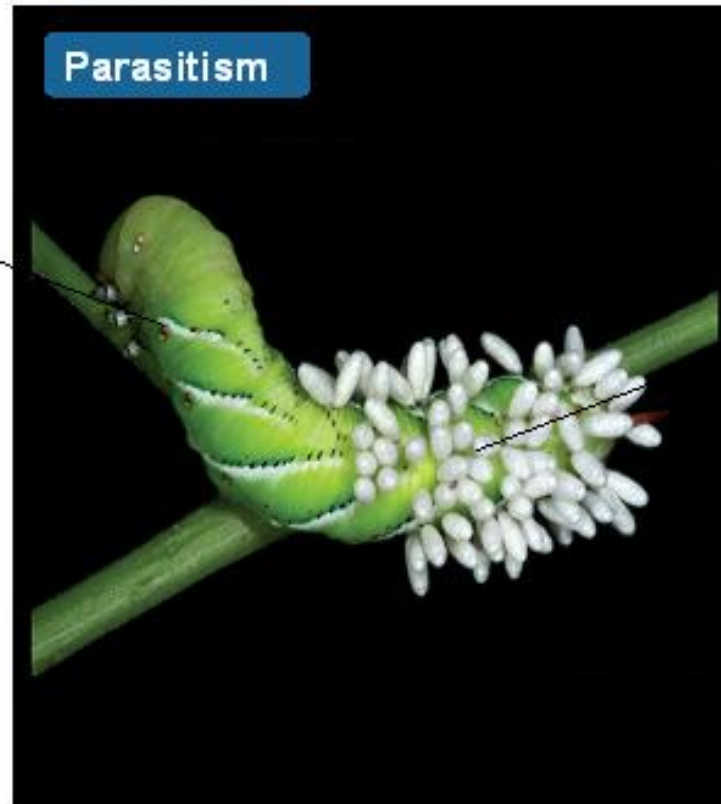


Organism benefits



3. **Parasitism**- similar to predation in that one organism benefits while the other is harmed

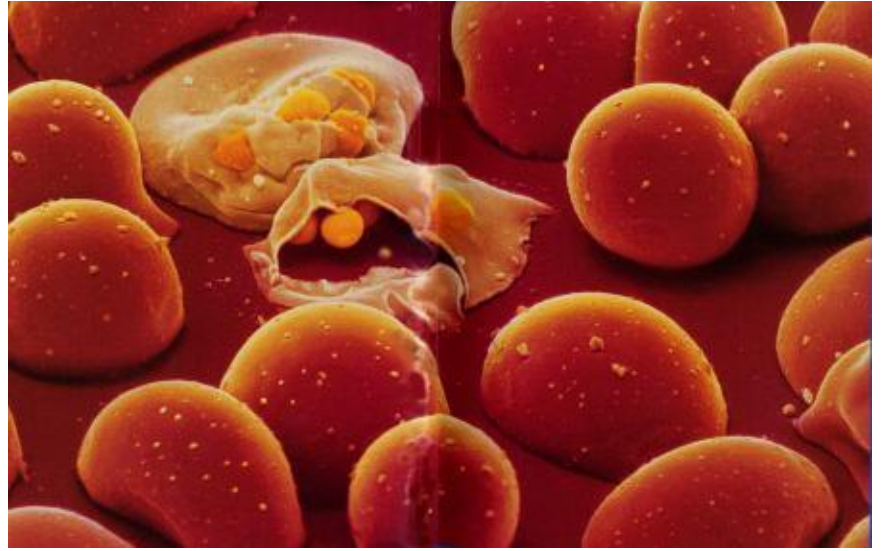
- Hornworm caterpillar
The host hornworm will eventually die as its organs are consumed by wasp larvae.



0 Braconid wasp
Braconid larvae feed on their host and release themselves shortly before reaching the pupae stage of development.

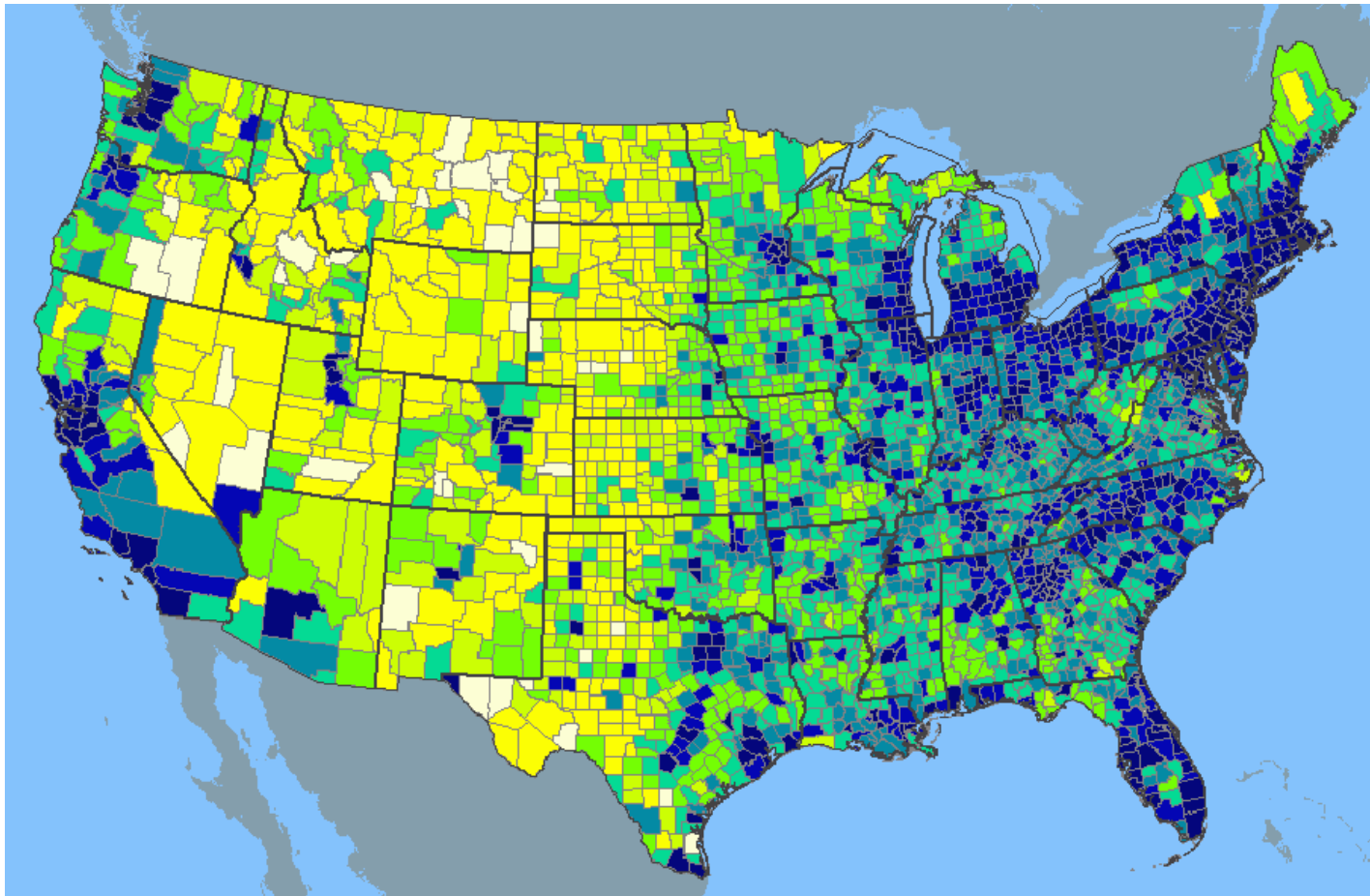
- Organism is not affected

0 Organism benefits



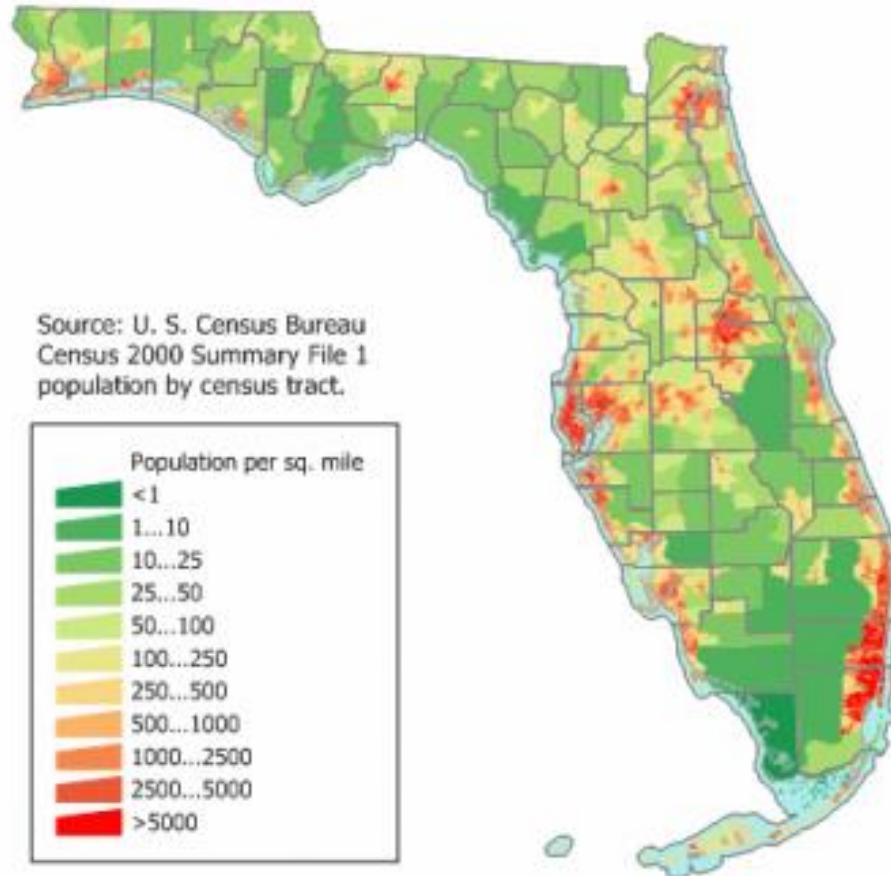
III. Population Density and Distribution (14.3)

A. **Population density** is the number of individuals that live in a defined area



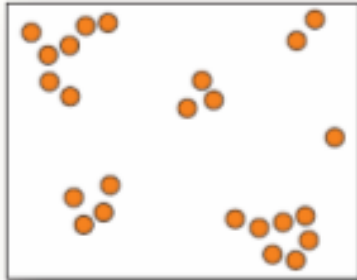
1. Measurement of the number of individuals living in a defined space.

2. Can calculate $\frac{\text{\# of individuals}}{\text{area (units}^2\text{)}} = \text{population density}$

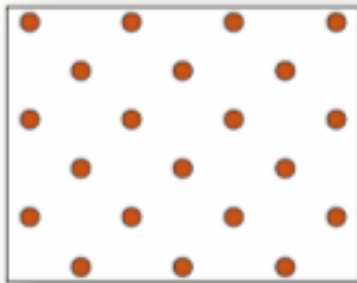


B. Geographic dispersion of a population shows how individuals in a population are spaced.

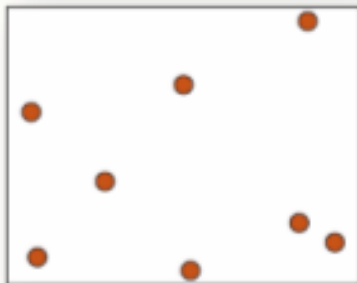
Clumped dispersion



Uniform dispersion



Random dispersion



1. **Population dispersion**- way in which individuals of a population are spread in an area or a volume.

2. Can be **clumped**, **uniform**, or **randomly** dispersed

Clumped



Uniform



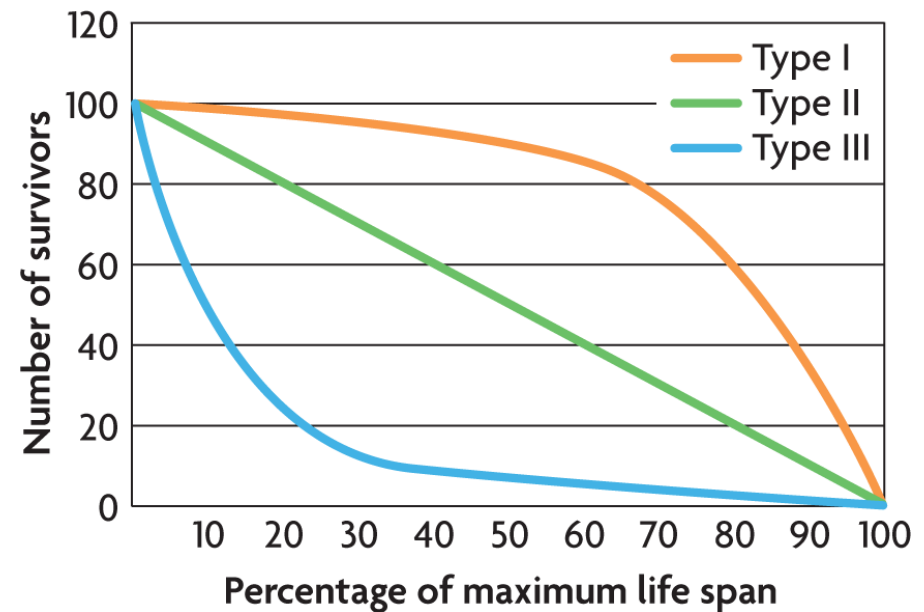
Random



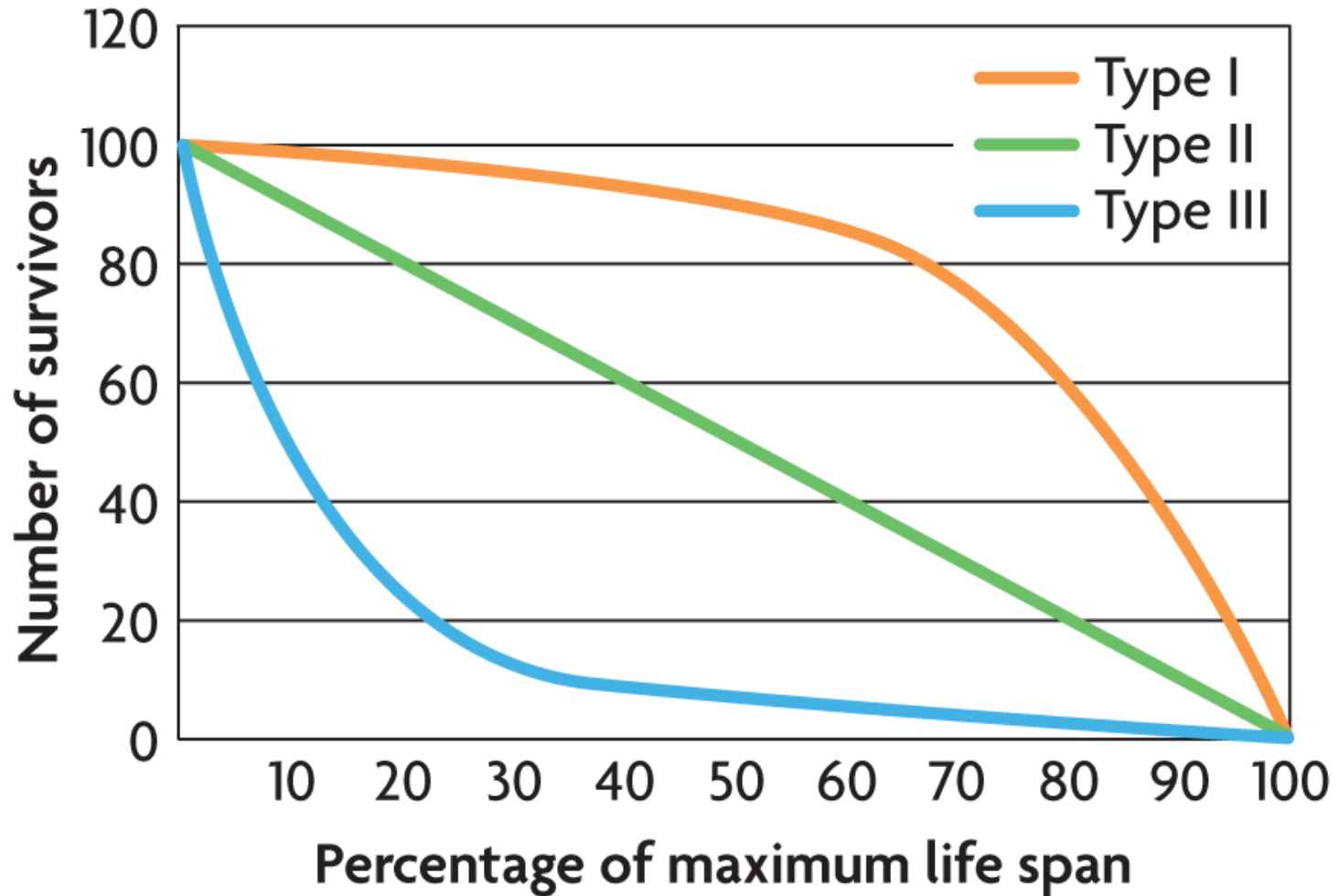
C. Survivorship curves help to describe the reproductive strategy of a species

1. **Survivorship curve**- generalized diagram showing the number of surviving members over time from a measured set of births.

SURVIVORSHIP DATA			
Age (years)	Deaths	Survivors	% Surviving
0–5	I	$35 - 1 = 34$	97
6–10	I	$34 - 1 = 33$	94
11–15	0	$33 - 0 = 33$	94
16–20	IIII	$33 - 4 = 29$	83
21–25	I	$29 - 1 = 28$	80



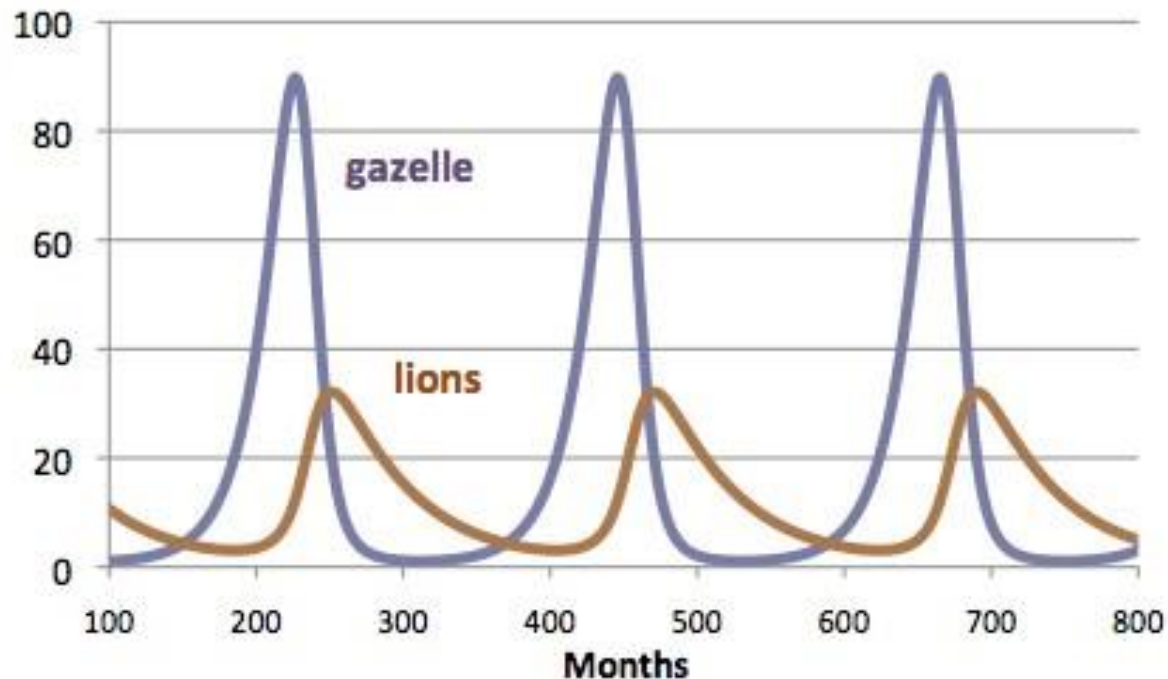
2. Gives information about life history of species



IV. Population Growth Patterns (14.4)

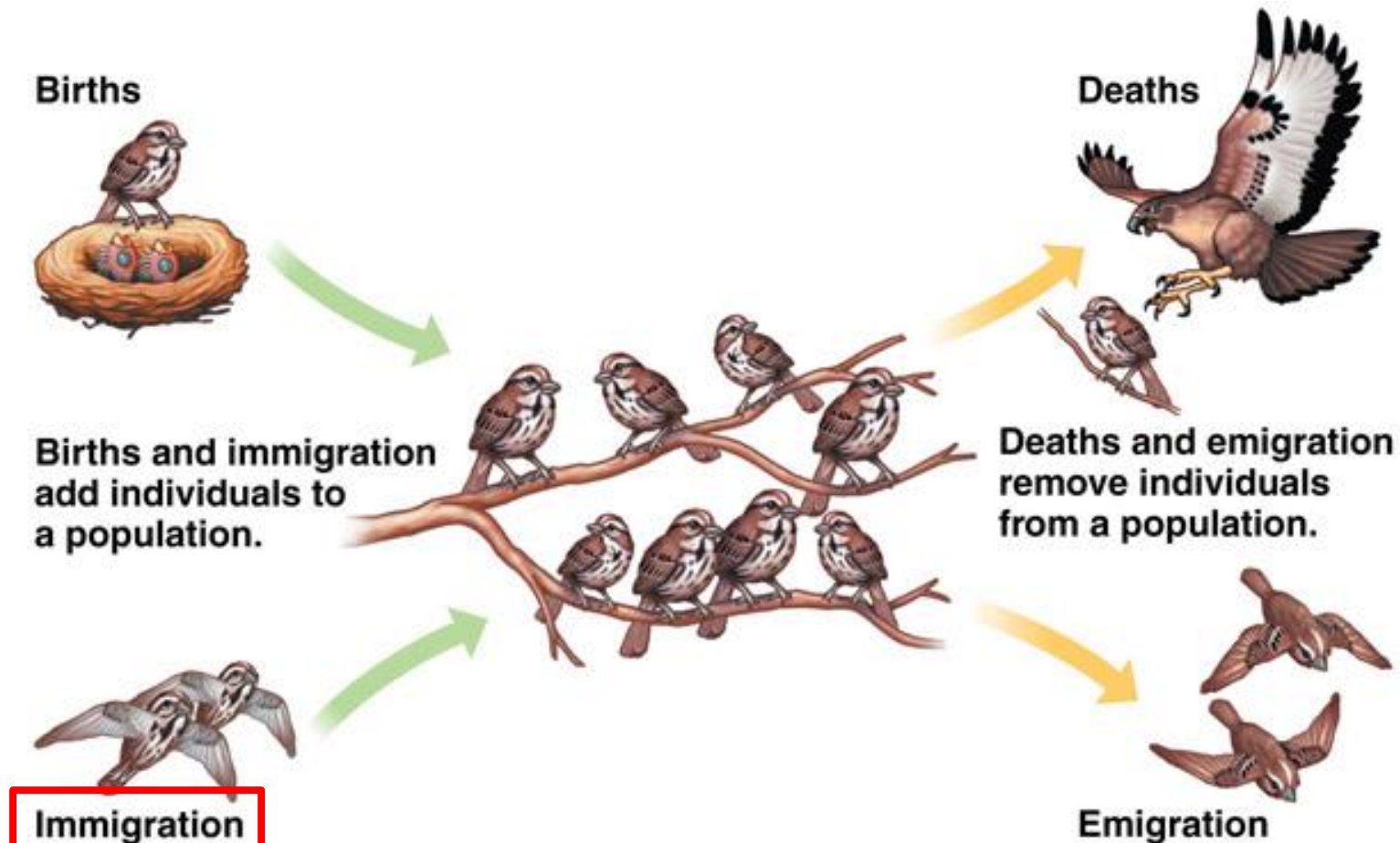
A. Changes in population's size are determined by immigration, births, emigration, and deaths.

1. Size of populations are usually changing

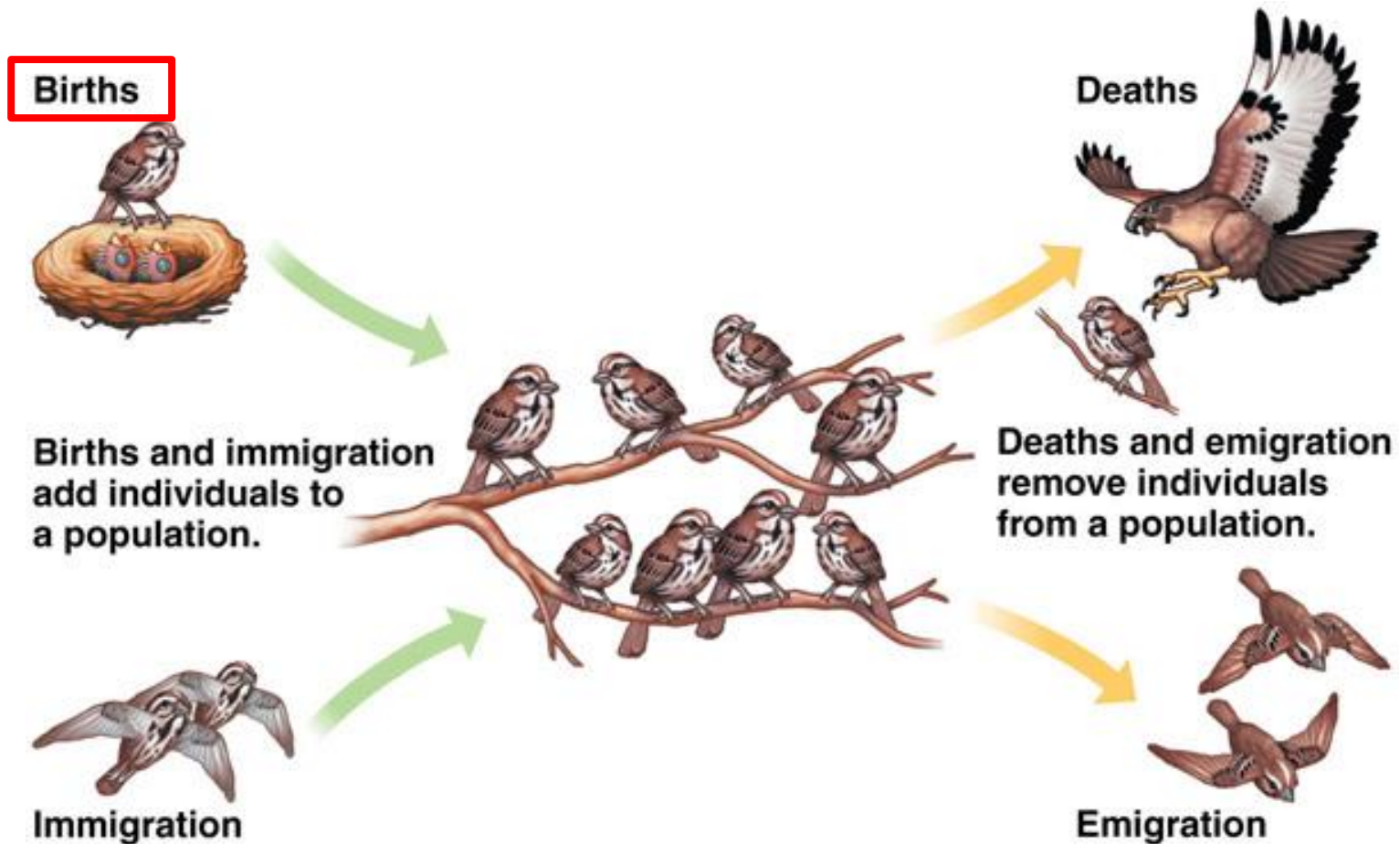


2. Four factors affect the size of a population

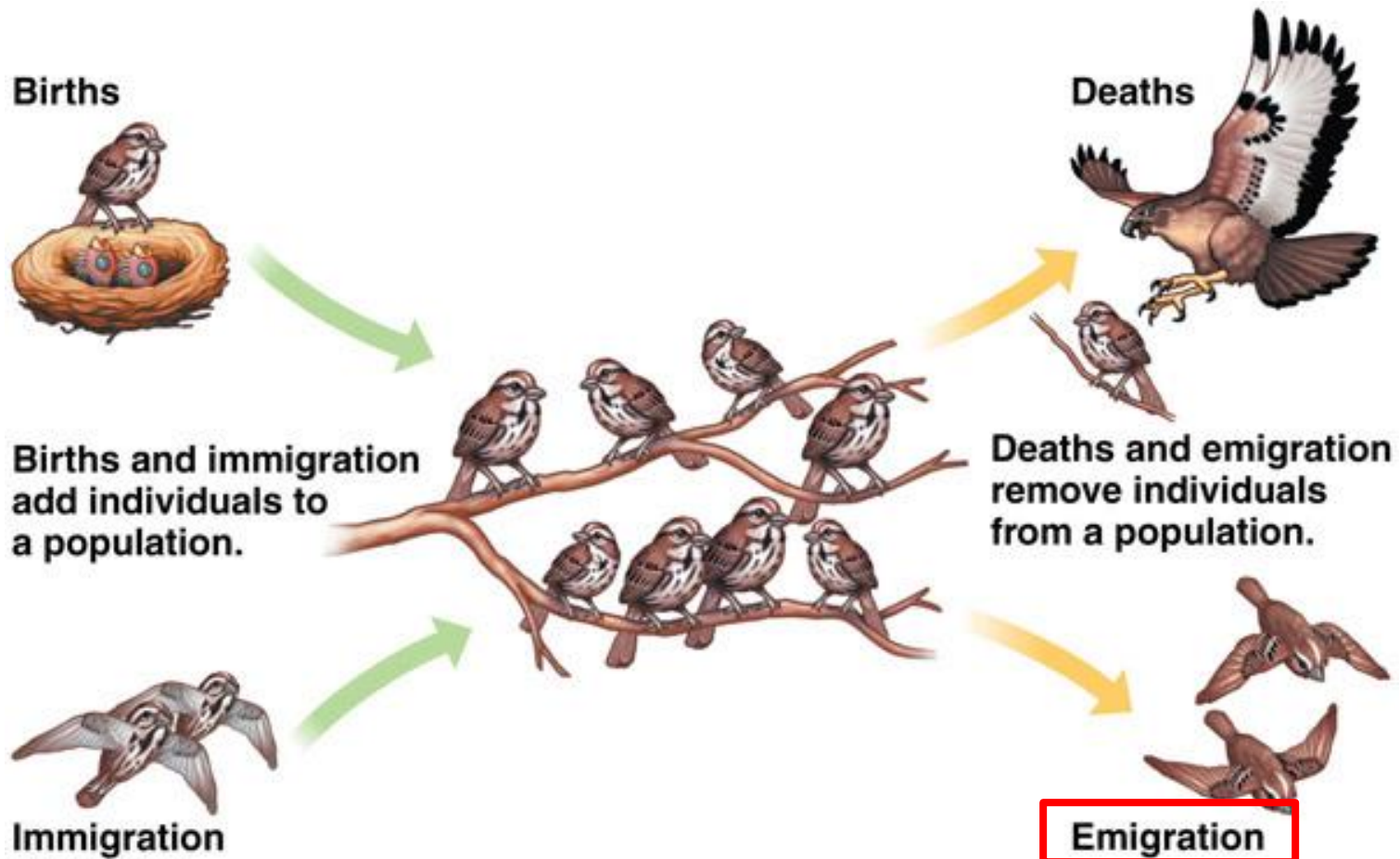
a. **immigration**- movement of individuals into a population from another population



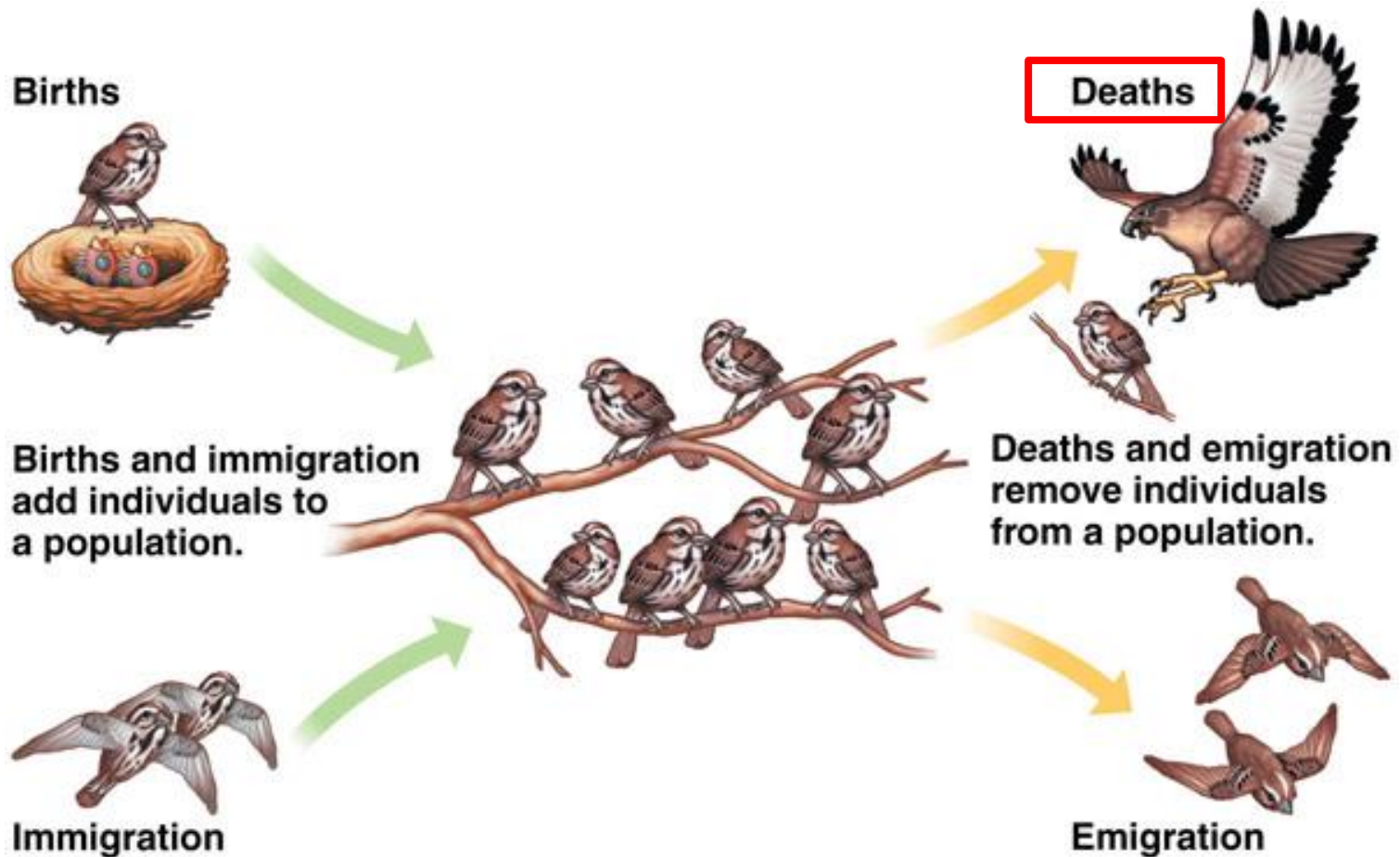
b. **Births**- births increase number of individuals in population



c. **Emigration**- movement of individuals out of a population and into another

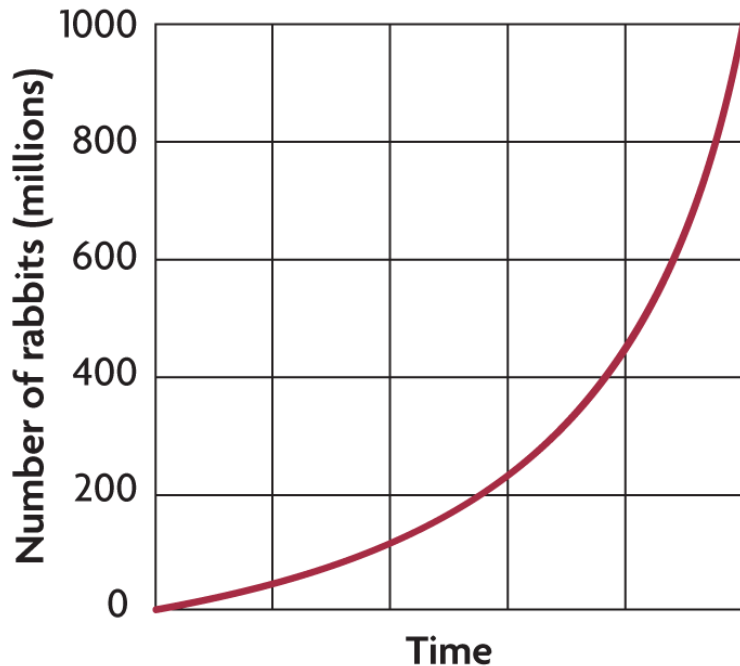


d. **Deaths**- size of population decreases when individuals die.



B. Population growth is based on available resources

1. population growth determined by amount of resources available.
2. Two types of population growth



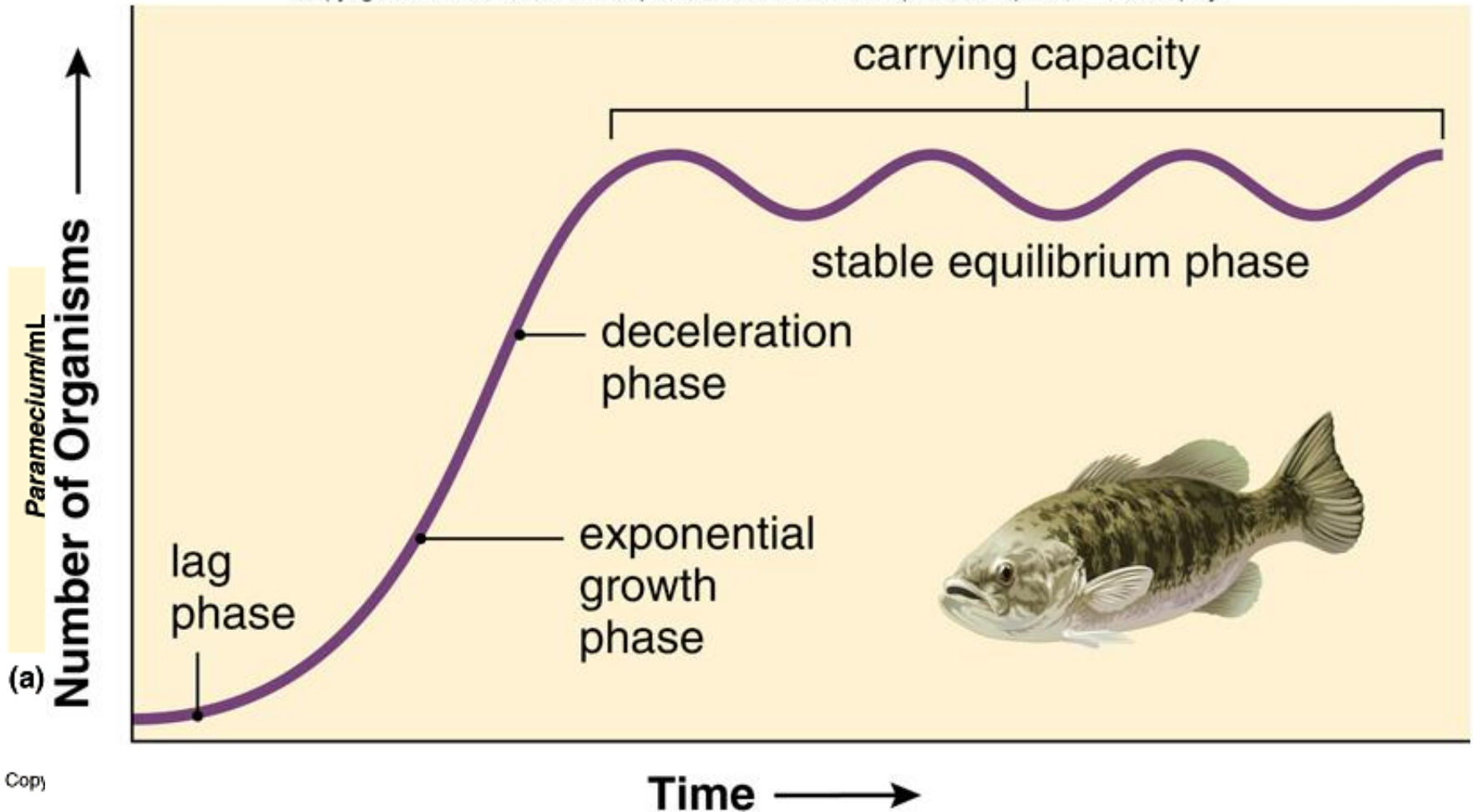
- a. **Exponential growth**- occurs when population size increases dramatically over period of time

Exponential growth



b. **Logistic growth**- begins with period of slow growth, followed by brief exponential growth before leveling off at a stable size.

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2). **Population crash-** dramatic decline in size of population over a short time

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FISH POPULATIONS
ESSENTIAL FOR
FOOD AND
JOBS HAVE
CRASHED BY 50%
IN THE LAST
4 DECADES





What are these?
What do they have to do with a
population crash?

C. Biological factors limit population growth

1. **Limiting factor**-factor that has the greatest affect on keeping down the size of a population
2. Two categories of limiting factors

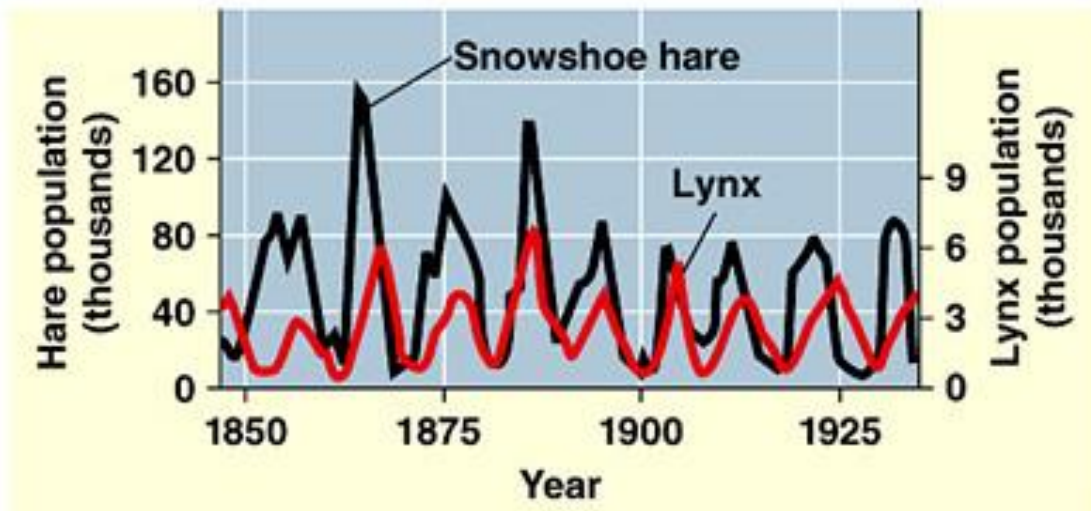


a. **Density-dependent**- affected by number of individuals in a given area

1). **Competition**- compete for resources



2). **Predation**- population of predator can be limited by available prey



3). **Parasitism and disease-** spread quickly through dense populations



b. **Density-independent limiting factors-**
aspects of environment that limit population growth
regardless of density

1). **Unusual weather**-can affect entire food
chain or web



2). **Natural disasters-** volcanoes, tsunamis, tornados, hurricanes, etc.



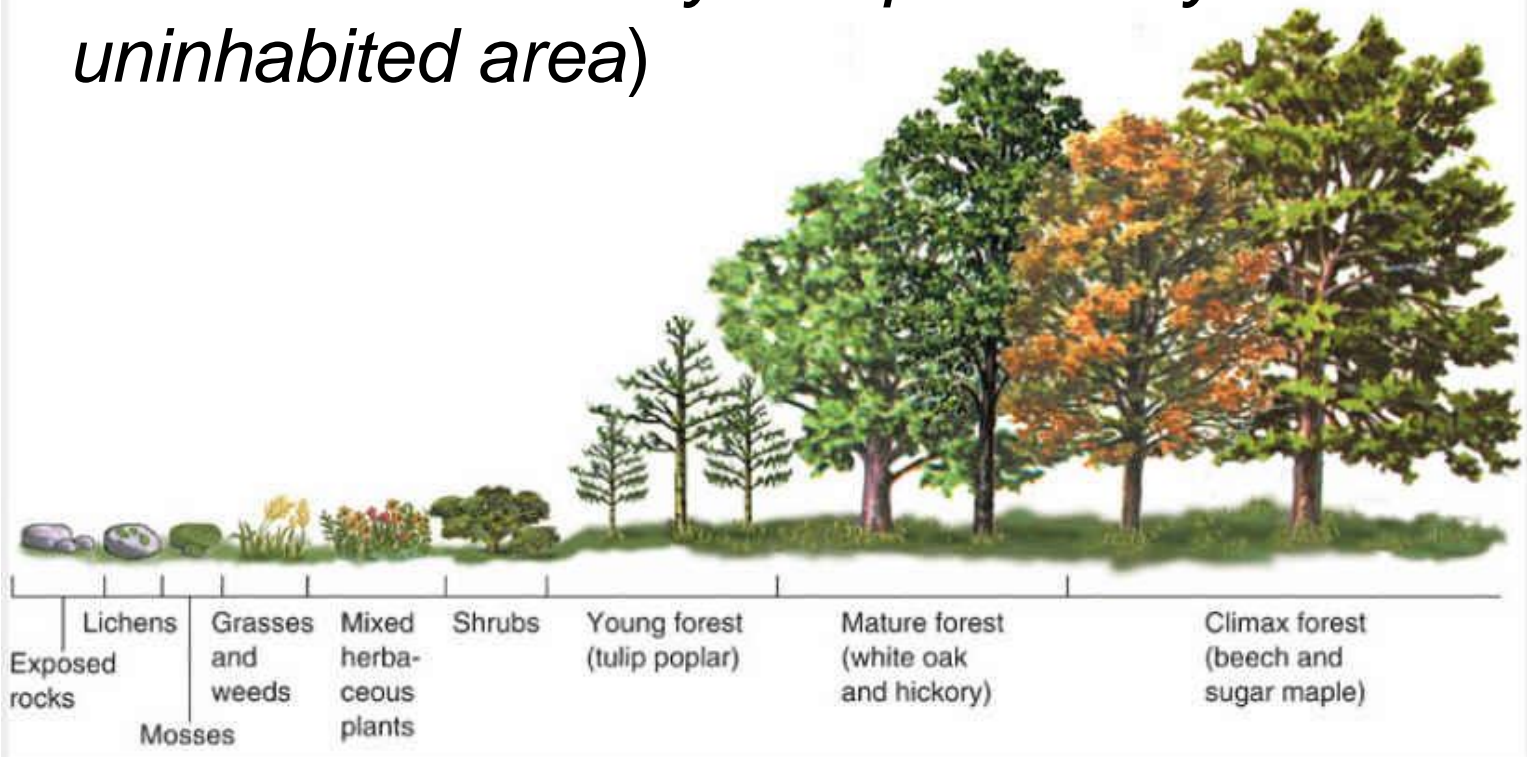
3). **Human activities-** destruction of habitat,
introduction of non-native species



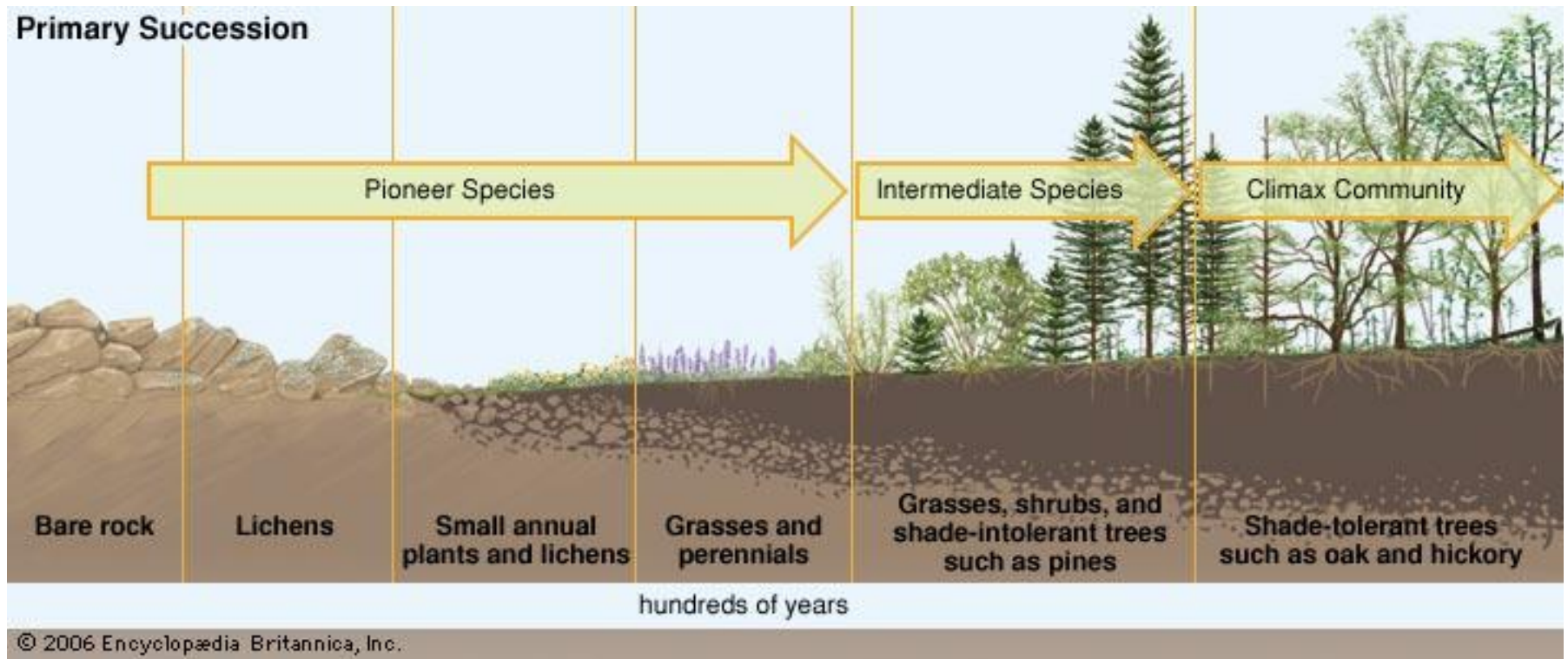
V. Ecological Succession (14.5)

A. Succession occurs following a disturbance in an ecosystem

(**succession**- *sequence of biotic changes that regenerate a damaged community or create a community in a previously uninhabited area*)



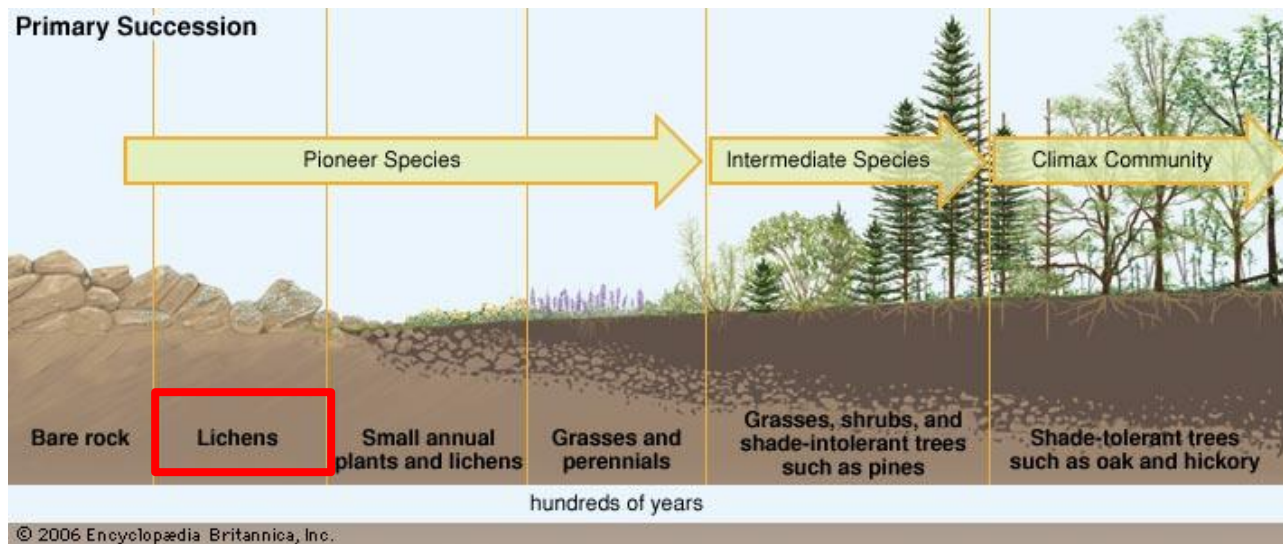
1. **Primary succession**- development of ecosystem in areas that was previously uninhabited



a. **pioneer species**- first organism to move into area like lichens and some mosses.

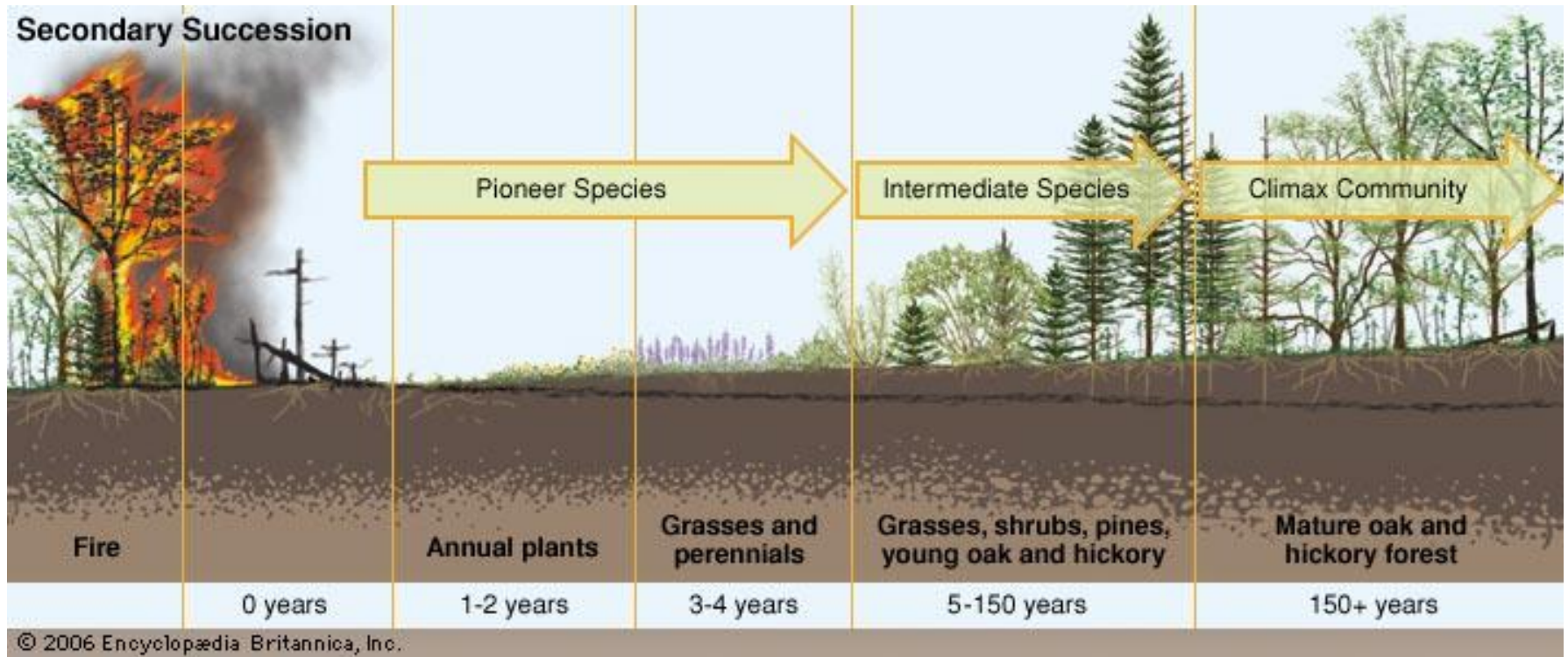


b. Series of steps: bare rock → **pioneer species** → small plants → small animals → larger animals and plants



2. **Secondary succession**- reestablishment of a damaged ecosystem where soil was left intact (after fire, hurricane, etc.)

a. Plants and animals that remain start the process of regrowth.



b. **dynamic process**- are always changing the face of an ecosystem

