

APES notes

Keystone: influence greater than relative abundance

ex: predator keeps herbivore pop down, preserves rare grass

Biomes:

terrestrial, freshwater, marine

latitude, humidity, elevation-terrestrial

freshwater: rivers, wetlands and basins (deeper than what they serve)

marine:

neritic -close to shelf

benthic-deep, sloping away from con shelf

pelagic-open sea

abyssal-very deep

hadal-trenches

food webs:

connections of energy from producer to consumer

trophic pyramid (see plankton to ahi, bioaccumulation)

primary producers: autotrophs-photosynthetic plants, chemotrophic (sulfur)-inorganic sources (also foundation species)

heterotrophs-get energy from organic sources:

herbivores, carnivores, scavengers

lots of energy lost between trophic levels (thermodynamics) rule of 10%

ecosystems-

abiotic environment

producers-autotrophs, e.g. plants

consumers-heterotrophs, e.g. herbivores, canrivores

decomposers-detritovores

photosynthesis-

CO₂, water, light into organic compounds (e.g. sugars)

photoautotrophs-plants

carbon fixation (redox rx) reduction is CO₂ to CHO

chlorophyll, carotenes and xanthophylls

cellular respiration-

conversion of energy to ATP (phosphate bonds)

glucose, amino acids and fatty acids with O₂ as an oxidizer (accepts electrons) OIL RIG
aerobic and anaerobic metabolism (aerobic is 19x more efficient)
TCA cycle, mitochondria

biodiversity-

variation of life forms within a biome or ecosystem
genetic
species
ecosystem
creates stability and robustness in ecosystems

biogeochemical cycles (nutrient cycles)

how an element or molecule travels through biotic (living things) and abiotic (earth, air, water) parts of earth
reservoirs may differ: N₂ in air, P in soil
closed system: C N O P
open system: energy, e.g. photosynthesis
cycles:
carbon
nitrogen
oxygen
phosphorus
water
also mercury and atrazine (herbicide)

GM crops

genetic engineering vs. selective breeding or mutation breeding
concerns: ecological, economic (LDC) and IP rights (see Monsanto)
uses restriction enzymes to ID and isolate genes
inserted using gene gun (plasmid) or agrobacterium

GMO

insertion or deletion of genes
recombinant DNA, transgenic organisms
if no DNA from other species, cisgenic (cis vs trans)
lentiviruses-can transfer genes to animal cells
Genentech-Berkeley 1978, created human insulin from E. Coli (vs. cow or

pig insulin)

pesticides-

biological, chemical, antimicrobial, disinfectant

pests: pathogens, insects, weeds, mullosks, birds, mammals, fish, nematodes and microbes

any food competitor or spoiler, also disease vectors

herbicides-glyphosate (roundup)

insecticides-HCl, carbamates, pyrethrins, etc.

green fungicides-paloxins

EPA regulates

banned: carcinogenic, mutagenic or bioaccumulators

see also NRDC

pesticide laws-

Federal insecticide act-1910

Federal insecticide, fungicide and rodenticide act (FIFRA)-1947 then 1972, 1988

1947-ag dept

1972-EPA

3 categories: antimicrobials, biopesticides, conventional

forest management-

silviculture, protection and regulation (Pennsylvania = Penn's woods)

conservation and economic concerns

watershed management included

see also FSC 1993, forest stewardship council (certifies wood harvests)

applied ecology-

conservation biology, ecology, habitat management

invasive species management

rangeland management

restoration ecology

land management-

habitat conservation

sustainable ag

urban planning

sustainable ag-

environmental stewardship

farm profitability

farming communities

e.g. ability to produce food indefinitely, without causing damage to ecosystem health

see also erosion, irrigation/salinization, crop rotation

see also landraces, e.g. prairie grasses

mining laws-

SMCRA surface mining control and reclamation act (1977)

1. regulates active coal mines

2. reclamation of abandoned mines

dept of interior admin

response to strip mining (1930+)

SMCRA

regulation:

1. standards of performance

2. permitting

3. bonding

4. inspection/enforcement

5. land restrictions

compare to 1945 strip mining practices

Fisheries laws-

monitor and protect fisheries resources

overfishing conference 1936

1957: Beverton and Holt did study on fish dynamics

goals:

1. max sustainable biomass yield

2. max sust. econ yield

3. secure employment

4. secure protein supply

5. income from export

6. bio and economic yield

UNCLOS-UN convention on law of the sea

EEZ-exclusive economic zones

12 mi = coastal sovereignty
200 mi = fishing restrictions
2004-UN made stricter laws on fisheries mgt.
1995 code of conduct for responsible fisheries
quotas, taxation, enforcement (USCG)

tragedy of the commons-

1968 Science article-Garrett Hardin
individual benefit, common damage
strict management of global common goods
see also overgrazing, pollution, privatization
"a fundamental extension of morality"

Rachel Carson: Silent Spring 1962

DDT weakening shells of birds
"biocides" bioaccumulation (single animal)

ozone depletion-

stratospheric ozone depletion
4% since 1970
ozone hole over antarctica
catalytic destruction of ozone by chlorine and bromine
halogen compounds CFCs (freons) and bromofluorocarbons (halons)
ODS ozone depleting substances
ozone blocks UVB 270-315 nm

Montreal protocol 1987 banned CFCs

$O + O_3 \rightarrow 2O_2$ (transparent)

$Cl + O_3 \rightarrow ClO + O_2$

$ClO + O_3 \rightarrow Cl + 2O_2$

effects:

1. ++ carcinomas
2. melanomas
3. cataracts
4. ++ tropospheric ozone (toxic)
5. kills cyanobacteria (rice nitrogen fixers)

-----**Laws**-----

1963 CAA Clean air act

1970: NEPA National environmental policy act
EIS environmental impact statement
EPA environmental protection agency

1972 CWA clean water act

1973 ESA endangered species act

1973 CITES convention on international trade in endangered species

1974 SDWA safe drinking water act

1976 RCRA resource conservation and recovery act (cradle to grave act)

1980 CERCLA comprehensive environmental response compensation and reliability act (superfund)

1987 Montreal protocol: ozone depletion, CFCs banned

1997 Kyoto protocol: climate change, GHG