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Living World: Ecosystems
Unit 1 ↓

Ecological Relationships - Predator-prey, mutualism, commensalism, parasitism, and competition
Terrestrial Biomes - Tundra, Taiga, Temperate Rainforests, Tropical Rainforests, Grasslands, Savanna, and Desert
Aquatic Biomes - Coral reefs, estuaries, ponds, lakes, rivers, and oceans
Carbon Cycle - Photosynthesis, carbon exchange, fossil fuels, respiration
Nitrogen Cycle - Nitrogen Fixation, Nitrification, Assimilation, Ammonification, and Denitrification
Phosphorus Cycle - major reservoirs are rocks
Hydrologic Cycle - precipitation, evaporation, condensation, transpiration
Primary Productivity→ energy from sun used by plants (GPP and NPP)
Trophic Levels - autotrophs, heterotrophs, primary producers, primary, secondary, and tertiary consumers
Energy Flow (10% Rule) - approx. 10% of energy moves to next trophic level
Food Web - shows the flow of energy and nutrients through different food chains

Living World: Biodiversity
Unit 2 ↓

Biodiversity (Genetic, species, & habitat diversity)
- Richness & evenness

Ecosystem Services - Supporting, provisioning, regulation, and cultural
Island Biogeography (islands & biodiversity)
- Larger island = more species
- closer to mainland = more species
- emigration and immigration

Ecological Tolerance
- Ability of species to tolerate certain conditions

Natural Disruptions to Ecosystems - Habitat changes, sea level, climate changes, & migrations
- Resistance & Resilience of Ecosystems

Adaptations
- Survival of the Fittest - best traits survive
- Reproductive Isolation - population is separated

Ecological Succession
- Primary (starts w/ rock) & Secondary (starts w/ some soil)
- Keystone Species (LARGE role in ecosystem) & Indicator Species (reflect health of ecosystem)

Populations
Unit 3 ↓

Types of Species
- Generalist (general niche) and Specialist (specific niche)
- K- and R-Strategists

Survivorship Curve- Type I, II, and III
Carrying Capacity- The population of a specific organism that an environment can support
Age Structure Diagram - shows the percentage of a population in different age groups
Growth- Exponential (J-curve) & Logistic (S-Curve)
Total Fertility Rate- avg # of kids born to a woman
Infant Mortality Rate- # of kids that die before 5 yrs old
Rule of 70- time to double population is 70/(% population growth)

Population Growth Formula

$$\frac{\text{(births + immigrants) - (deaths + emmigrants)}}{\text{Number of people}} \times$$

Earth Systems and Resources
Unit 4 ↓

Plate Tectonics
- Convergent (→|←), Divergent (←|→), Transform (↑|↓)

Soil Formation: Weathered → Transported → Deposited
Soil Horizons: Hummus → Topsoil → Horizon E → Subsoil → Parent Material → Bedrock
Properties of Soil - Water-Holding Capacity, Particle Size, pH, Aeration & Compaction
Earth's Atmosphere - Major Gases (Nitrogen and Oxygen)
- Troposphere → Stratosphere (**Ozone Layer**) → Mesosphere → Thermosphere (aka **ionosphere**)

Global Wind Patterns
- **Convection Currents**- warm air to poles and cool air to equator
- **Coriolis Effect**- winds curve

Watersheds - Channel that brings runoff together to main discharge point
Climate - mountain rain effect, volcanic activity, human interaction, pollution,
El Niño and La Niña
- El Niño- warming of ocean surface
- La Niña- cooling of ocean surface

Land and Water Use
Unit 5 ↓

Tragedy of the Commons - Shared resources are overused by individuals
Clearcutting - Greatest profit, leads to soil erosion, ↑ water temps., flooding
The Green Revolution
- New ways to increase food supply
- GMO, Mechanization, Fertilization, Irrigation, Pesticides- destroys pests

Impact of Agricultural Practices
- Tilling, Slash-and-Burn farming, Fertilizers

Irrigation Methods
- 70% of freshwater is for irrigation
- Drip, Spray, Flood, Furrow, Waterlogging, Salinization

Pest Control Methods- Pesticides, GMOs
Meat Production
- 20x more land than crops (CAFOs, free-range)

Mining
- Soil must be replaced, habitat fragmentation, must dig deeper = more expense

Urbanization- Urban Sprawl increases FF use, more impervious surfaces = lots of runoff
Sustainability
- Reduce-reuse-recycle & energy efficiency
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Energy Resources & Consumption
Unit 6 ↓

Nonrenewable- finite supply and can't be replenished (Oil, Coal, Natural Gas, Petroleum)
Renewable- can be replenished (wind, hydroelectric, solar, biomass)
Industrialization = more energy demand
Biomass- from organic material
Fossil Fuels- Oil (compressed organic material), Coal (Carbon, hydrogen, & Oxygen), Natural Gas
- Releases CO2, greenhouse gases, etc.

Hydraulic Fracking- drilling through rock for oil
Nuclear Energy- getting power from nuclear rxn (Nuclear Fission)
Renewable- supply able to be replenished
Geothermal- power from using heat stored in earth
Hydrogen Fuel Cell- powered by the sun, hydrogen and water
Wind- captures kinetic energy of wind
Energy Conservation- can be done through regulations and personal actions

Air Pollution
Unit 7 ↓

- Primary are from the source, then altered into secondary with + UV +H_2O (sometime)
- Combustion of fossil fuels creates: NO_x, SO_x CO_x, PM

Photochemical Smog- VOCs + O_3, irritates eyes and lungs
Thermal Inversion warm air blankets cool air, traps pollution, forms easily in valleys
Indoor Air Pollutants - CO, VOCs, Radon, PM
Reducing Air Pollutants - conservation of FF, scrubbers in smokestacks, catalytic convertor in cars
Acid Rain - NO_x, SO_x combine with water in air, fall as rain; negatively impacts plants, animals, statues
Noise Pollution - volume that causes stress and hearing loss (transportation, construction, music)
- Interferes with mating, hunting, migration

Catalytic Converter - Cars use it to reduce very harmful pollutants, $2NO + 2CO \rightarrow 1N_2 + 2CO_2$

Aquatic and Terrestrial Pollution
Unit 8↓

Point source of pollution- a single pollutant source, like a smokestack or walgal bloom
- When algal bloom dies, microbes digest algae and O2 in the water, -> decrease in dissolved O2
- Lack of dissolved O2 -> large of die-off of aquatic organisms

Hypoxia Zones- bodies of water with low dissolved O2
D.O - dissolved O2
B.O.D- Biological Oxygen demand (D.O. Increase, B.O.D. Decrease)
Oligatrophic- very low nutrients, stable algae population, and high dissolved O2
Clean Water Act- 1948 (established) 1972 (expanded) Sets maximum permissible amounts of water pollution in waterways
Safe Drinking Water Act- 1974 set maximum containment level for pollutants in drinking water that hurt human health
ater discharge pipe
Nonpoint source of pollution- diffused, and therefore are difficult to identify, like the spraying of a pesticide or urban runoff.
Eutrophication- occurs when a body of water is enriched in nutrients.
- Increase in nutrients causes

Global Change
Unit 9↓

Tropical Ozone Cycle-
Step 1: O3 + electromagnetic radiation -> O + O2
Step 2: O + O2 -> O3
Ozone Depletion with CFCs-
Step 1: CFCl3 + electromagnetic radiation → Cl + CFCl2
Step 2: Cl + O3 → ClO + O2
Step 3: ClO + O3 → Cl· + 2 O2
Montreal Protocol- 1987 created to phase out production of chemicals that deplete the ozone. Use HFCs, not CFCs
Greenhouse Gase sources- volcanic eruptions, carbon dioxide, methane, nitrous oxide, CFCs.
Changes to The Environment- rise in global temp -> rising sea levels, melting ice sheets, disease vectors spreading, extreme weather
Biodiversity- variety of life in a given area
Factors causing a decrease in biodiversity:
HIPPCO- habitat destruction, invasive species, population growth, pollution, climate change, over exploitation

FRQ Tips + Tricks

- Do not use flowery words/phrases
- like "Bad for the environment"
- Label your sections (A, Ai, Aii, B)
- Ecological/environmental does NOT mean people (economic does)

Experimental design
- **Independent variable** (IV) is one that you CHOOSE to change
- **Dependent variable** (DV) is the result of that change, data that is collected
- **Constants** factors that do not change
- **Control** - the experiment done without IV
- **Hypothesis format**: If IV then DV will occur.
- Must be **repeatable** (run experiment at least three times)

Analysis
- Graphical trends are + (line goes up) or - (goes down), may go up, then down, then up. . .
- Describe trend using the data, ALWAYS include numbers / %