

one-way energy in, ten percent passed on, and everything else recycled forever

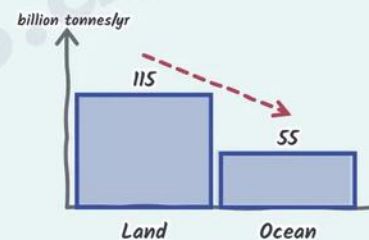
Ecosystem: Structure and Function

- a self-regulating, self-sustaining structural and functional unit of the biosphere
- term coined by Tansley (1935); ranges from a pond to an ocean
- classed as **natural** (self-sustaining) or **artificial** (needs constant input), e.g. farm, fish tank
- also classed as **terrestrial** (forest, grassland, desert) or **aquatic** (lake, river, sea, estuary)
- four functional processes keep any ecosystem going: productivity, decomposition, nutrient cycling, energy flow
- **stratification**: vertical layering of species, e.g. trees, shrubs, herbs in a forest
- at sea, stratification runs epipelagic, mesopelagic, bathypelagic and benthic zones by depth
- **zonation**: horizontal distribution across a gradient, sharpest where land meets water
- e.g. intertidal, littoral, sub-littoral zones at a lake edge or beach

Productivity: GPP, NPP and Secondary Productivity



- **gross primary productivity (GPP)**: total rate of organic matter production by photosynthesis
- plants spend part of GPP on their own respiration (R)
- what's left is **net primary productivity**: $NPP = GPP - R$
- it's NPP, not GPP, that heterotrophs actually feed on
- **secondary productivity**: rate at which consumers assimilate food energy into their bodies
- measured at whichever trophic level the consumer sits
- biosphere's annual NPP is roughly 170 billion tonnes dry weight
- oceans contribute only about 55 billion tonnes despite their size
- land-based ecosystems supply the remaining roughly 115 billion tonnes



of the biosphere's roughly 170 billion tonnes annual NPP, land contributes far more than the ocean