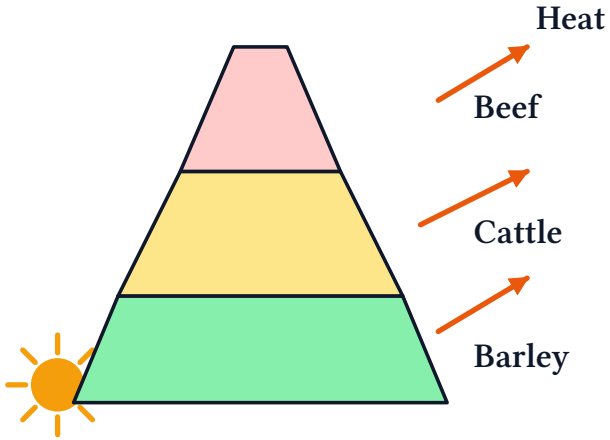
Biology 20

Unit A: Energy and matter in the biosphere

Ecological pyramids

Energy loss along a food chain

- A hectare of barley holds a large store of chemical energy in the grain.
- Cattle that eat that grain keep only a fraction, and people who eat the cattle keep a fraction of that fraction.



Three ways to stack one chain

- Count the organisms when you build a numbers pyramid.
- Weigh the dry matter when you build a biomass pyramid.
- Use kilojoules per square metre per year when you build an energy pyramid.

Key terms

pyramid of energy

A stack of trophic levels drawn by the energy available at each level in a set time. (kJ m^{-2} y^{-1})

pyramid of numbers

A stack of trophic levels drawn by how many organisms sit at each level.

pyramid of biomass

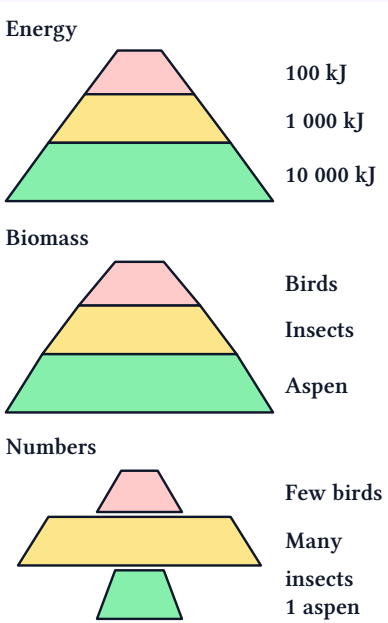
A stack of trophic levels drawn by the dry mass of organisms at each level.

albedo

The fraction of incoming sunlight that a surface reflects.

Energy narrows even when counts invert

- About one tenth of the energy at one level is available at the next.
- One aspen can support thousands of insects, so a numbers pyramid can widen upward.
- Biomass and energy for that tree still narrow because the tree outweighs and out-stores the insects.



Energy pyramid with units

- Write the producer value, then take one tenth twice.
- Keep kJ m^{-2} y^{-1} on every floor and match the digits to the data.

Pyramids and decisions

- Diet, grain storage, ice cover, and wetland loss ask different energy questions.
- Choose the display whose unit can answer the question in front of you.

Which stack

- Give the energy values after two transfers of about one tenth.
- State when a numbers pyramid widens and which human choice the energy pyramid explains.

The atoms stay when the joules leave

- The next lesson follows carbon, oxygen, nitrogen, and phosphorus.
- Those atoms cycle after the energy pyramid has already narrowed.