

# Energy Flow

## 4.2



### *Energy Flow In Ecosystem*

*10% Law – Energy Loss*

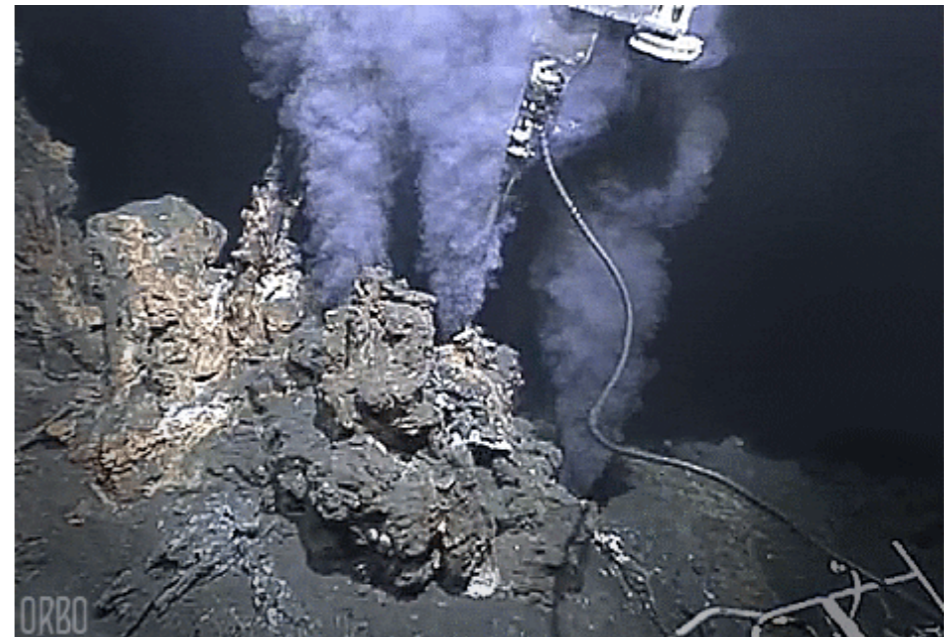


**Progressive Loss of Energy in Food Chain**

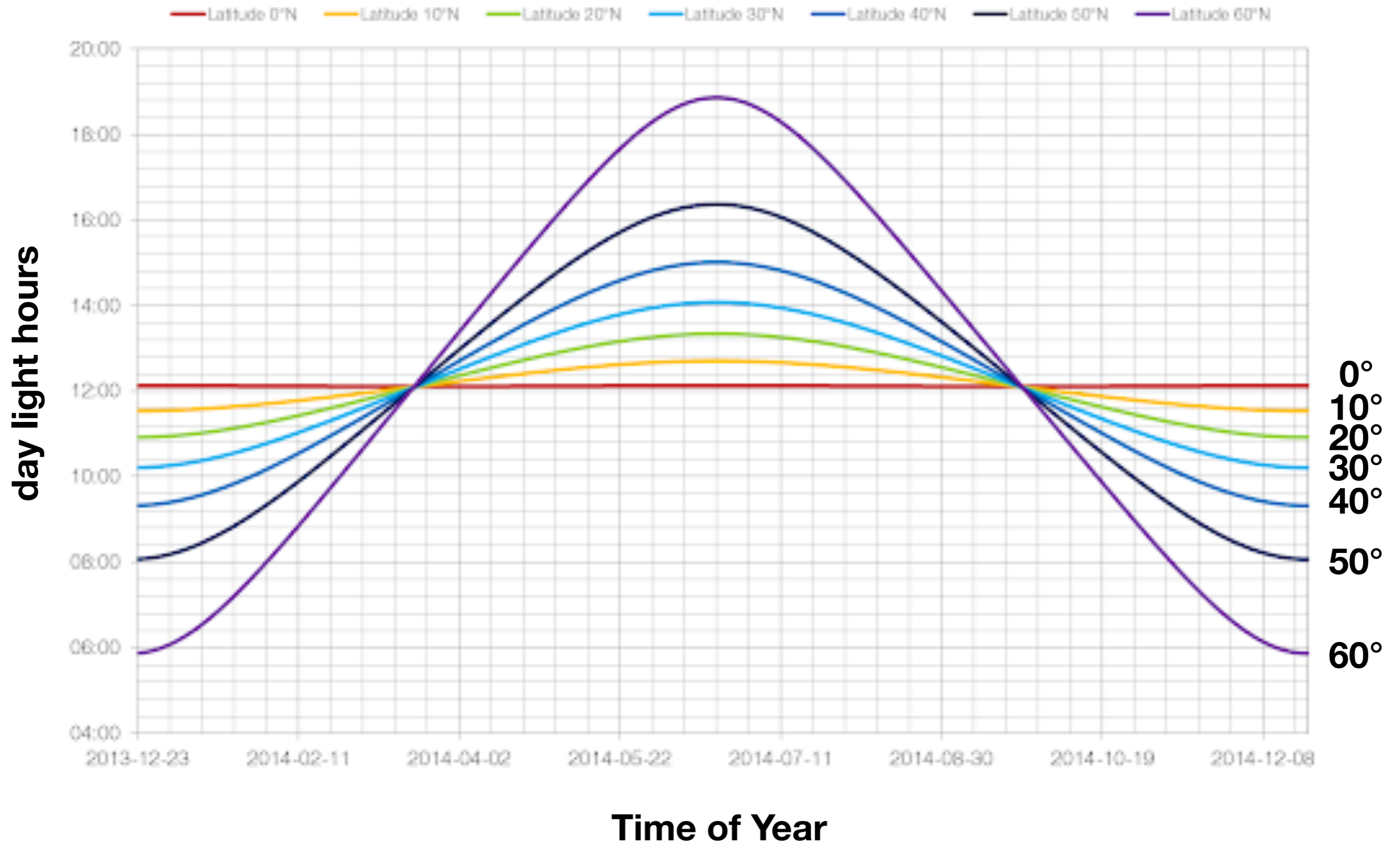
# Solar Energy

- Energy in most cases flows from the **sun** to all organisms directly or indirectly
- **Autotrophs** —> by way of photosynthesis
- **Heterotrophs** —> transfer of energy from producers to consumers
- Light intensity and uses vary.
  - Too much- too hot to support producer ( deserts)
  - Too little- too little for photosynthesis

Where on the planet does sun light affect energy flow to any considerable amounts?



# What does this data suggest ?



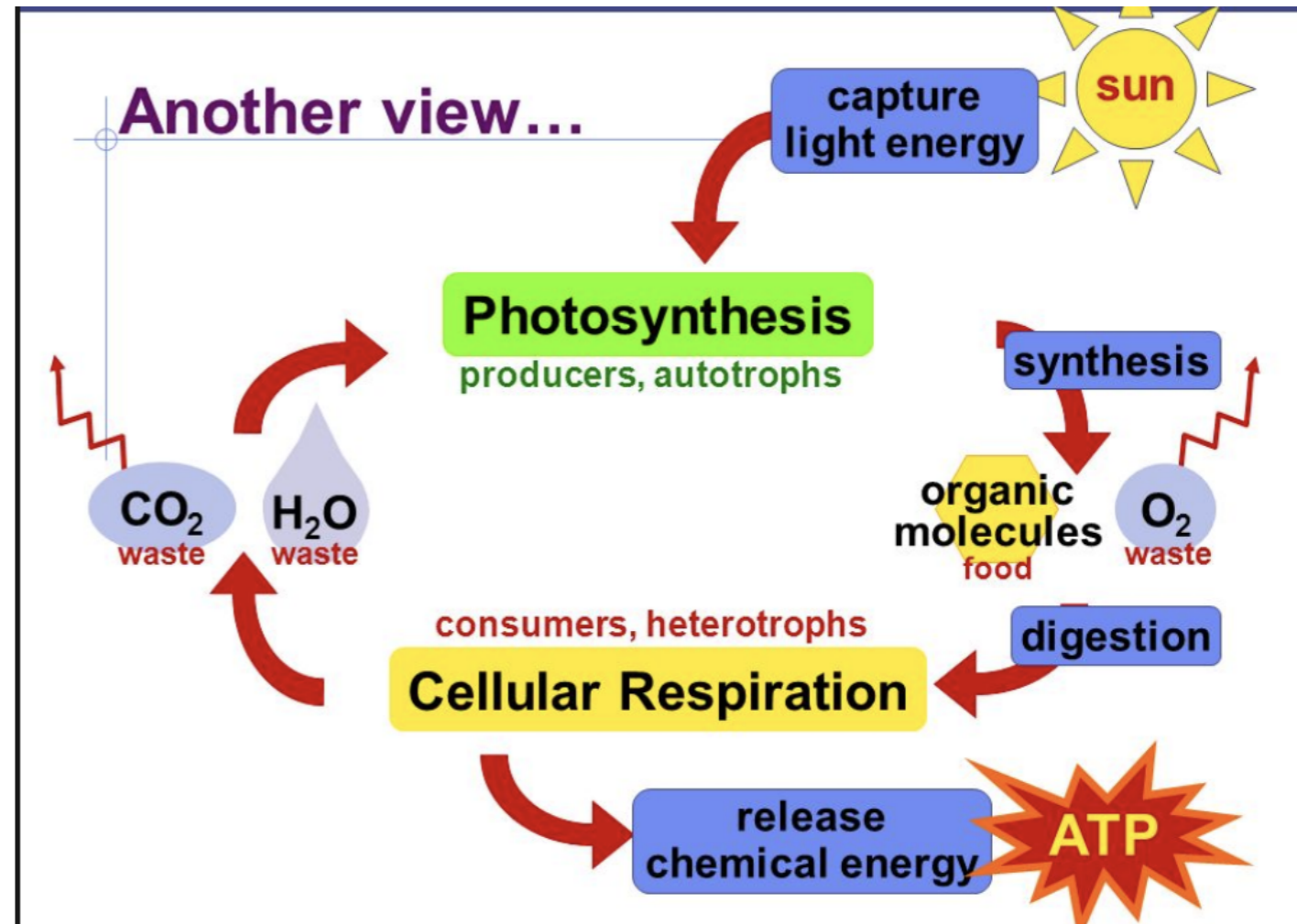
# Energy conversions

Light → Producers

- photosynthesis stores light energy in chemical bonds of organic molecules (**C**)

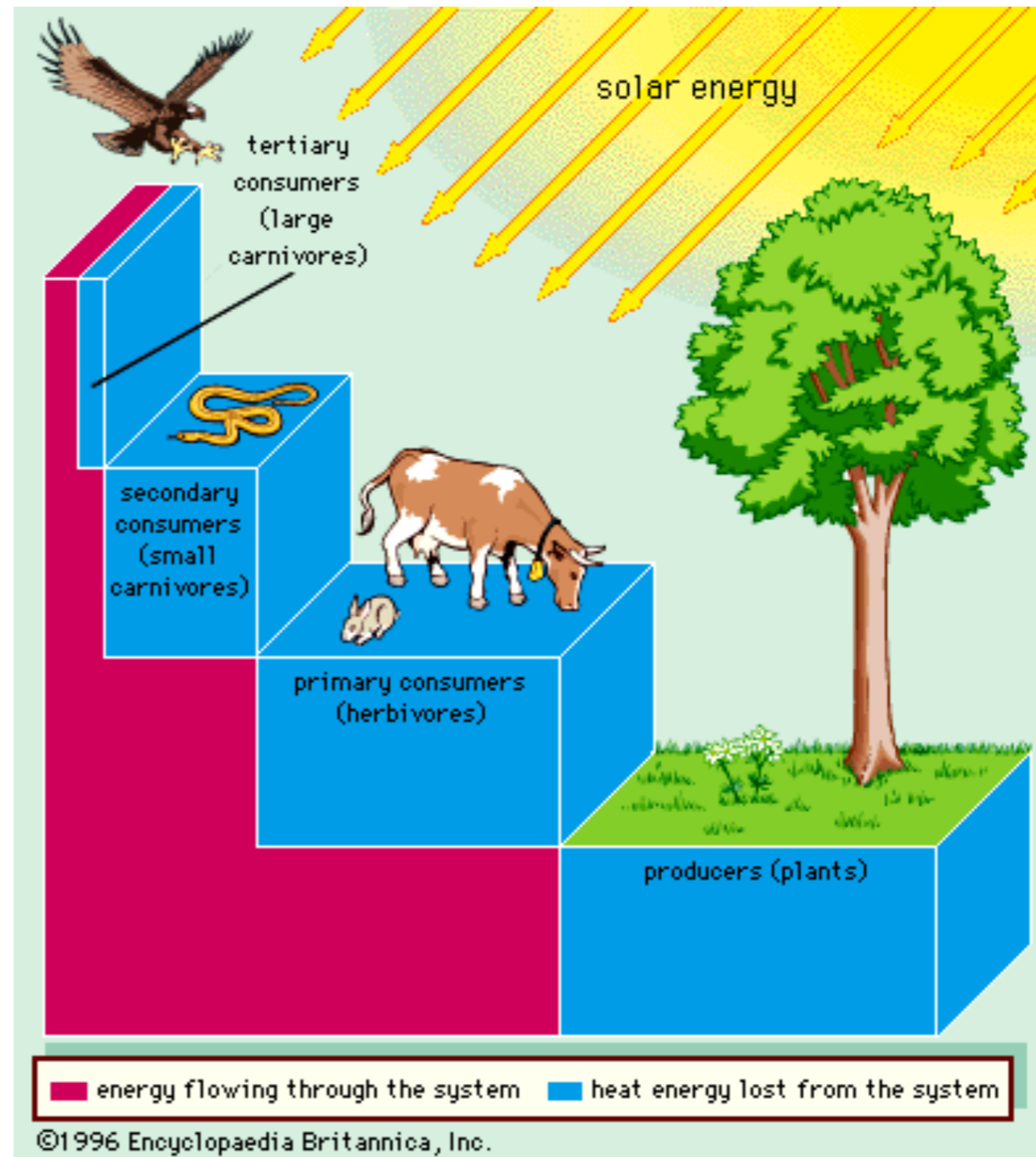
Producers → consumers

- chemical bonds of organic (**C**) molecules are broken and converted in ATP energy for cells
- each conversions experiences a loss of energy ( transfer of energy from one to another is inefficient (  $\approx 10\%$  ).



# Energy Losses

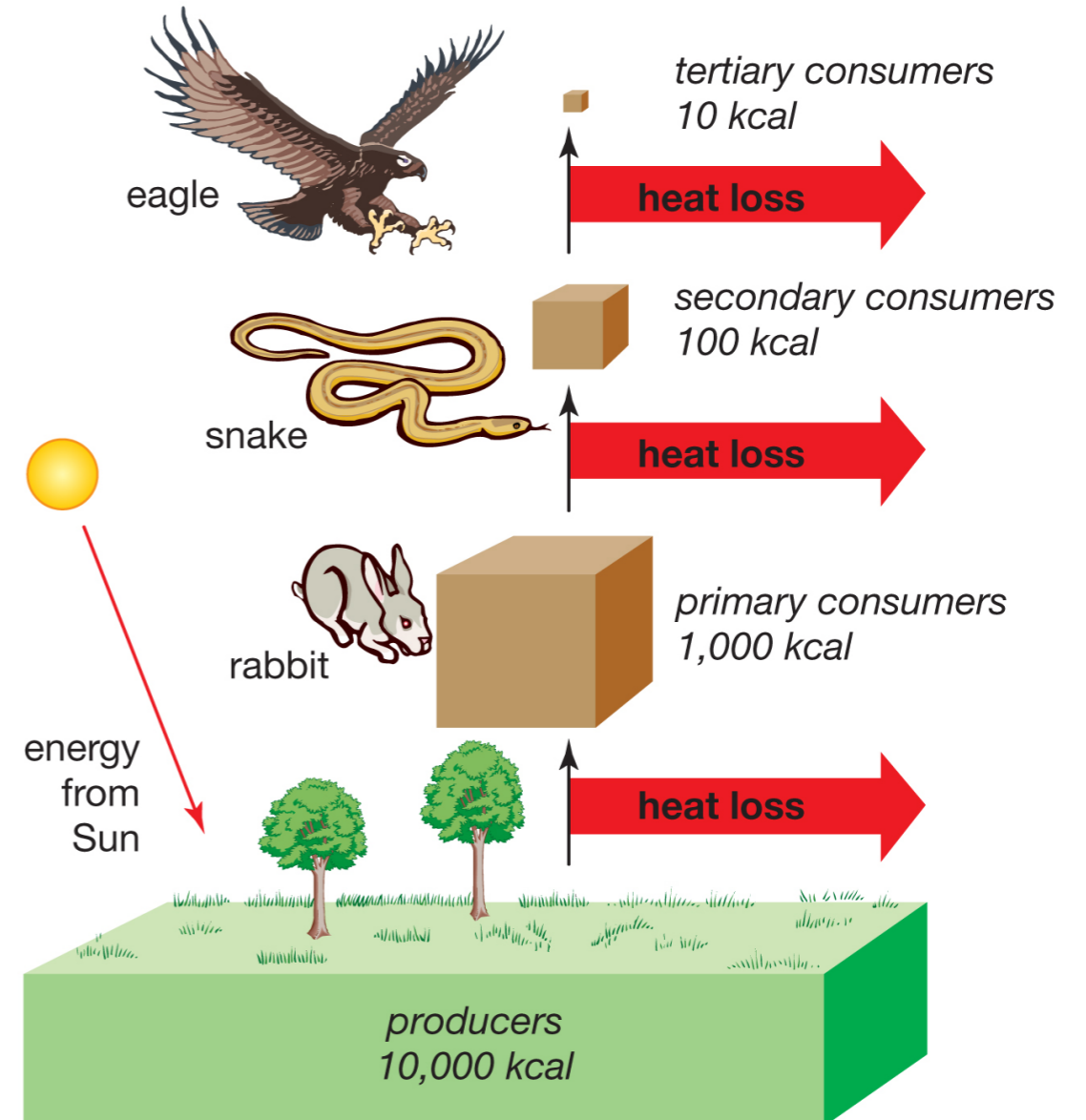
- Food passed along chains experiences energy loss
- at each transfer results in less energy available to subsequent feeding levels
  - some converts to heat (lost to environment)
  - some converts to tissues growth (eg plant cell mitosis)
  - some lost as waste (indigestible) (cellulose walls are not digested)
  - some lost to death ( trees shed leaves each fall)
  - cellular metabolic activity - muscle contraction, nerve conduction, etc



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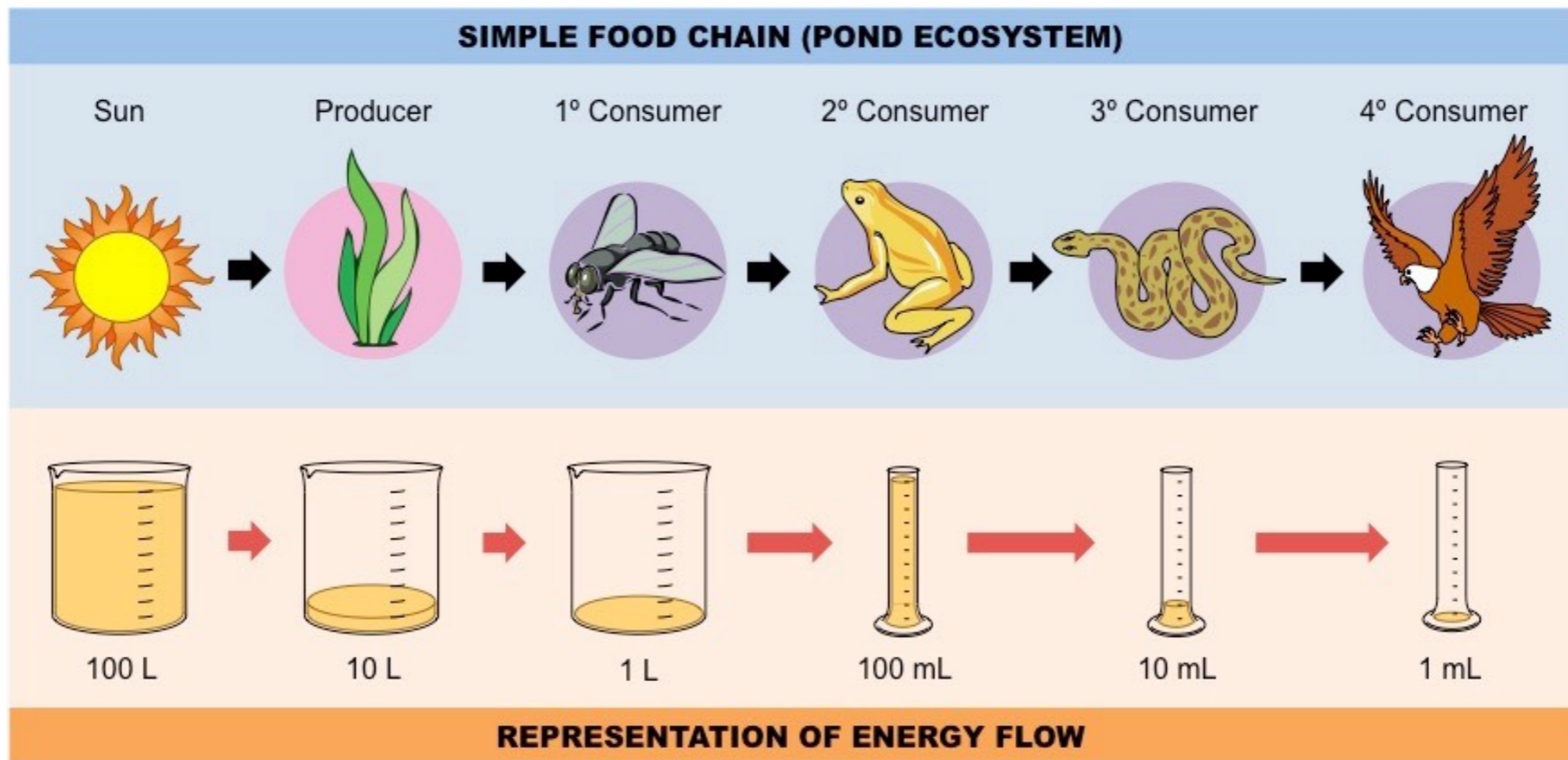
## Energy flow and trophic levels



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# Food Chains

- shows the a simplified flow of energy in species interactions
- each step is a trophic level
- arrows represent the energy flow direction
- transfer from one trophic level to the next is  $\approx 10\%$ 
  - explains the population sizes of each species in the ecosystem



# Energy uses in a Consumer

- organic molecules in food  $\rightarrow$  ATP molecules in mitochondria  $\rightarrow$  ATP to Use
- Building molecules (protein synthesis, DNA, RNA, lipids.. etc
- Transport across membranes  $\rightarrow$  ions and molecules (active transport, gradient maintenance in neurones and muscles)
- movement around cells

eg.

- \* actin and myosin
- \* chromosomes during mitosis
- \* vesicles in cells

\*

