

Organisms and their environment

Energy flow and food chains

Sun: principal energy source

Light energy Photosynthesis

Energy flows, not cycled

Chemical energy in organisms Heat to environment

Food chain

Transfer of energy Starts with producer Arrows: food to feeder

Food web

Interconnected food chains

Consumers

Primary Secondary Tertiary Quaternary

Herbivore, carnivore, decomposer

Eats plants Eats animals Feeds on dead material

Human impact

Overharvesting Introduced species

Trophic levels and pyramids

Trophic level

Position in food chain Producers are level 1

Pyramid of numbers

Number of organisms Can be inverted

Pyramid of biomass

Mass of living material Takes size into account

Pyramid of energy **Supplement**

$\text{kJ per m}^2 \text{ per year}$ Always pyramid-shaped

Energy transfer is inefficient **Supplement**

Parts not eaten Faeces and urine Respiration: heat

Food chains are short **Supplement**

Fewer than five levels Too little energy left

Plants versus livestock **Supplement**

Fewer trophic levels Less energy lost

Nutrient cycles

Carbon cycle

Photosynthesis removes CO_2 Respiration adds CO_2 Feeding passes carbon on

Fossil fuels and combustion

Decomposition

Bacteria and fungi Release CO_2 by respiration

Nitrogen cycle **Supplement**

Nitrate absorbed by plants Amino acids and proteins Feeding and digestion

Deamination forms urea

Bacteria and nitrogen **Supplement**

Decomposition: ammonium ions Nitrification: nitrates Nitrogen fixation

Denitrification: nitrogen gas

Fixation by lightning **Supplement**

Air nitrogen to nitrates

Populations

Population

One species Same area Same time

Community

All populations Different species

Ecosystem

Community plus environment Interacting together

Growth factors

Food supply Competition Predation Disease

Sigmoid curve phases

Lag Exponential (log) Stationary Death

Explaining the phases **Supplement**

Limiting factors Birth rate and death rate