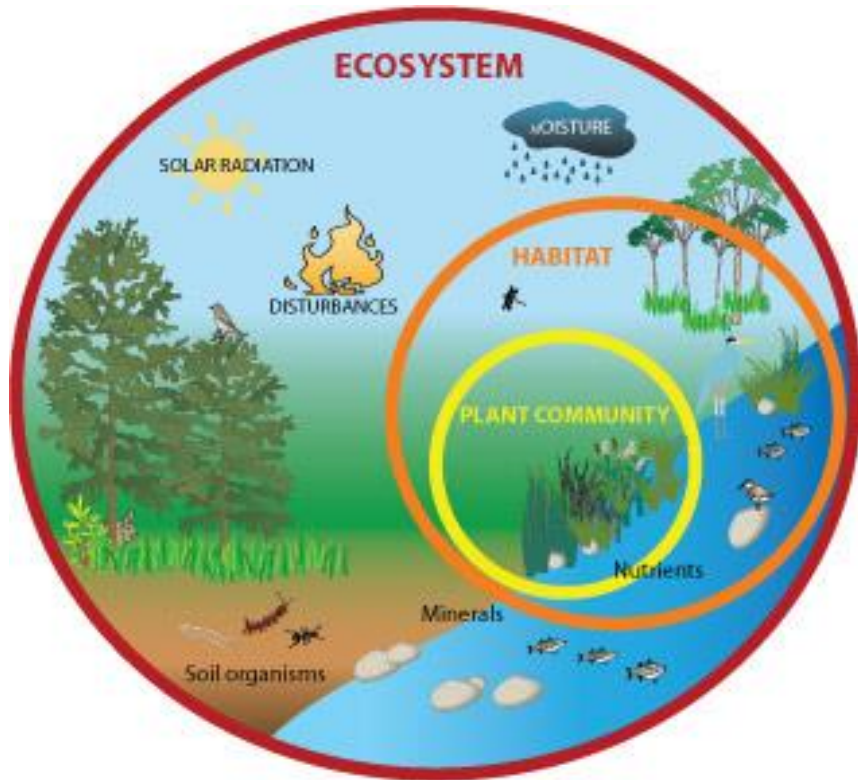


NOTES: CH 4 – Ecosystems & Communities



4.1 - Weather & Climate:

- **WEATHER** = day-to-day conditions of Earth's atmosphere



- **CLIMATE** = refers to average conditions over long periods; defined by year-after-year patterns of temperature & precipitation



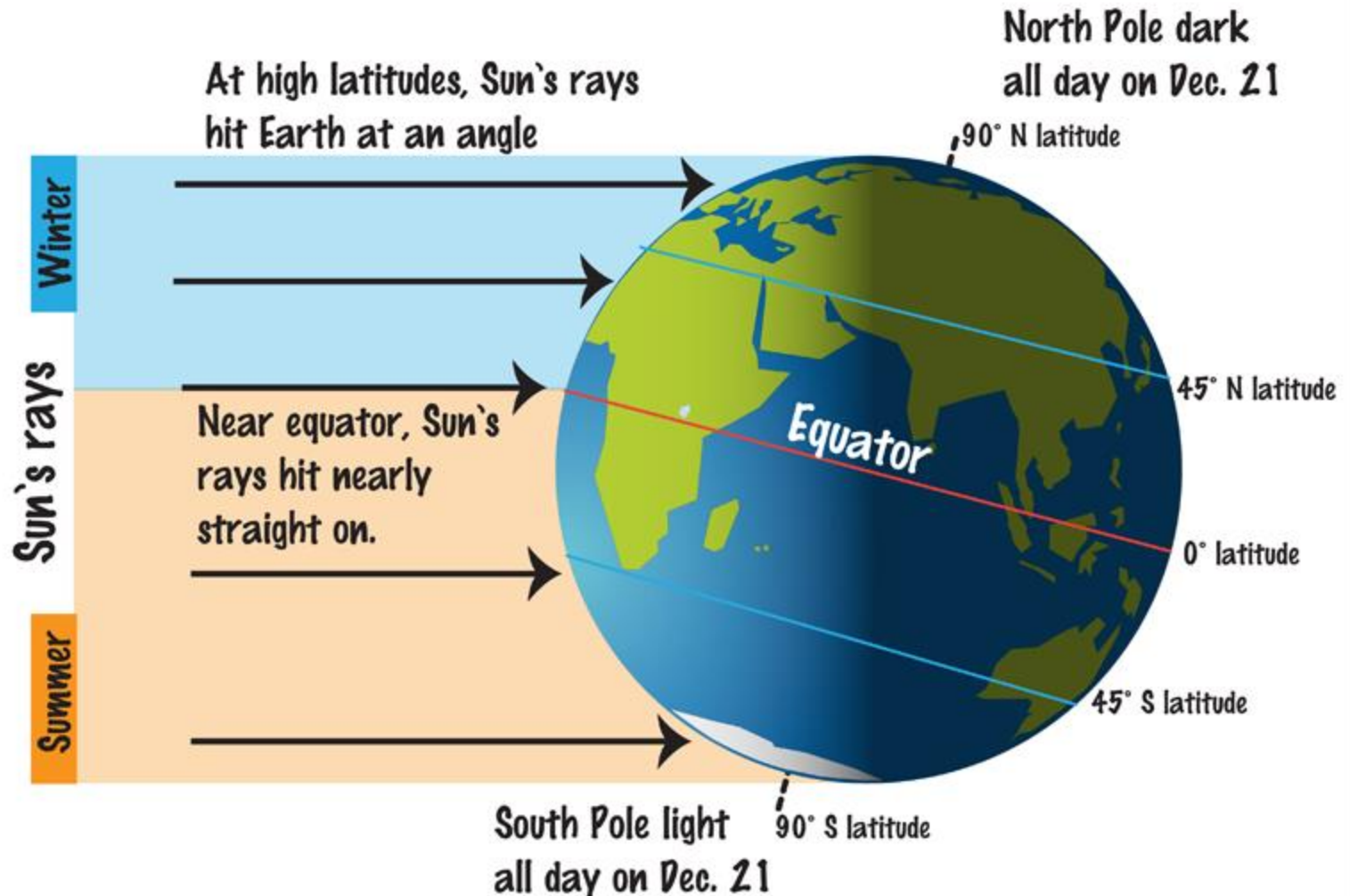
Factors that Affect Climate:

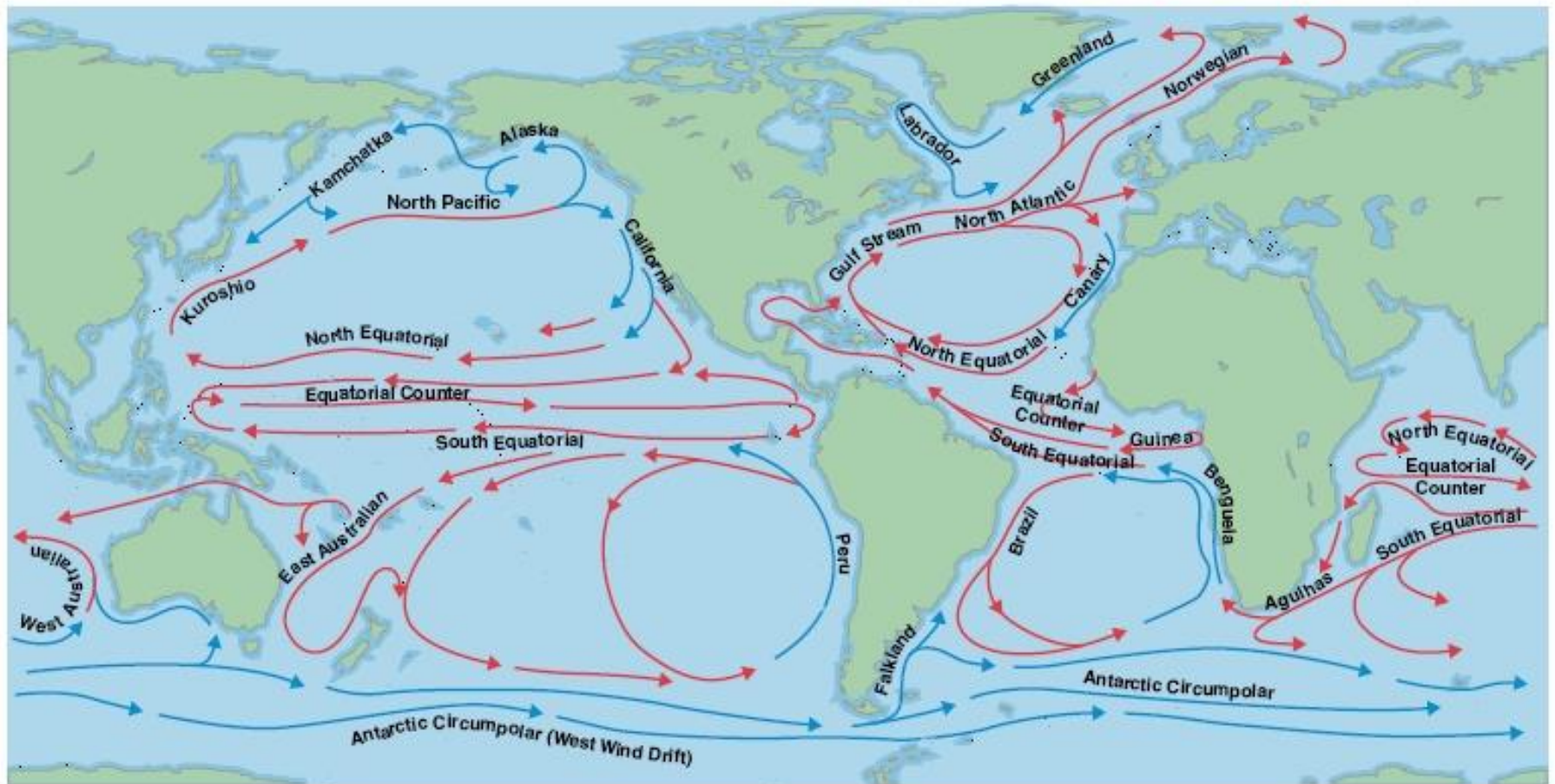
➔ What causes differences in climate?

➔ Global climate is shaped by many factors, including:

- **solar energy trapped in the biosphere**
- **latitude**
- **transport of heat by winds & ocean currents**

Earth at Winter Solstice (~Dec. 21)



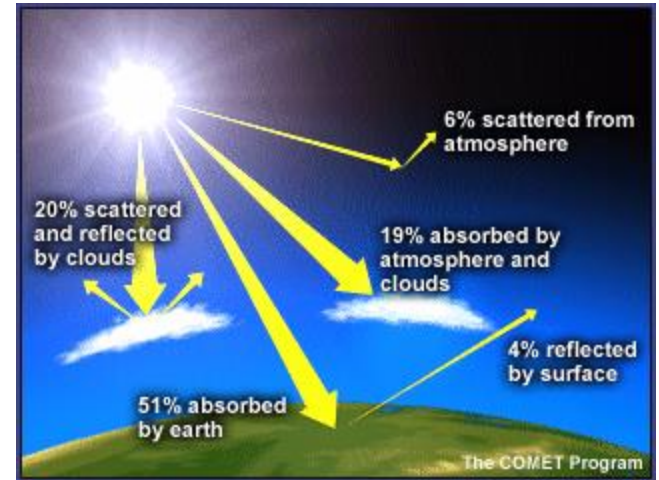


→ Warm-water current

→ Cold-water current

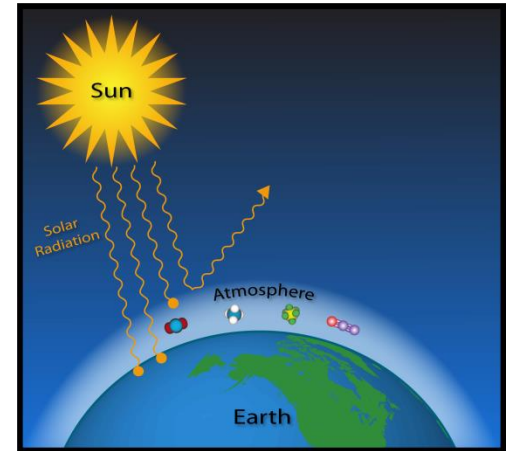
Solar Energy and the Greenhouse Effect:

- solar energy arrives as sunlight & strikes the Earth's surface
 - some of that **energy** is:
 - reflected back into space
 - absorbed & converted into heat
 - some of that **heat** then:
 - radiates back into space, or
 - is trapped in the biosphere!



Solar Energy and the Greenhouse Effect:

- three gases that “trap” heat:
 - carbon dioxide, CO₂
 - methane
 - water vapor
- as these gases accumulate, more heat is trapped...the **GREENHOUSE EFFECT**



The Greenhouse Effect

Some of the infrared radiation passes through the atmosphere but most is absorbed and re-emitted in all directions by greenhouse gas molecules and clouds. The effect of this is to warm the Earth's surface and the lower atmosphere.

Solar radiation powers the climate system.



Some solar radiation is reflected by the Earth and the atmosphere.

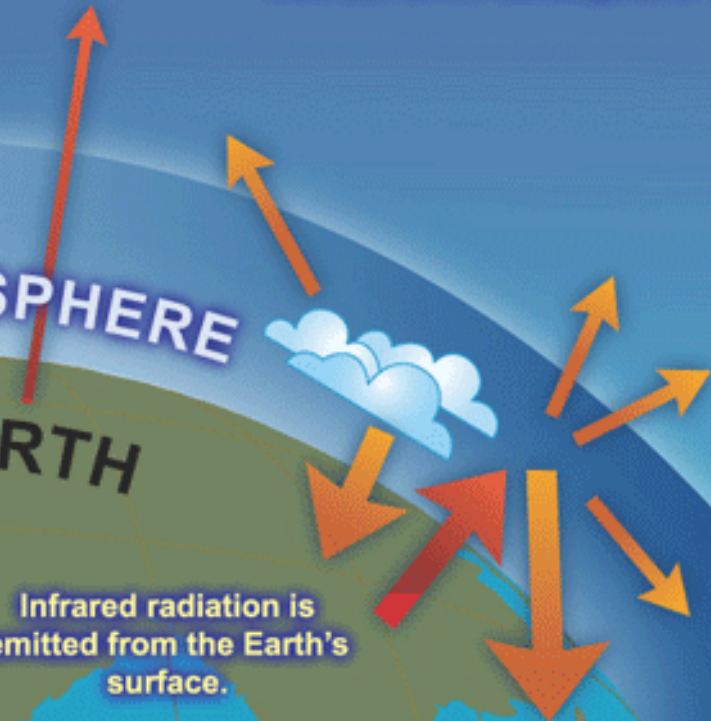


About half the solar radiation is absorbed by the Earth's surface and warms it.

ATMOSPHERE

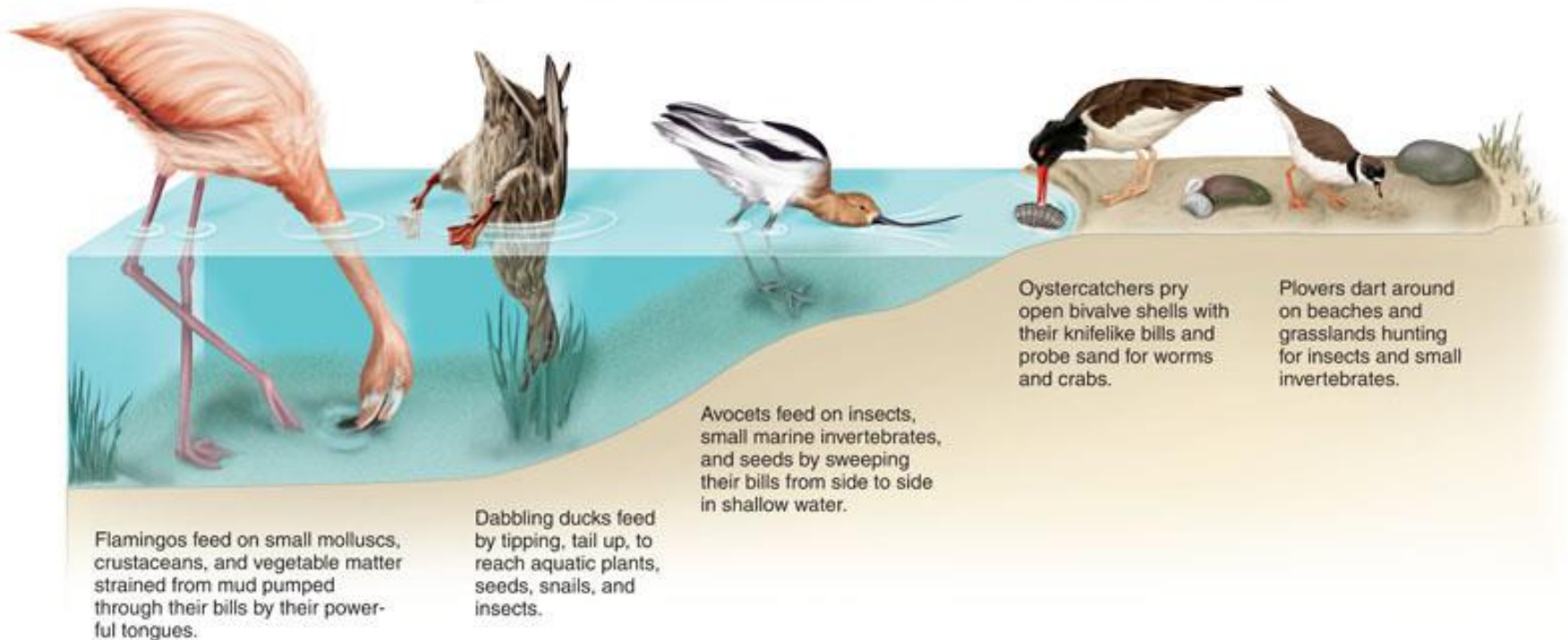
EARTH

Infrared radiation is emitted from the Earth's surface.



4.2 – Niches & Community Interactions

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The Niche:

- each species has a range of conditions under which it can grow & reproduce
- 2 factors that shape where and how organisms live are **BIOTIC** and **ABIOTIC** factors
- These can make areas suitable or not suitable for various organisms
- Any biotic or abiotic factor that restricts the number of organisms, their distribution, existence, or ability to reproduce is called a **LIMITING FACTOR**

- An example of a **limiting factor** is the timberline (elevation, winds, shallow soil, etc.)

- Factors that limit one population may have an indirect affect on other populations within that community

-EX: lack of water: decreases seed production, affects mice that are dependent on those seeds



- **RANGE OF TOLERANCE**

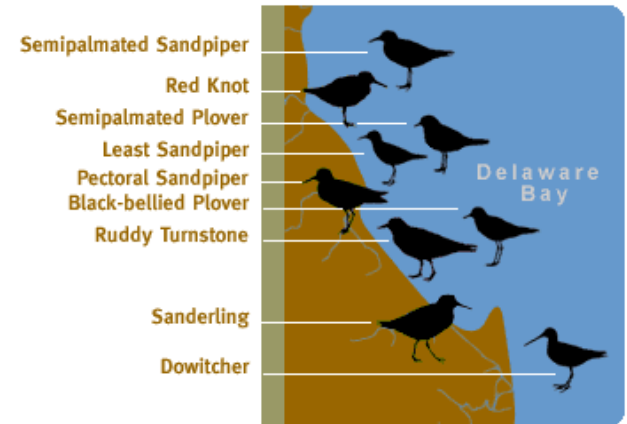
- the ability of an organism to withstand fluctuations in biotic and abiotic factors

- EX: catfish can withstand warmer water (which contains less oxygen than cooler water) than trout or bass

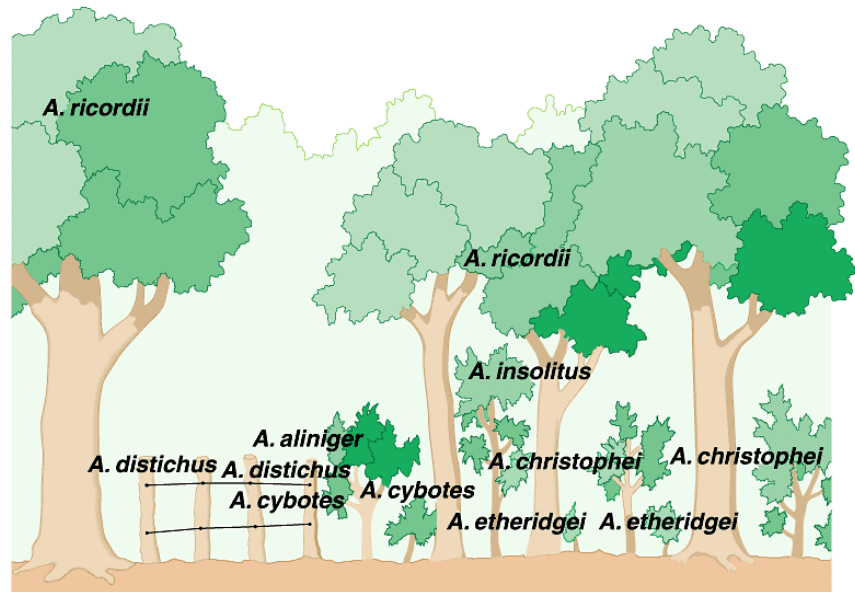


the NICHE

- **HABITAT**: (address) = area where an organism lives
-Ex: hollow tree trunk; includes biotic and abiotic factors
- **NICHE** (job / lifestyle) = full range of physical and biological conditions in which the organism lives and the way the organism uses those conditions
-Ex: place in the food web, range of temperatures the organism needs to survive, food the organism eats



- If two species try to occupy the same niche, it creates **competition**
- Result: one species will not survive → **extinction (or driven out)**
- No two species can share the same niche in the same habitat

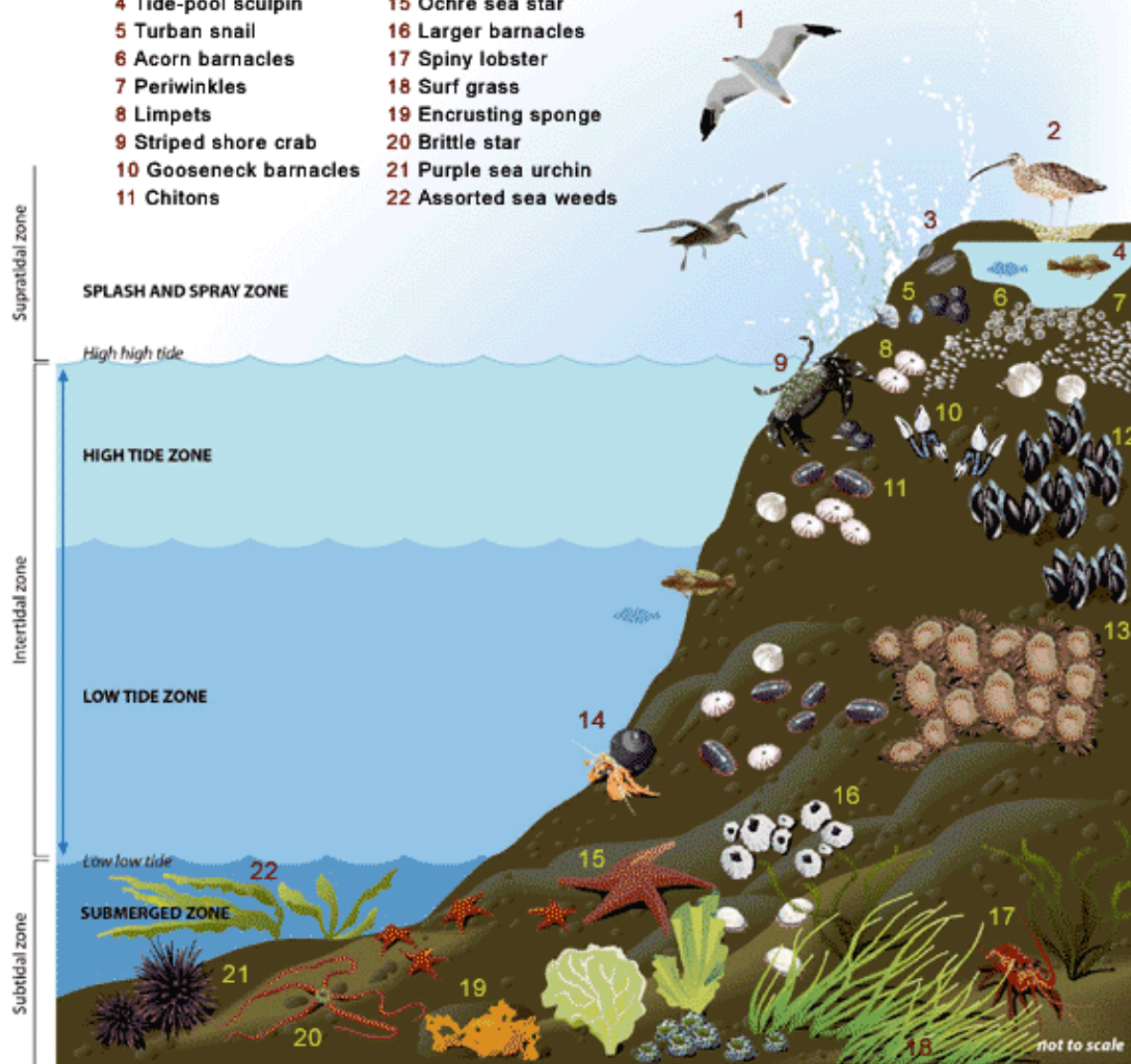


(a)

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Tidepool life in southern California

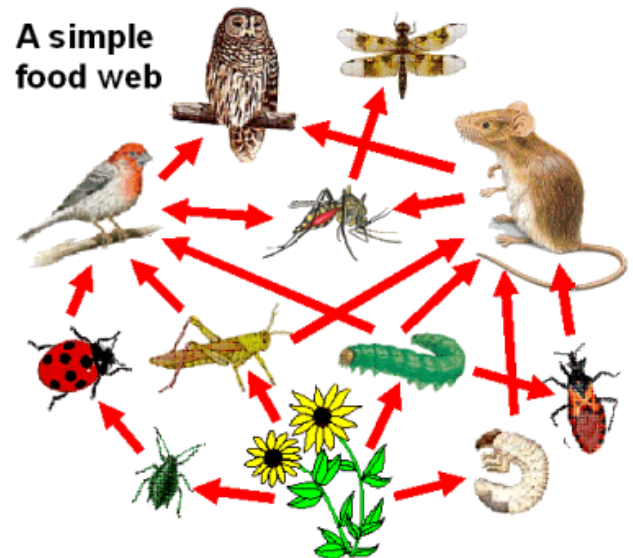
- | | |
|------------------------|--------------------------------------|
| 1 Sea gull | 12 Mussels |
| 2 Marbled godwit | 13 Aggregating sea anemones |
| 3 Rock louse | 14 Hermit crab in turban snail shell |
| 4 Tide-pool sculpin | 15 Ochre sea star |
| 5 Turban snail | 16 Larger barnacles |
| 6 Acorn barnacles | 17 Spiny lobster |
| 7 Periwinkles | 18 Surf grass |
| 8 Limpets | 19 Encrusting sponge |
| 9 Striped shore crab | 20 Brittle star |
| 10 Gooseneck barnacles | 21 Purple sea urchin |
| 11 Chitons | 22 Assorted sea weeds |



COMMUNITIES

-COMMUNITY = all populations in a given area

-includes HOW organisms' interactions affect the community



- A change within 1 population in a community can cause change with another in the same community

EX: an increase in hawk pop. may cause a decrease in mouse pop.

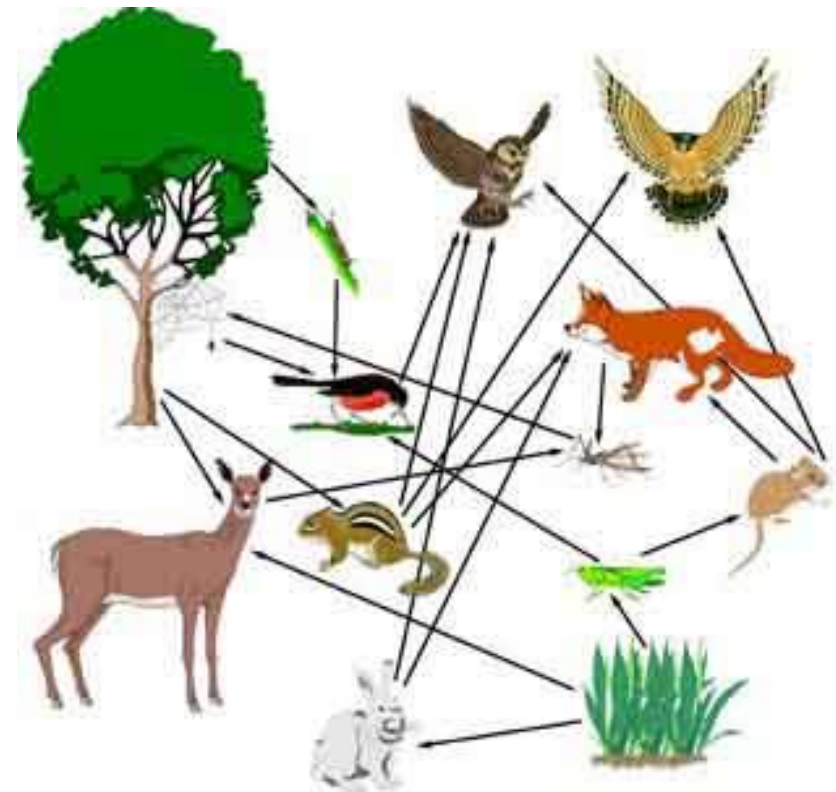
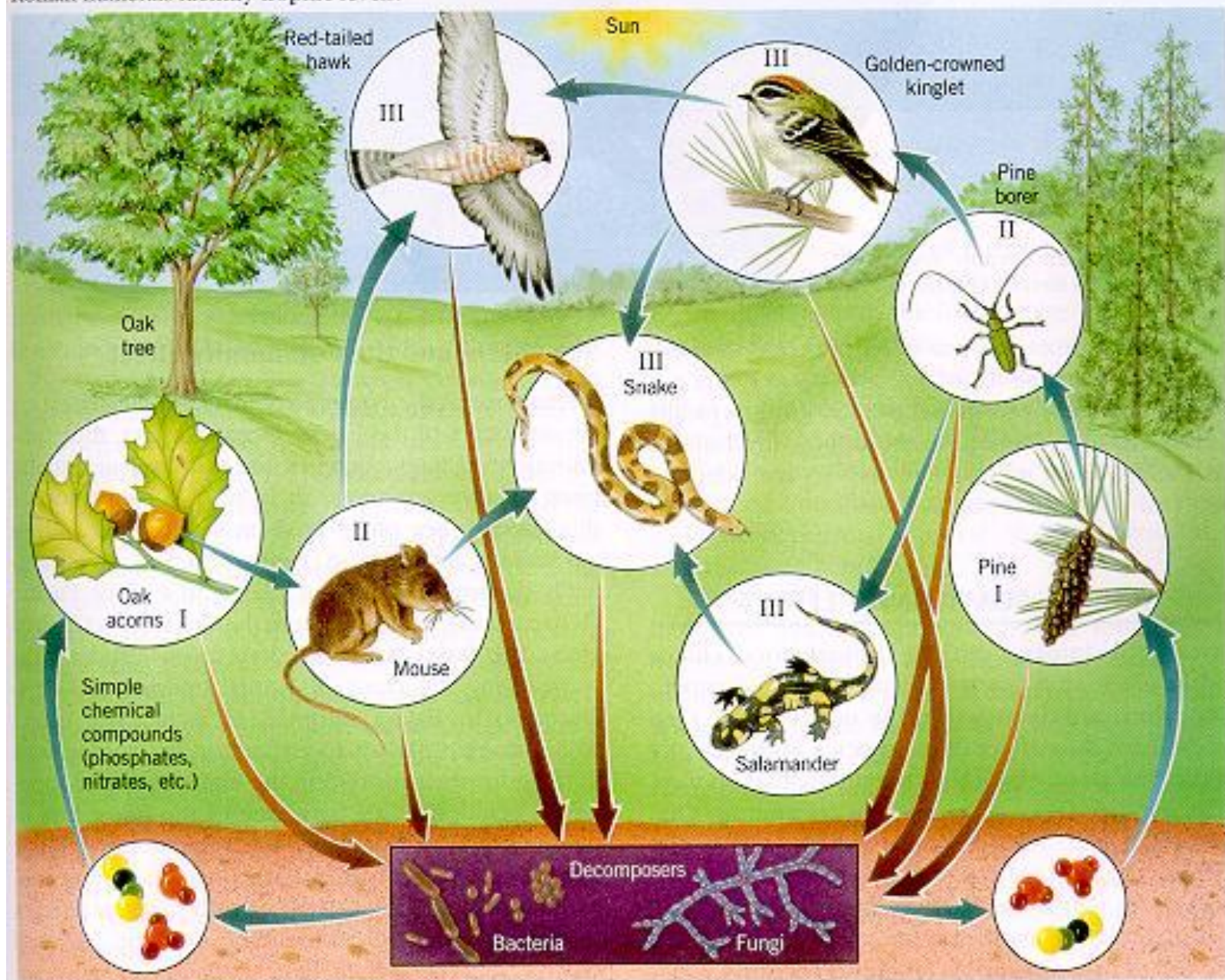


FIGURE 6.3 Food webs: (a) a typical terrestrial food web. Roman numerals identify trophic levels.



COMMUNITIES

- types of interactions within a community:

-Competition

-Predation

-Symbiosis

-Parasitism



RESOURCE = necessity of life

- **COMPETITION** = when organisms try to use a resource at the same place / time

EX: Two lizards want to eat the same type of insect



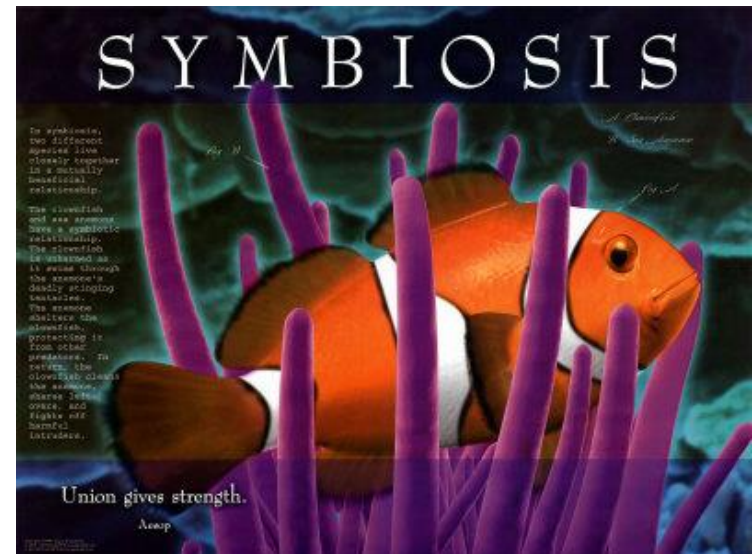
- **PREDATION** = one organism captures and feeds on another

EX: lions and wildebeests



SYMBIOSIS:

- **SYMBIOSIS** = a close and permanent association among organisms of different species; “living together”
- includes:
 - COMMENSALISM
 - MUTUALISM
 - PARASITISM



COMMENSALISM:

- one species benefits while the other species is neither harmed nor benefited

EXAMPLE: red-breasted
goose nests near peregrine
falcons' nests and is
protected by the falcons'
fierce defense tactics
(from other predators)





19 9'03

MUTUALISM:

- both species benefit from the relationship

EXAMPLE: ants and acacia trees;

ants protect the tree by attacking other animals that try to feed on it; ants get nectar and a home from tree





PARASITISM:

- one organism benefits and the other is harmed (but typically not killed)

EXAMPLE: ticks and fleas living on a dog;
tapeworms and roundworms living inside
their host





DOCTOR FUN



More unusual examples of animal symbiosis

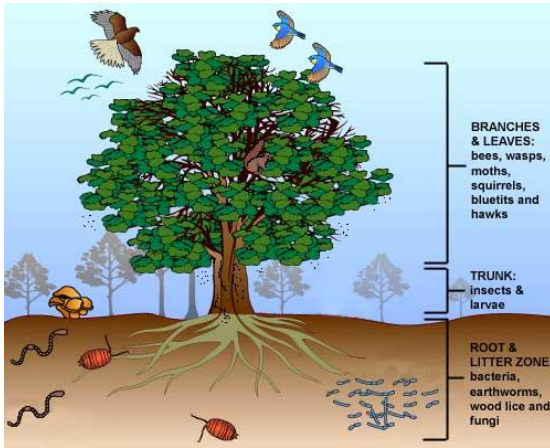
ECOSYSTEM

ECOSYSTEM = the community and its surrounding environment (biotic and abiotic factors)



- Interactions with biotic and abiotic factors
 - How does everything in an ecosystem affect another?
 - 3 kinds of ecosystems
 - Terrestrial (land)
 - Freshwater
 - Saltwater



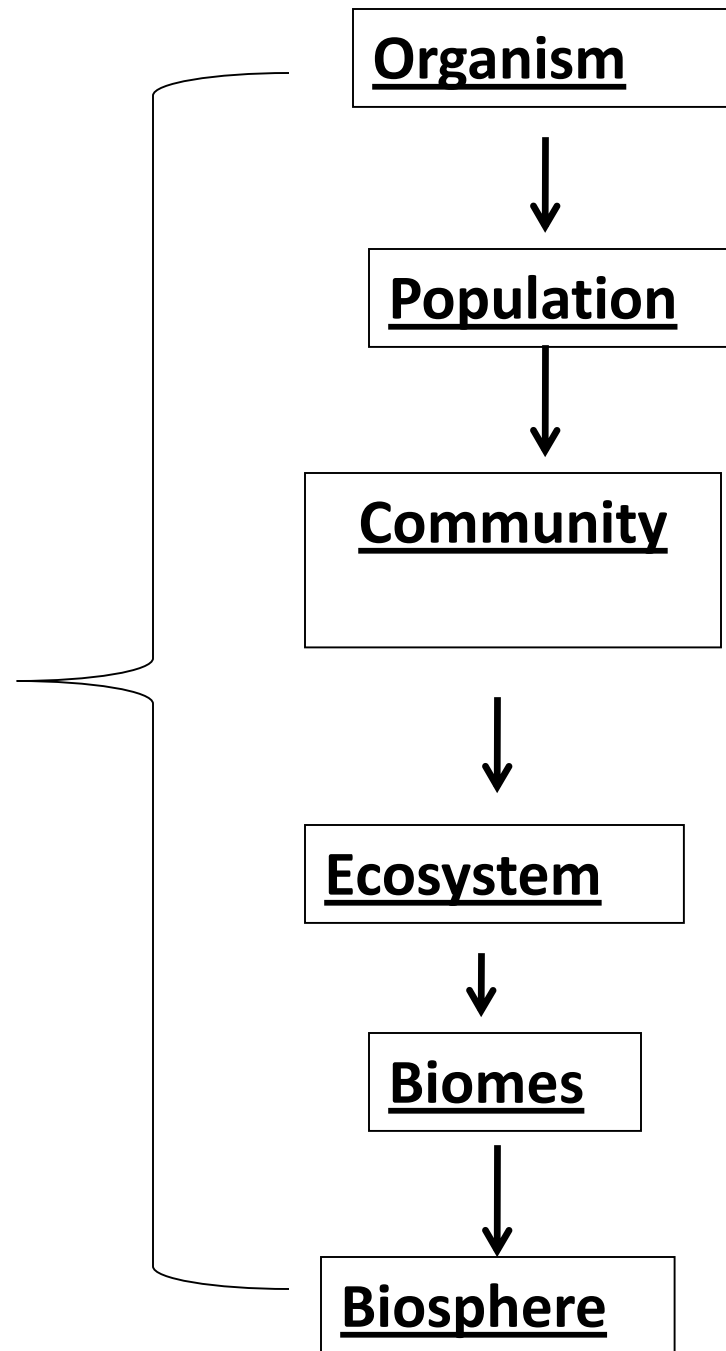


Summary of Ecological Hierarchy



The Earth System

M. Ruzek, 1999



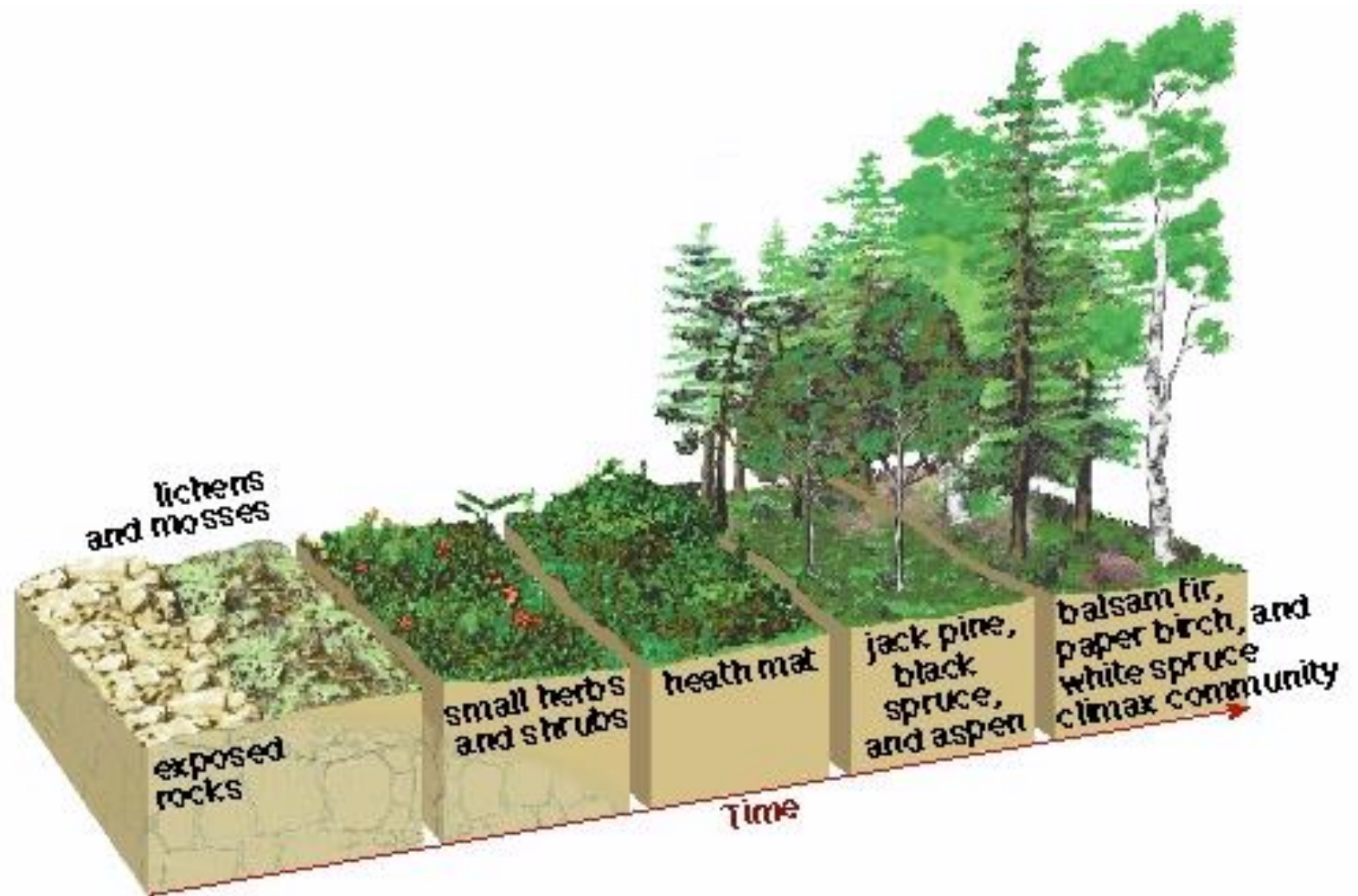
4.3 - ECOLOGICAL SUCCESSION:

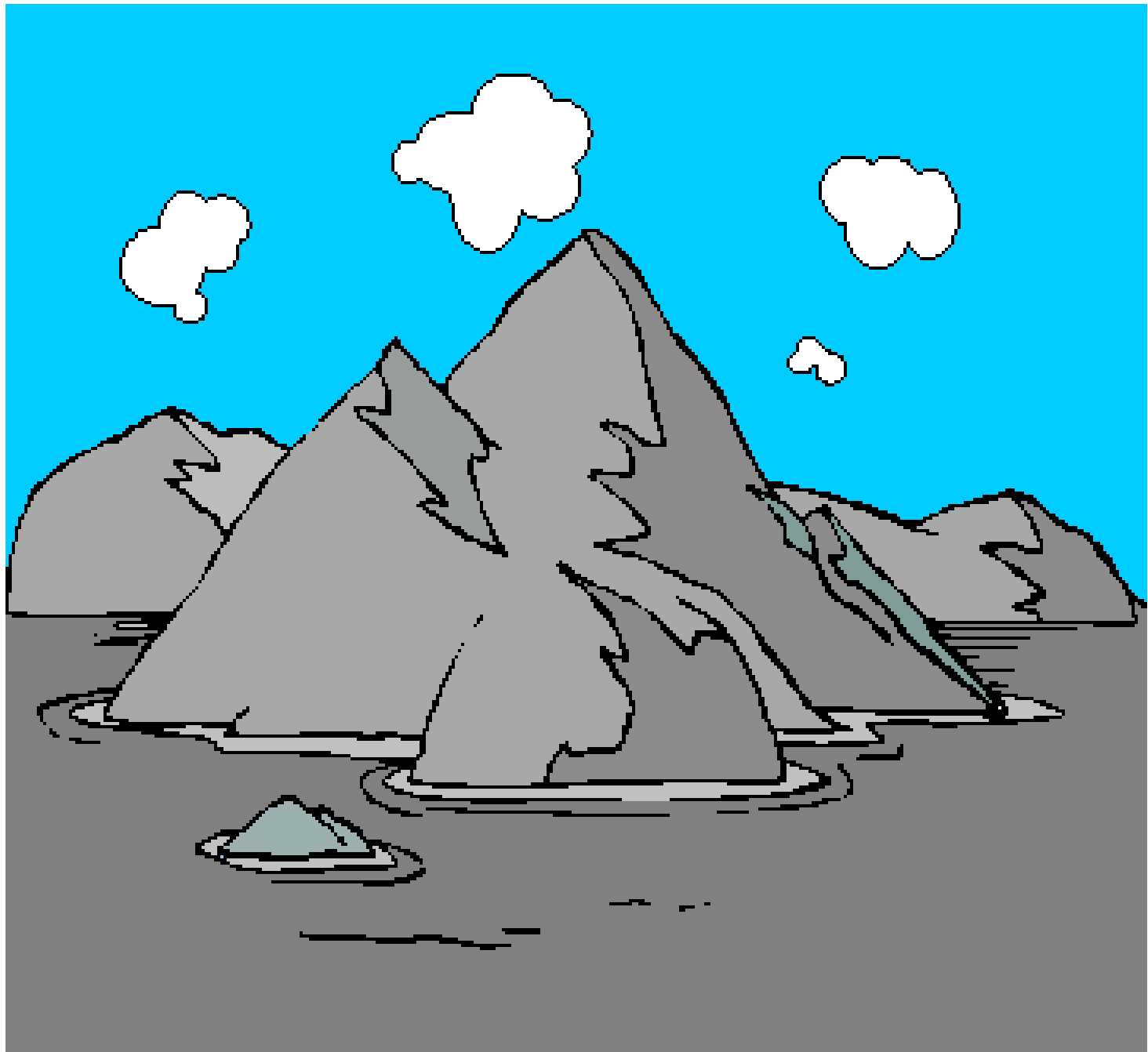
- Ecosystems change:
human intervention,
natural disaster
- **ECOLOGICAL**
SUCCESSION =
series of predictable
changes that occur in a
community over time



PRIMARY SUCCESSION:

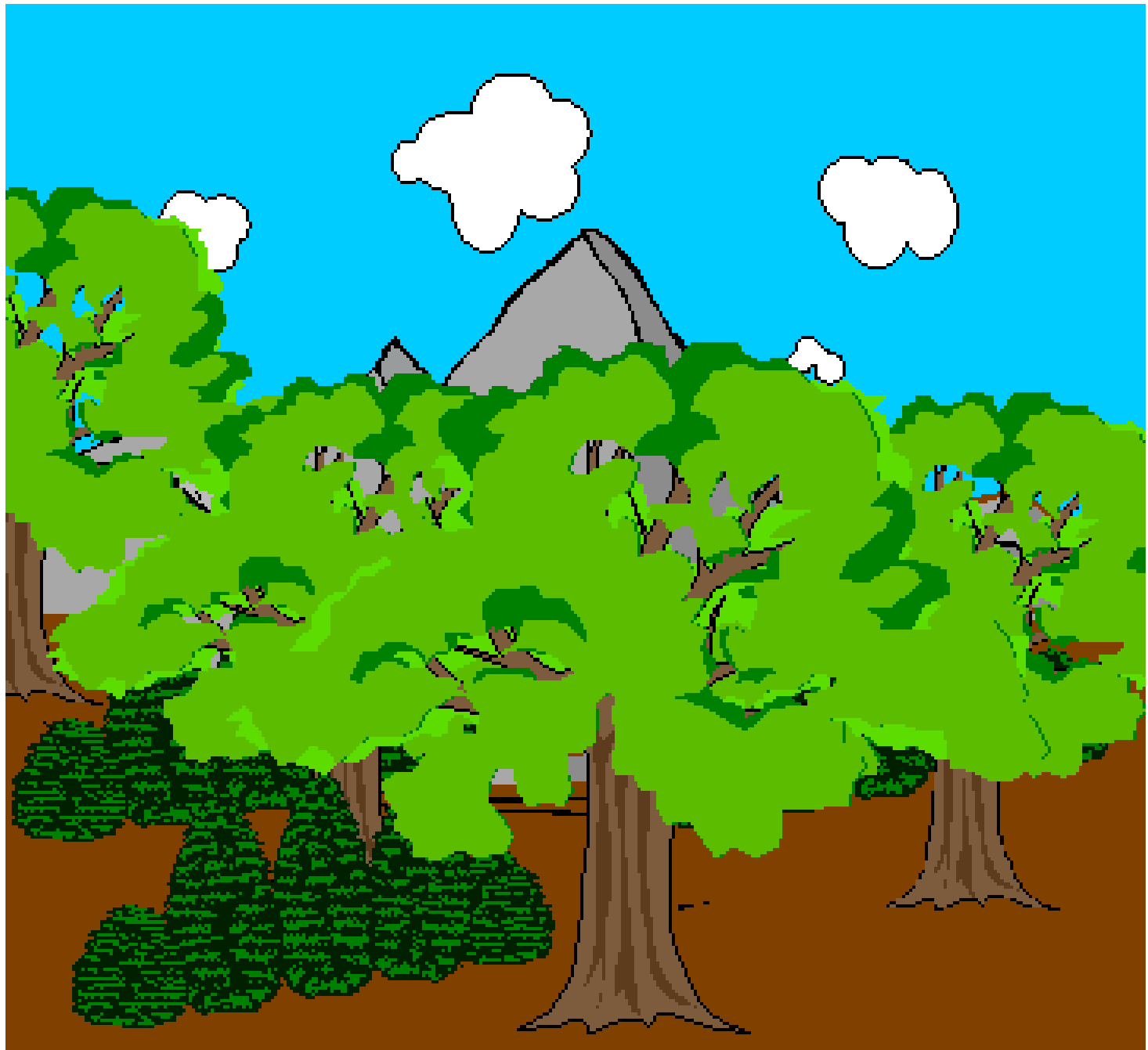
- **PRIMARY SUCCESSION:** occurs on surfaces where there is no soil; no life previously
 - EX: Volcanoes erupt and lave flows build up an island
 - Pioneer species** = 1st organisms to colonize barren areas
- Once a community becomes stable, mature, and there is little change in species, it is known as a **CLIMAX COMMUNITY**





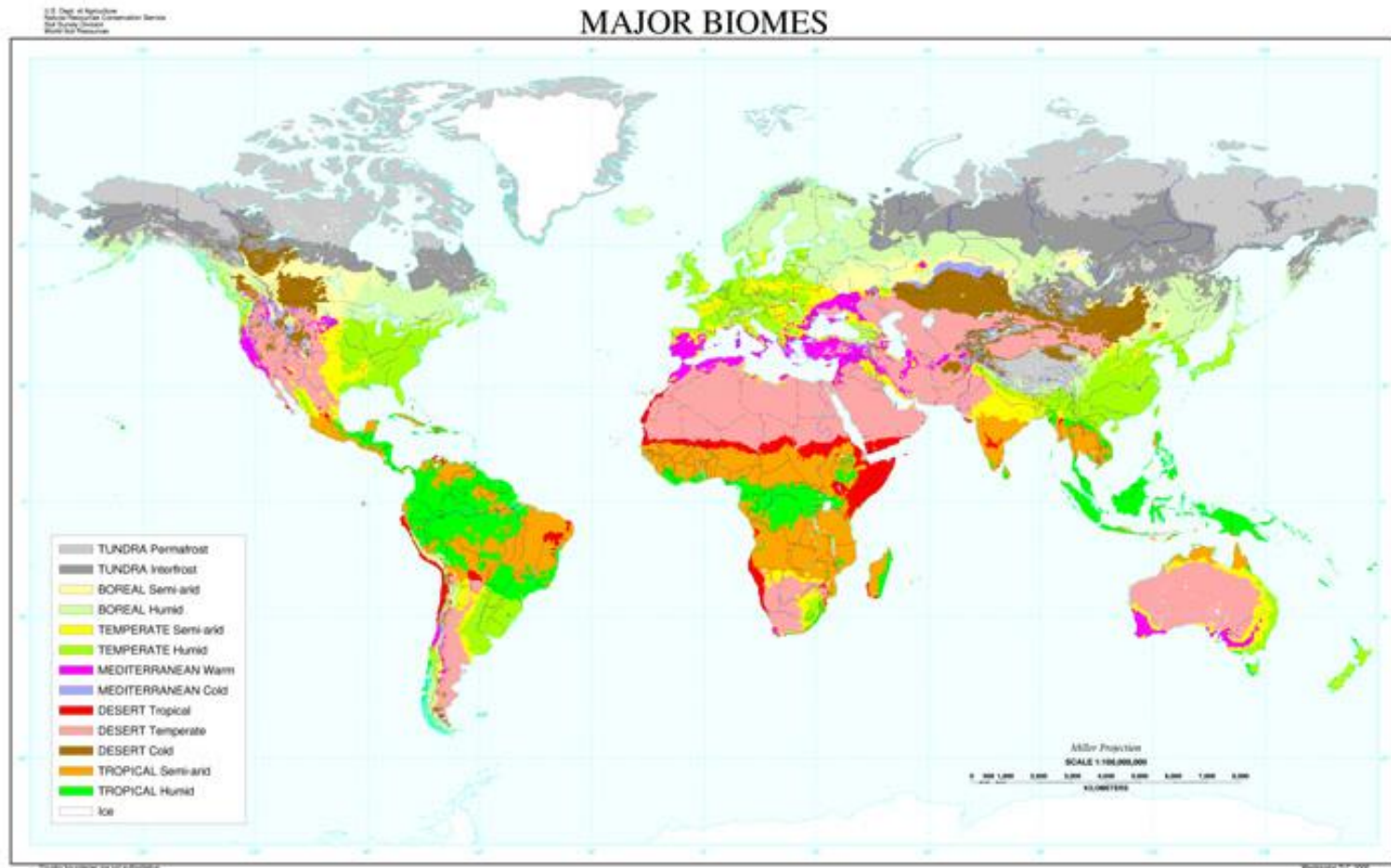
SECONDARY SUCCESSION:

- **SECONDARY SUCCESSION** = some kind of change happens, but soil (& some life forms) remain
 - Fire
 - Land cleared / plowed
- Change in species is also gradual, but typically takes less time than primary succession, because...
 - Seeds in the soil from previous vegetation take over



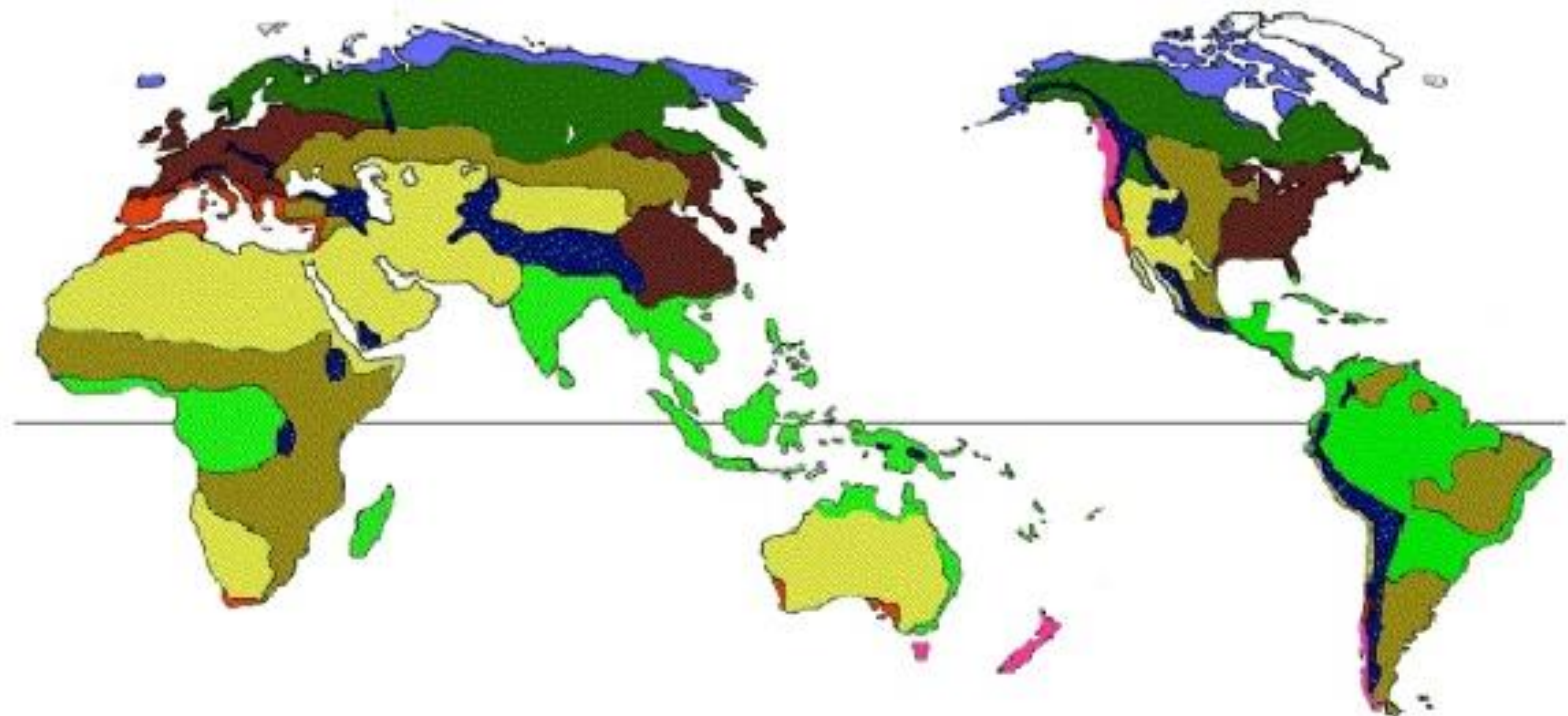


4.4 & 4.5 – Biomes & Aquatic Ecosystems



Major Types of Ecosystems:

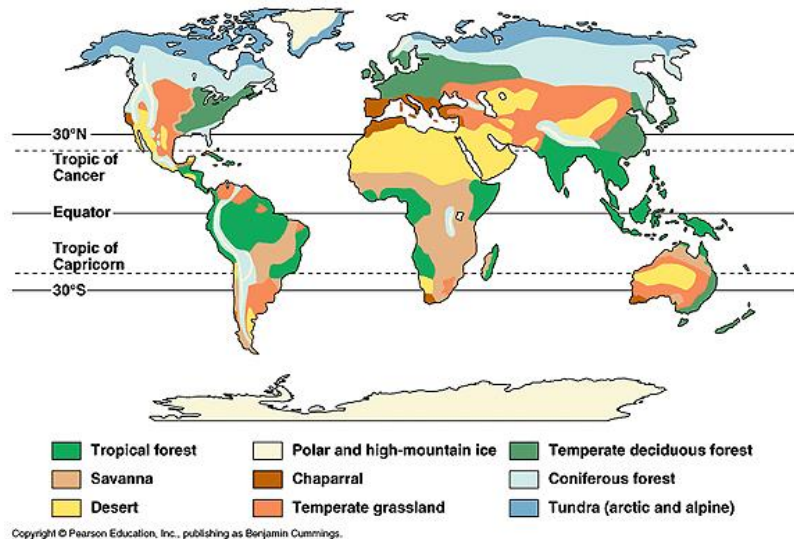
BIOMES!



- | | | | | | |
|---|--|--|---|--|--|
|  Tundra |  Chaparral |  Grassland |  Taiga |  Desert |  Mountain Zones |
|  Tropical Rainforest |  Temperate Evergreen Forest |  Temperate Deciduous Forest |  Polar Ice | | |

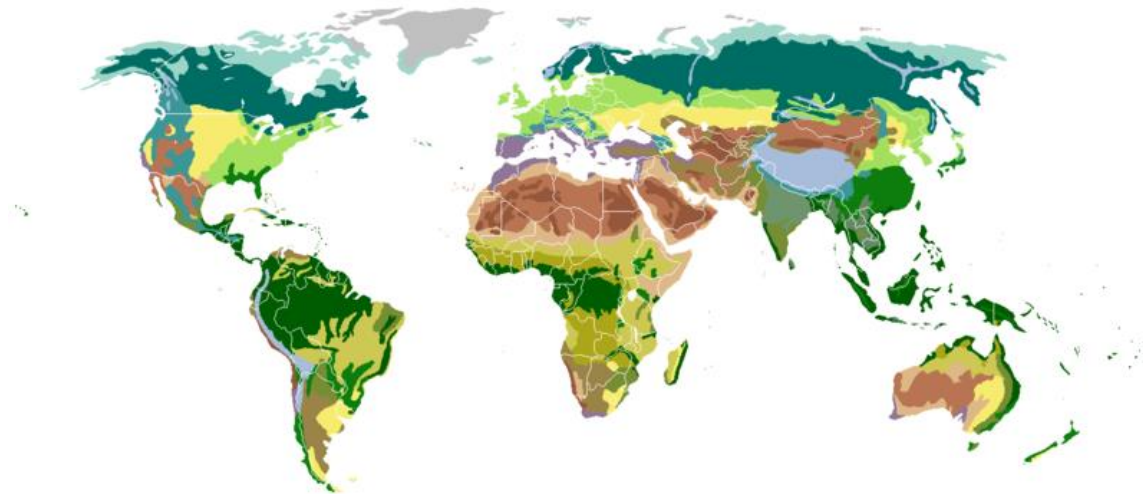
BIOMES:

- BIOME = large group of ecosystems that share similar climate & soil type
- Biomes are located on land (TERRESTRIAL) and in water (AQUATIC)



4.4 - TERRESTRIAL BIOMES:

- Two abiotic factors that affect terrestrial biomes are temperature and precipitation
- 10 major types of terrestrial biomes:



Terrestrial Biomes:

- Tropical Rain Forest



Figure 51-12 A broad view of a tropical rain forest on one of the Hawaiian Islands. (David Muench)



- Tropical Dry Forest



Terrestrial Biomes:

- Tropical Grassland / Savanna



- Desert



Terrestrial Biomes:

- Temperate Grassland



- Temperate Woodland / Shrubland



Terrestrial Biomes:

- Temperate (deciduous)
Forest



- Northwestern Coniferous
Forest



Terrestrial Biomes:

- Boreal Forest / Taiga



- Tundra



4.5 - Aquatic Biomes:

- **Marine: saltwater conc. of 3%;
cover about 75% of Earth's
surface**
- **Freshwater: saltwater conc. of
less than 1%**



AQUATIC BIOMES:

1) MARINE BIOMES:

-refers to salt waters
(oceans, seas)

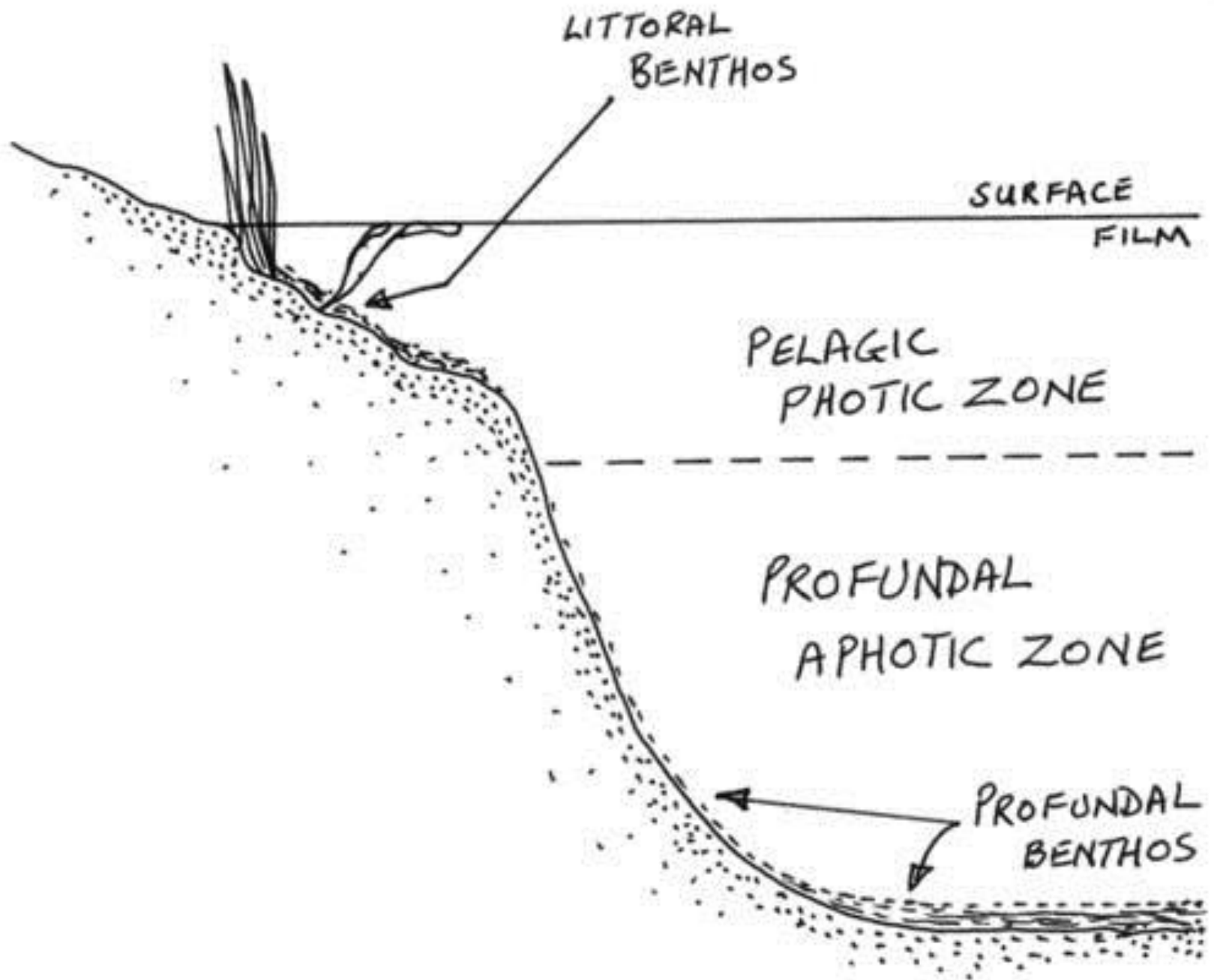
-contains the largest amount of biomass (living material)

-PHOTIC ZONE: shallow, sunlit

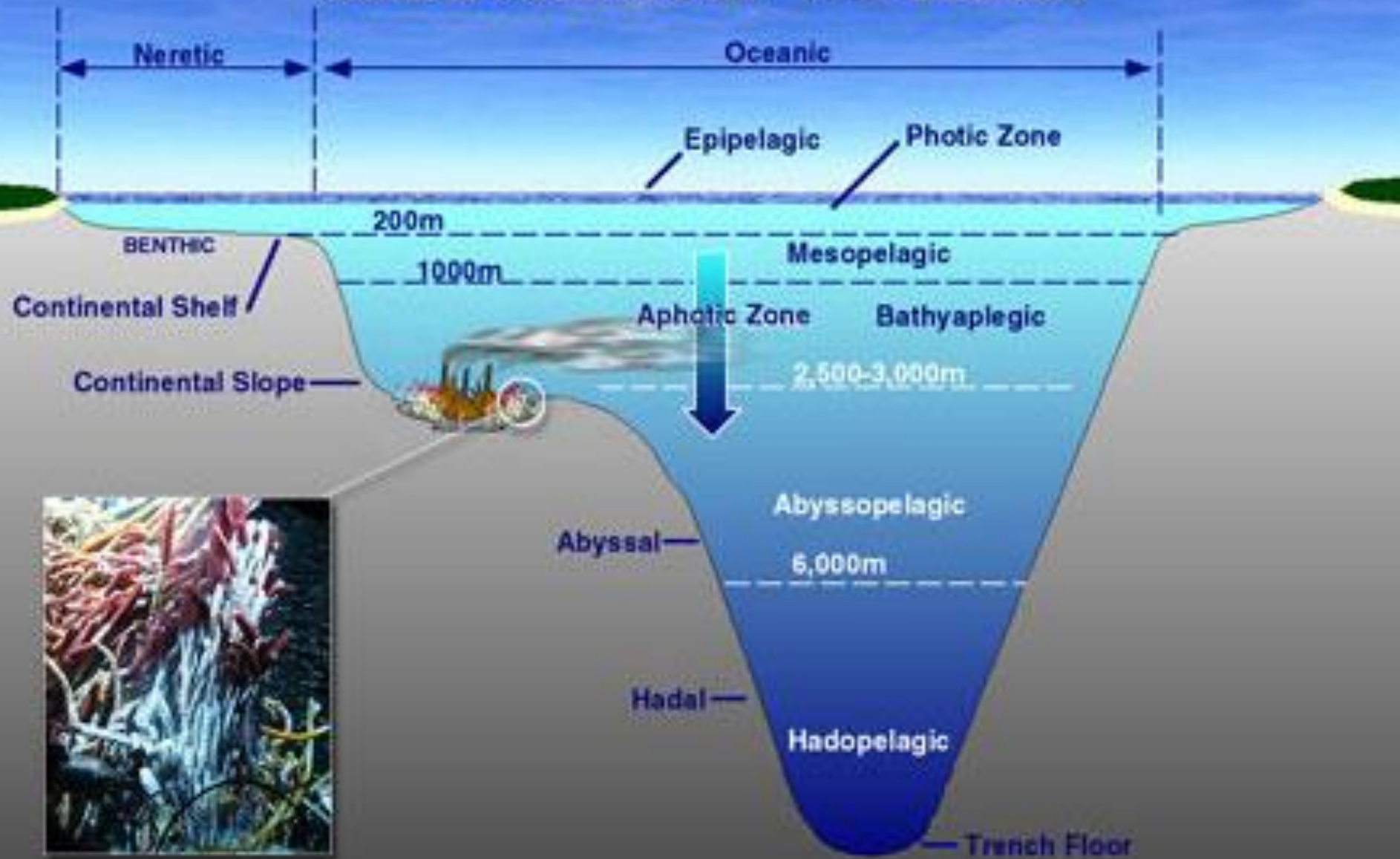
→ EX: rocky shores, sandy beaches,
mudflats

-APHOTIC ZONE: deeper, no sunlight



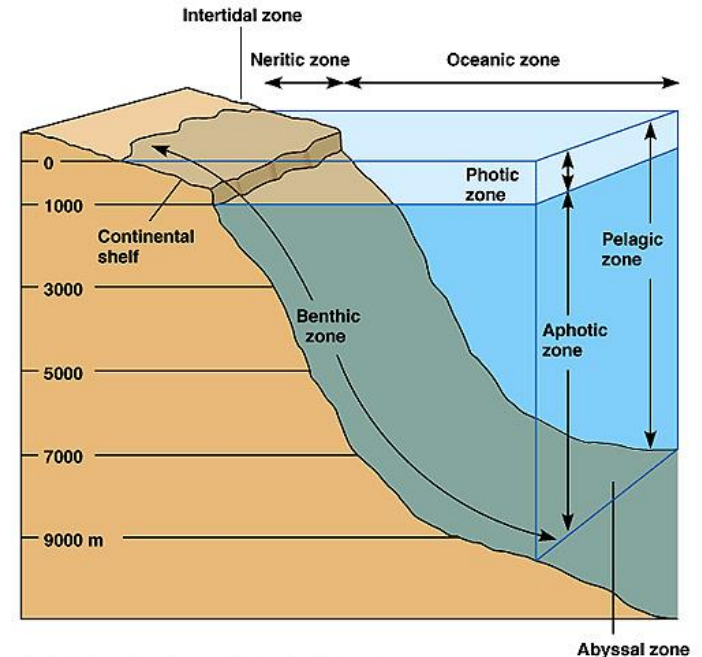


MAJOR ZONES OF THE OCEAN



Marine Biomes:

- Intertidal Zone
- Coastal Zone
- Open Ocean
- Coral Reefs



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AQUATIC BIOMES:

- TIDES:

- rise and fall of ocean tides are caused by the sun and moon's gravitational pull

- INTERTIDAL ZONE: portion of shoreline that is between high and low tides

- ➔Size of I.T. zone varies depending on slope of land and height of tide



AQUATIC BIOMES:

- Areas where salt water and fresh water meet are called **ESTUARIES**
 - salinity** (amount of salt) ranges between very salty to fresh water
 - changes with the tides*



AQUATIC BIOMES:

2) FRESHWATER BIOMES:

- rivers, streams, lakes, ponds

- limiting factors: light and temperature



