

1 Ecosystems and Energy Flow

Chapter 4

2 Ecology

- ☞ Study of how organisms interact with one another and with their nonliving environment
- ☞ Sustainable ecosystems have a balance and resilience in these relationships between the organisms and the environment in a way that perpetuates the system without depleting the resources

3 Setting up the hierarchy

- ☞ Cell→organism (prokaryote, eukaryotic, species, asexual, sexual)
- ☞ Population- all individuals of a species in an area
- ☞ genetic diversity: size age distrib density genetic composition
- ☞ Habitat-location, address
- ☞ Niche-function or role in ecosystem
- ☞ community-populations interacting in area
- ☞ ecosystem-community of diff species interacting w one another & with their nonliving env of matter & energy
- ☞ biome
- ☞ biosphere

4 Parts of the Earth

- ☞ atmosphere thin env or membrane of air around planet
- ☞ troposphere-inner layer 17K 11 mi above sea level contains most of the planet's air, mostly nitrogen and oxygen where weather occurs
- ☞ stratosphere: 17-48K 11-30 mi lower portion contains enough ozone to filter our much UV allowing life to exist on land and in surface layers of bodies of water

5 Parts of the Earth

- ☞ hydrosphere consists of the earth's
- ☞ 1. liquid water (both surface and underground)
- ☞ 2. ice (polar ice, icebergs, and ice in frozen soil layers, or permafrost)
- ☞ 3) water vapor in atmosphere

6 Parts of the Earth

- ☞ lithosphere: earth's crust and upper mantle
- ☞ contains NONrenewable fossil fuels and minerals we use
- ☞ renewable soil chemicals (nutrients) for plant life

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8 Life Support Systems

- ☞ biosphere: portion of earth in which living exist and interact and w nonliving environment
- ☞ most of hydrosphere and parts of the lower atmosphere and upper lithosphere deepest ocean floor 20 K to tops of highest mountains TTHINTHINTHINTHIN
- ☞ of this 73% of habitable land has been perturbed by man

9 How Life is Sustained

sun to

- ☞ 1) THROUGH MATERIAL AND LIV THINGS IN FEEDING INTERACTIONS
- ☞ 2) INTO ENV LOW QUAL energy heat
- ☞ 3) what is not absorbed reflected back
- ☞ cycling of matter - all nutrients used by organisms are already present on earth and must be recycled again and again for life to continue

☞

gravity allows the planet to hold on to atmosphere and causes the downward mvmt of chem in matter cycles

10 Sun's job to sustain life

- 1) lights and warms planet
- ☞ 2) photosynthesis
- ☞ 3) powers cycling of matter
- ☞ 4) drives the climate and weather systems that distribute heat and water over earth's surface

11 Sun's energy

- ☞ most of what reaches the atmosphere is visible light
- ☞ IR
- ☞ UV
- ☞ 1) warms troposphere and land
- ☞ 2) evap water and cycles it through the biosphere
- ☞ 3) generates winds

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13 Natural Greenhouse Effect

- ☞ 1) unreflected solar radiation not absorbed by plants is degraded into IR heat
- ☞ 2) greenhouse gases, water vapor, CO₂, CH₄, NO₂, and ozone
- ☞ 3) blanket earth slow waves down finally leave as LONG wavelengths
- ☞ if this didn't happen too cold only few extremophiles and nothing else

14 BIOMES

- regions char by distinct climate and specific life-forms esp veg adapted to climate
- ☞ climate: long-term patterns of weather climate drives

- ☞ aquatic-freshwater or marine freshwater lotic or lentic no in this book but in most counted as biomes on their own
- ☞ ecotone: transition
- ☞ not truly self-contained- that is why violate 3rd law of thermodynamics
- ☞ 2 sources allochthonous and autochthonous

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16 **FORCING FUNCTIONS**

- ☞ light
- ☞ Hydrology: water
- ☞ Nutrient cycling or availability

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18 **Range of tolerance**

- ☞ each pop has range of tolerance in physical and chem env
- ☞ individuals may have slight differences range is usually average conditions
- ☞ genetics, age, health
- ☞ total range and optimum range

19 **law of tolerance**

- ☞ The existence, abundance, and distribution of species in an ecosystem are determined by whether the levels of one or more physical or chemical factors fall within the range tolerated by that species. LEIBIG's law of minimum

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21 **limiting factor principle**

- ☞ too much or too little of any abiotic factor can limit or prevent growth of a population, even if all other factors are at or near the optimum range of tolerance.
- ☞
- ☞ 1) hydrology 2)soil 3)nutrients 4)sunlight 5) temperature 6) dissolved oxygen in aquatic systems 7) salinity

22 **Niches**

- ☞ producers autotrophs most use light to fix CO₂ some are chemoautotrophs
- ☞ consumers heterotrophs
- ☞ Herbivores, carnivores, omnivores, scavengers
- ☞ detritivores detritus feeders and decomposers
- ☞ detritus feeders extract nutrients from partly decomposed organic matter in leaf litter, plant debris, and animal dung
- ☞ decomposers
- ☞ 1) breaking down biodegrading detritus
- ☞ 2) releasing the resulting simpler inorganic compounds in to the soil and water then can be taken up by producers

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24 **Energy utilization**

aerobic respiration

anaerobic respiration or fermentation

end products: methane, ethyl alcohol, acetic acid, hydrogen sulfide

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31 **Water Cycle**

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35 **Carbon Cycle**

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37 Atmospheric Carbon Emissions over Time

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39 **Phosphorous Cycle**

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41 **Nitrogen Cycle**

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44 **Sulfur Cycle**

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