HUMAN ECOLOGY

Human ecology deals with the relationship between humans and their environment

I. Biodiversity
 A. The variety of life in an area
 B. Increases the stability of an ecosystem (e.g multiple food sources for predators)

C. 3 types: 1. Genetic diversity: variety of genes in a population 2. Species diversity: number of different species 3. Ecosystem diversity: different types of ecosystems leads to species diversity

GLOBAL BIODIVERSITY: SPECIES NUMBERS OF VASCULAR PLANTS





II. Threats to biodiversity A. Extinction: disappearance of a species from all or part of its range 1. Background: gradual process, due to long-term changes 2. Mass extinction: when a large percentage of species go extinct (dinosaurs)

B. Overexploitation 1. Excessive use of resources for profit 2. Tragedy of the commons – individuals not motivated to conserve public resources for the welfare of others, instead they take what they can for themselves while it is still available

C. Habitat Loss 1. Destruction due to agriculture and suburban sprawl 2. Disruption of food webs Keystone species: a species that plays a large role in an ecosystem, its disappearance can cause a dramatic shift in an ecosystem

• Some starfish may perform this function by preying on sea urchins, mussels, and other shellfish that have no other natural predators. If the sea star is removed from the ecosystem, the mussel population explodes uncontrollably, driving out most other species, while the urchin population annihilates coral reefs.





D. Habitat Fragmentation 1. Separation of an ecosystem into small pieces or "islands" 2. Smaller island --> smaller populations --> more vulnerable

E. Pollution 1. Anything that makes the environment less fit to live in 2. Some examples: hazardous waste, solid waste (5 pounds per person per day!), noise pollution, thermal pollution, chemical pollutants 3. Can be in the soil, water, or air 4. Example: DDT a) Perfect pesticide: cheap, active for long time, kills many insects b)Perfect hazardous pollutant: Non-biodegradable (can't be broken down by natural processes), Cannot be eliminated from body

c) Biological magnification 1) Toxic substance (DDT) becomes more concentrated at higher trophic levels in a food chain 2) Top carnivores at highest risk 3) Bald eagle populations threatened with extinction because of DDT





5. Example: Eutrophication a)accelerated aging of lakes due to pollutants like N and P b)step 1 - nitrogen+phosphorus in the water = excessive growth c)step 2 - overpopulated algae = decreased light, algae die off d)step 3 - Bacteria eat the dead algae and use up O2 in lake. e)step 4 - fish die from lack of Oxygen

The Eutrophication Process

Lighter, fresher, warmer surface layer

Nutrients, primarily from agricultural and urban sources, are delivered by stormwater runoff and atmospheric deposition.

Escape Mobile animals sometimes move out of hypoxic areas. oxygenate surface layer

Wind and waves

02

Pycnocline layer blocks oxygen flow to bottom waters

Organic material, from sources such as dead or dying algae and plankton, falls to the seafloor and decomposes.

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Heavier, saltier, cooler lower layer

Mortality Oxygen is consumed as organic matter decomposes, leaving slow-moving or attached animals to suffocate.

No Phosphate Added

Phosphate Addition

6. Example: Greenhouse effect a)Caused by pollutants such as CO₂ & methane b)They allow solar heat in, and trap it in c)Global temperatures rise d)Leads to changes in weather, melting ice caps, rising sea levels

CO2 CULPRITS

33% 33% 12% 22% power plants cars and trucks major transportation factories, home heating systems

Satellite imagery shows where carbon dioxide is being emitted or absorbed, measured here in 2003. Reds show sources; blues, absorption. (Credit: NASA)

<u>7.Example: Acid Rain</u> a)SO2(burning Coal) + NO(Cars)

b) NO + H2O = HNO3 (Nitric Acid Rain) c) SO2 + H2O = H2SO4 (Sulfuric Acid Rain)

The pH Range Chart







Effects of Acid Rain

a)Can Sicken or Kill plants

b) Lowers PH in Lakes/Rivers

C) Can Cause lakes to release stored Heavy metals(Mercury) * Can kill Fish



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	PH 6.5	PH 6.0	PH 5.5	PH 5.0	HI 4.5	HH 4.0
TROUT						
BASS						
PERCH						
FROGS						
SALAMANDERS						
CLAMS						
CRAYFISH						
SNAILS						
MAYFLY						

Acid Rain in Minnesota

Northern Lakes Have Granite
No Buffer action – More Problems

Southern Lakes Have LIMESTONE * Buffers Acid!– Less Problems

The Greenhouse Effect

Some energy is reflected back out to space Earth's surface is heated by the sun and radiates the heat back out towards space

Solar energy from the sun passes through the atmosphere Greenhouse gases in the atmosphere trap some of the heat F. Invasive Species 1. Organisms transported by humans into new habitats 2. No limits to population growth in new habitat(no predators or parasites) 3. Cause extinction of native species, human health problems, damage to structures

Purple Loosestrife







Gypsy Moth



Eurasian Water milfoil













IV.Conservation of Resources A. Use of resources in U.S. 1. 5 lbs of garbage/person/day 2. 183 gallons of water/person/day 3. more than 200 million metric tons of pollutants are released into the atmosphere each year 4. Refrigerators account for 20% of household energy use

B. Two types of natural resources 1. Renewable - can be replenished through natural processes • Wood, cotton, air, water, sun, soil 2. Nonrenewable - once it is used, it cannot be replaced • Coal, oil, metals, minerals

C.Sustainable Use 1. Using resources at a rate that does not deplete them 2. Improved farming methods reduces soil erosion and water consumption Cover crops, terracing, crop rotation 3. Fishing regulations limits catches to prevent overfishing



D.Natural pest control 1. Avoid overuse of chemicals 2. Bring in natural enemies a)Lady bugs eat aphids b)Some larva (e.g. Gypsy Moth) can be attacked with parasites 3. Pheromones (scent meant to attract mates) to lure insects into traps 4. Release sterile males

@ 1999 Noture's Control

Ladybug

Virus killed Gypsy Moth

Viru

E.New practices focus on conserving ecosystems 1. Focus on biodiversity hotspots, to preserve endemic species (only found in that location) 2. Focus on ecosystems that provide services like wetlands 3. Conserve habitat and all the species that live there

F. Conserving on a local scale 1. Reduce 2. Reuse 3. Recycle

35%

11%

9%

9%

1%

garden waste

Plastic

Metals

The rest

Glass



