Module 08: Response to disturbances

Module 8: Response to disturbances Recall negative feedback (stable ships, relationships): greater the disturbance, the greater the restoring force (pendulums too)**Resistance** is how hard it is to move the pendulum (ecosystem) away from center
Resilience is how fast the pendulum (ecosystem) returns to normal

Biodiversity and disturbances: This is strange stuff:Rare disturbances = competition, so only a few species dominateCommon disturbances = only fast reproducers survive, so low biodiversityIntermediate disturbances = highest biodiversity
Watershed: drainage basin usually leading to a large body of water (Chesapeake watershed is huge):https://www.cbf.org/about-the-bay/chesapeake-bay-watershed-geography-and-facts.html



How do you think this impacts the water quality, phosphates, nitrates and silt in the Chesapeake bay?Why are we not allowed above the fences behind Pu'u La'e La'e?On Oahu, the watershed is guarded by a barbed wire fence-why?How are the Himalayas acting as a watershed?
Poisoned waters:Video:

http://physics.hpa.edu/physics/apenvsci/videos/poisoned_waters/POISONED_WATERS.mp4

http://physics.hpa.edu/physics/apenvsci/videos/poisoned_waters/poisoned_waters.m4v
Weblog page:

http://physics.hpa.edu/groups/apenvironmentalscience/weblog/973c4/Poisoned_Waters_videoPBS.html

On campus try these:

http://physics.local/physics/apenvsci/videos/poisoned_waters/POISONED_WATERS.mp4

http://physics.local/physics/apenvsci/videos/poisoned_waters/poisoned_waters.m4v

http://physics.local/groups/apenvironmentalscience/weblog/973c4/Poisoned_Waters_videoPBS.html

quiz

1. why is the soil on Kauai so poor, and how does it get its Potassium?
2. how does the size of the Cheseapeake watershed impact eutrophication in the Chesapeake bay?

3. what is the difference between resistance and resilience in natural systems?
4. why do rotting fish smell so bad?

Summary notes: Systems

- systems are usually connected, exchange matter and/or energy
- main energy source is our sun, or past suns (e.g. uranium)
- feedback loops (again)
- spheres: litho=stone, bio=living, hydro=water, atmo=above
- geosphere: crust-mantle-core-inner core (spins, no way!)
- plates-who thought this up? need to understand convection
- where are oldest parts of crust? trick question
- subduction zones, mid atlantic ridges (atlantis?)
- eq: deep near subduction zones, shallow in transform faults
- mid atlantic ridge: how do we know this? submarines
- himalayas-how? matterhorn-what?
- water cycle: evaporation and transpiration (eTO)
- precipitation-condensation is first (condensation nuclei, e.g. vog)
- aquifers-underground lakes, low turnover rate (pesticides) Oglalla
- water can be ground water: aquifer, water table, water lens or surface water

Cycles

- conservation of matter (neglect E=mc2)
- nutrient cycles: carbon, oxygen, phosphorus, nitrogen COPN
- primary producers-photosynthesis: CO_2, water and light/heat
- create sugar as stored food, structural element
- consumers-eat primary producers, decomposers break down waste/detritus
- cellular respiration (flowers in hospitals) at night
- carbon also in HCO_3^- ion (seawater) and $CaCO_3$ (seashells, limestone)
- greenhouse effect from CO_2 captured as plants->oil/coal "carbon bank"
- phosphorus: rocks and water (stone and sea), erosion, very limited supply in biosphere (Waterloo bones)
- P only absorbed in aqueous form (aq)
- too much = eutrophication (also nitrogen) see dead zones
- eutrophication: too much of a good thing, when algae dies, decomposes, creates hypoxic zones
- aerobic vs. anaerobic bacteria-wounds
- nitrogen cycle-NPK
- N_2 to life: lightning and bacteria (N_2 to ammonia NH_3 then to NO_2 and NO_3 (plants absorb NO_3)
- denitrifying bacteria change NO_2 back to N_2 (gas)
- Haber process
- See figure 3.30-nitrogen uptake
- golf courses-Mauna Kea, iBoat

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