

Energy in Ecosystems

Food Chains, Food Webs and Energy Pyramids



Courtesy: www.lab-initio.com

Producers (Autotrophs)

- **Photosynthetic organisms**
 - Capture energy from sunlight, CO_2 and H_2O
 - Most producers are photosynthetic
- **Chemosynthetic organisms**
 - Capture energy from chemical compounds in the surroundings

Consumers (Heterotrophs)

- **Herbivores**
 - Eat only plants and fungi
- **Omnivores**
 - Eat both plants/fungi and animals
- **Carnivores**
 - Eat only animals
- **Detritivores**
 - Eat dead organic matter
- **Decomposers**
 - Break down organic matter into simpler compounds

Movement of Energy

- **Trophic Structures**
 - Manner in which energy moves through an ecosystem
 - Each ecosystem has its own unique trophic structure

Biotic Energy Movement

- **Producers**
 - Autotrophs (Photosynthesizers, Chemosynthetic organisms)
- **Primary consumers**
 - Herbivores and omnivores that eat producers
- **Secondary consumers**
 - Carnivores and omnivores that eat herbivores
- **Tertiary consumers**
 - Carnivore eats another carnivore
- **Decomposers and Detritivores**
 - Consume decaying producers and consumers

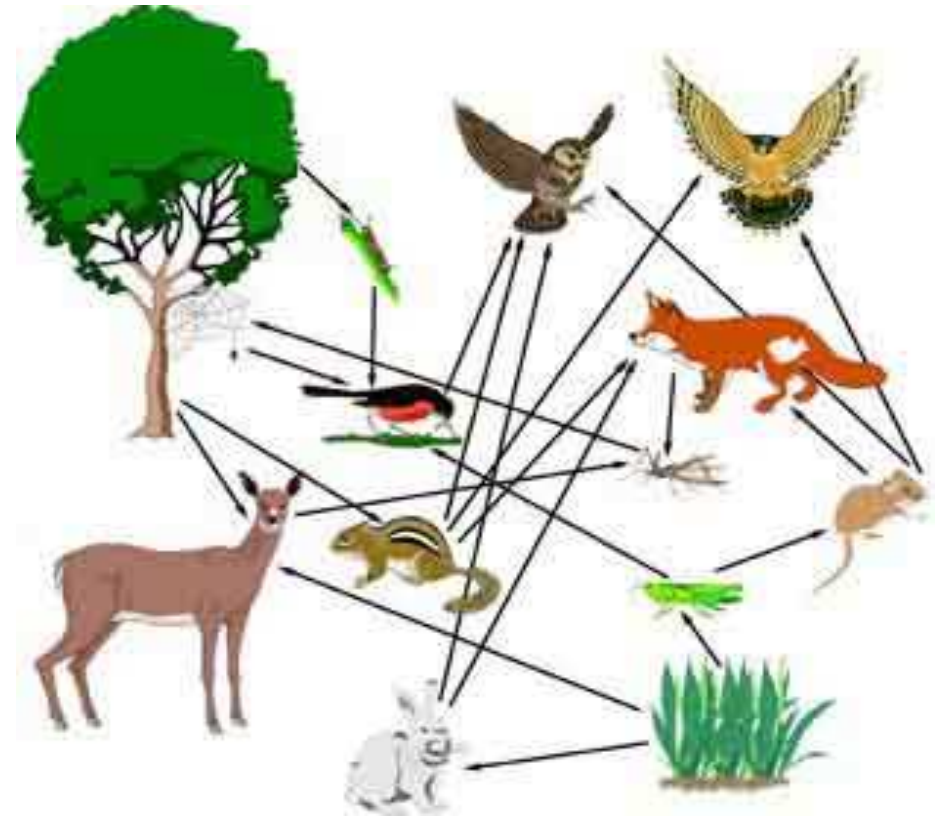


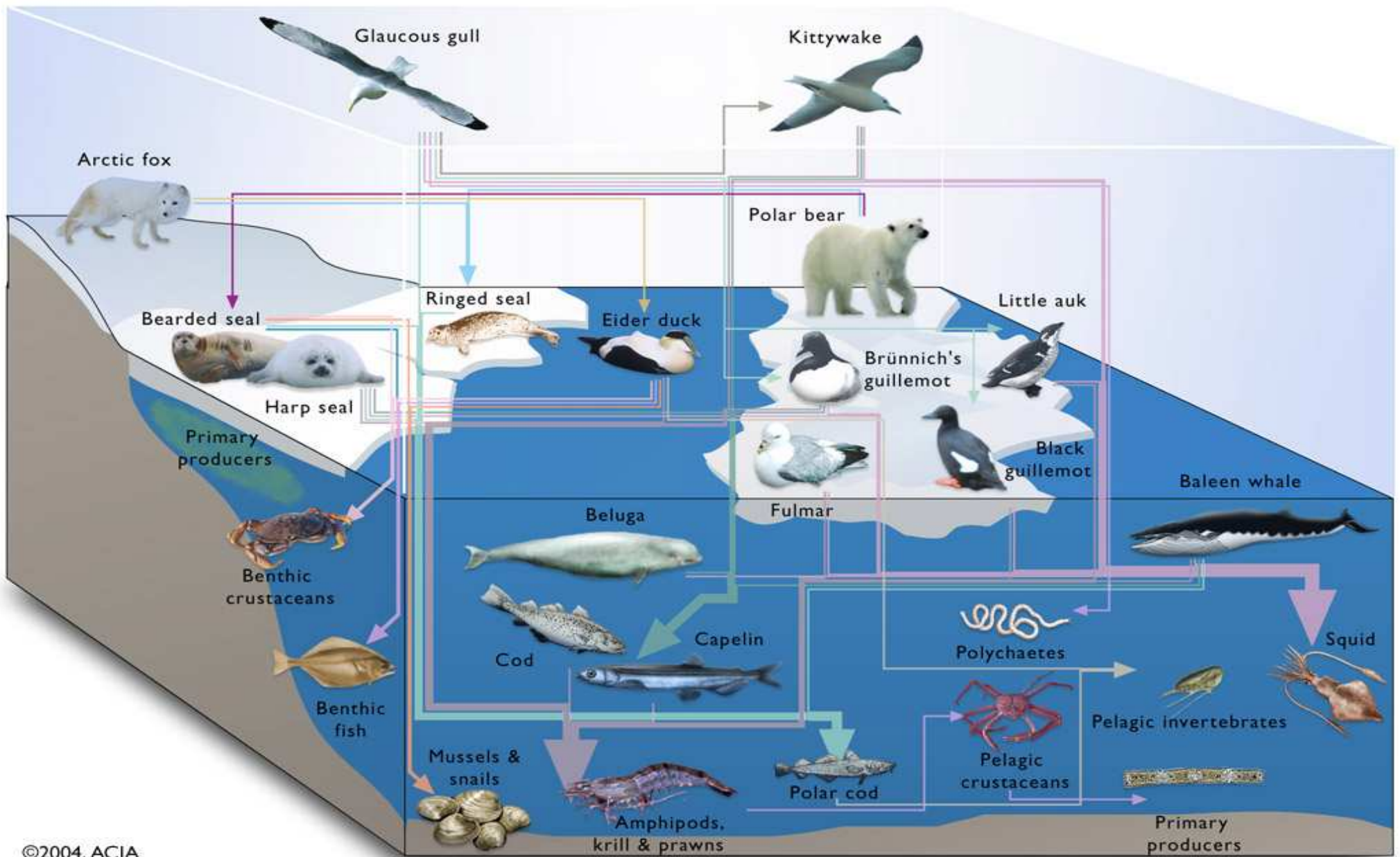
Food Chain

- ❑ Energy is lost in each step up a food chain
- ❑ Only 10 percent of the energy from one level on the food chain is available to the next level

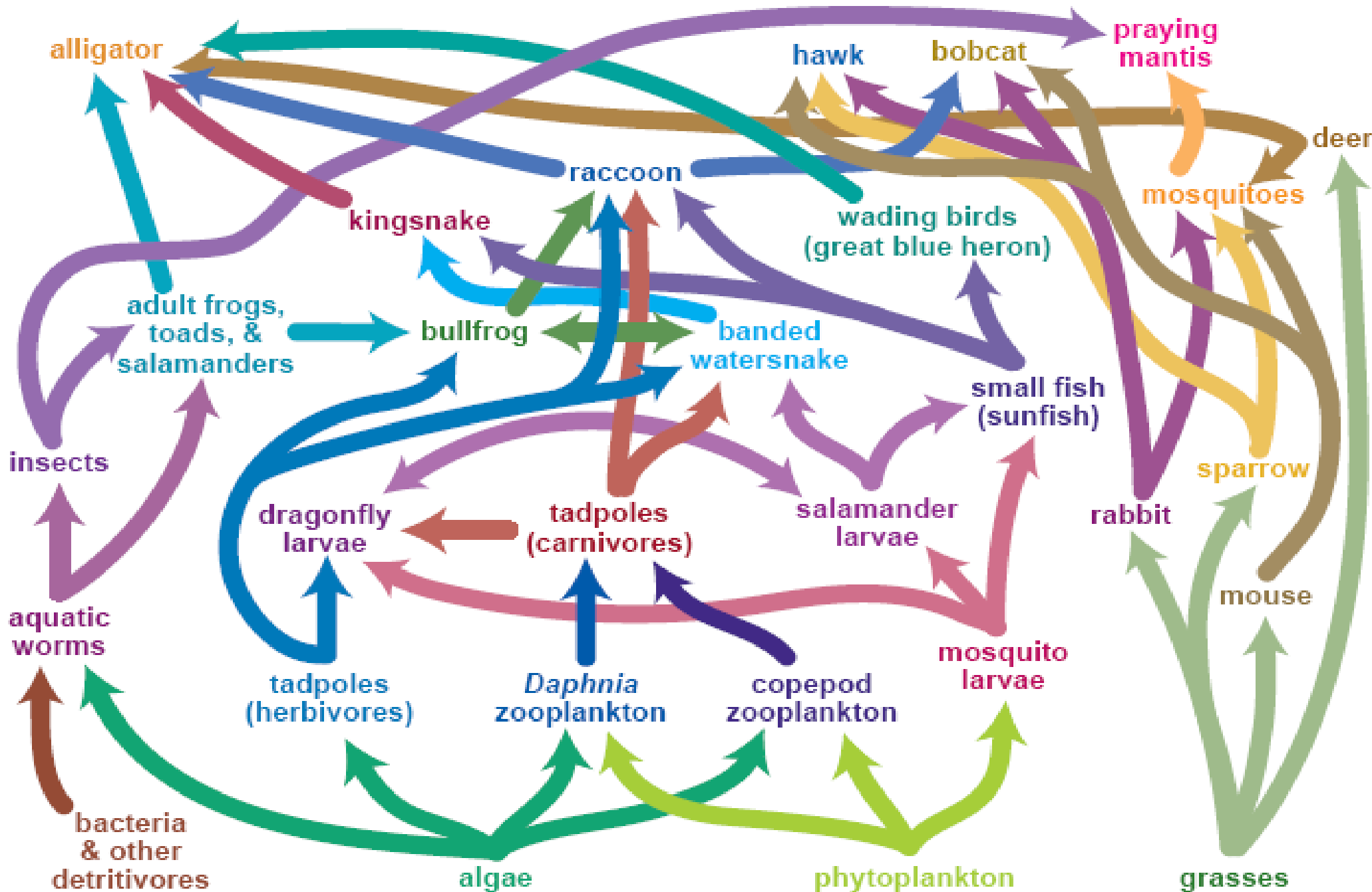
Food Webs

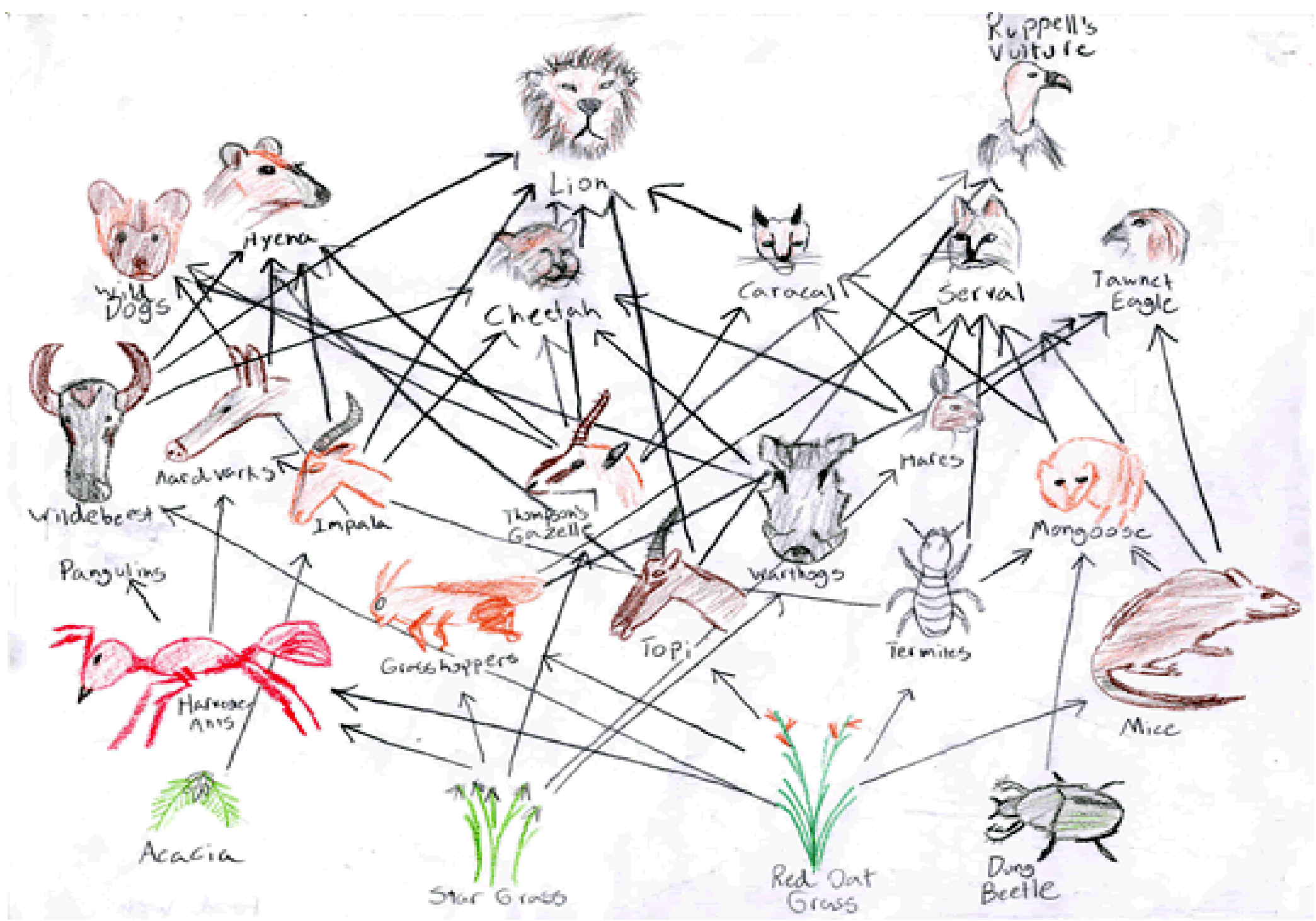
- Many consumers and decomposers have more than one food source
- Movement of energy occurs in complex webs rather than in simple chains





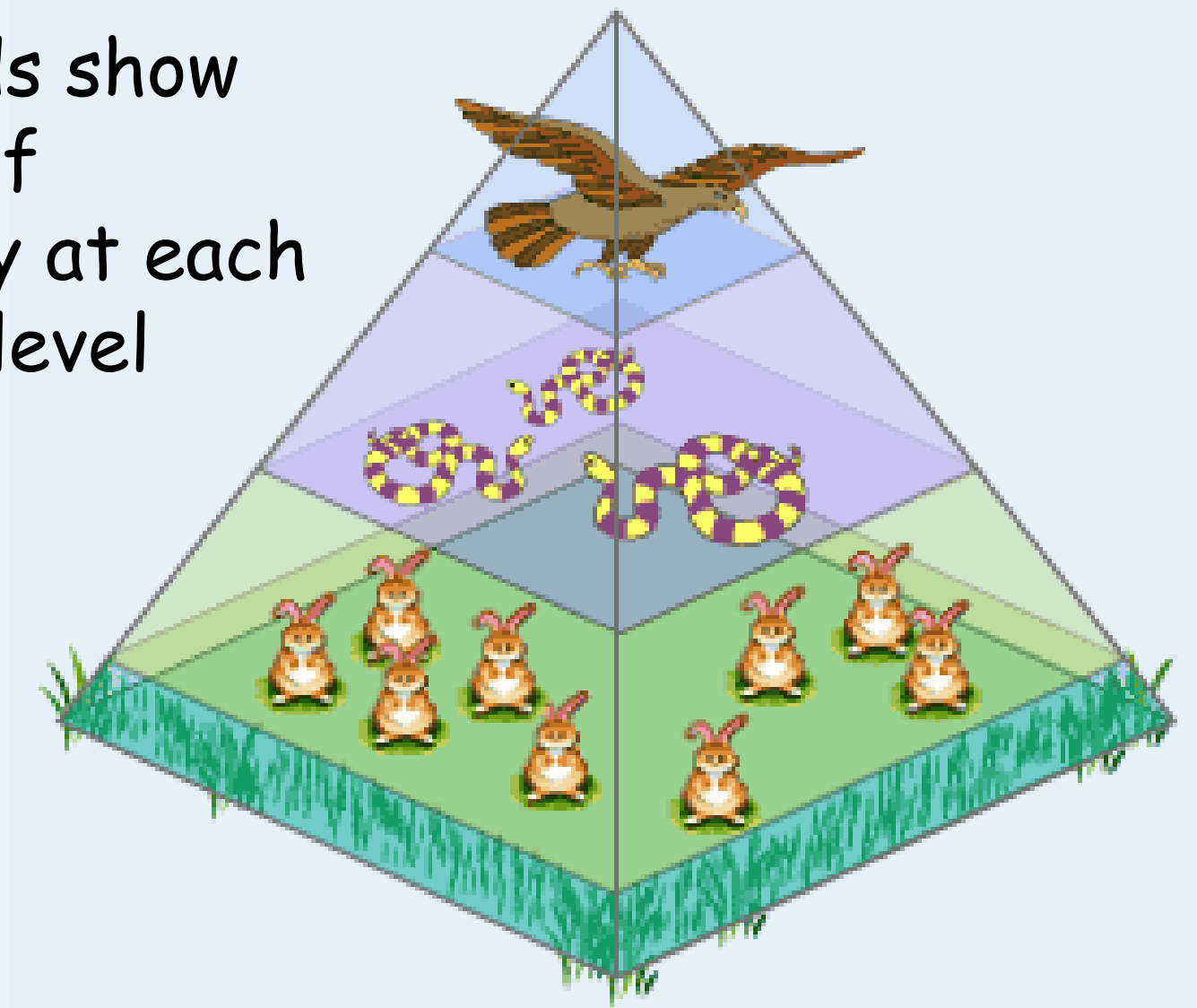
A Simplified Food Web



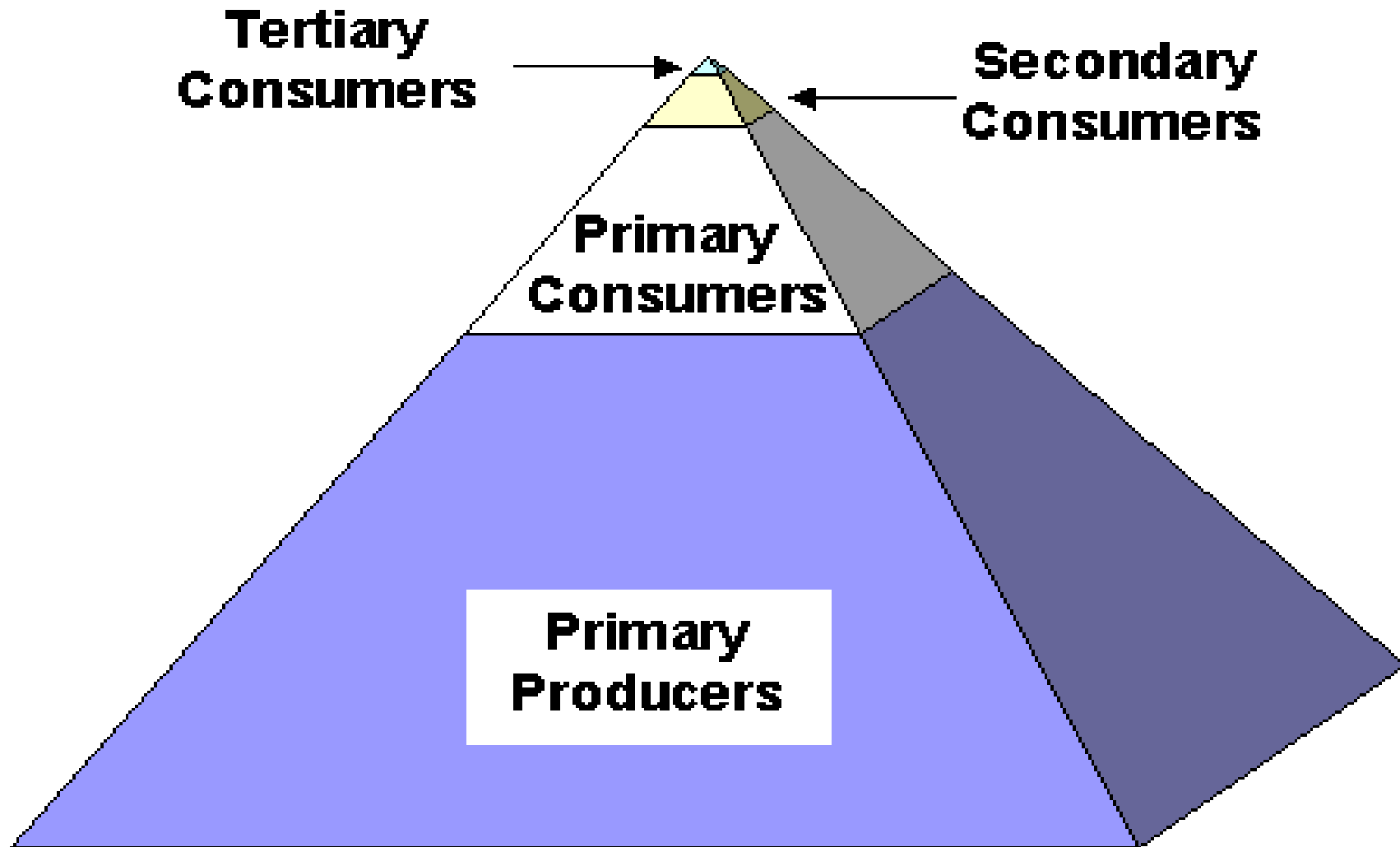


Energy Pyramids

- Energy pyramids show the reduction of available energy at each higher trophic level



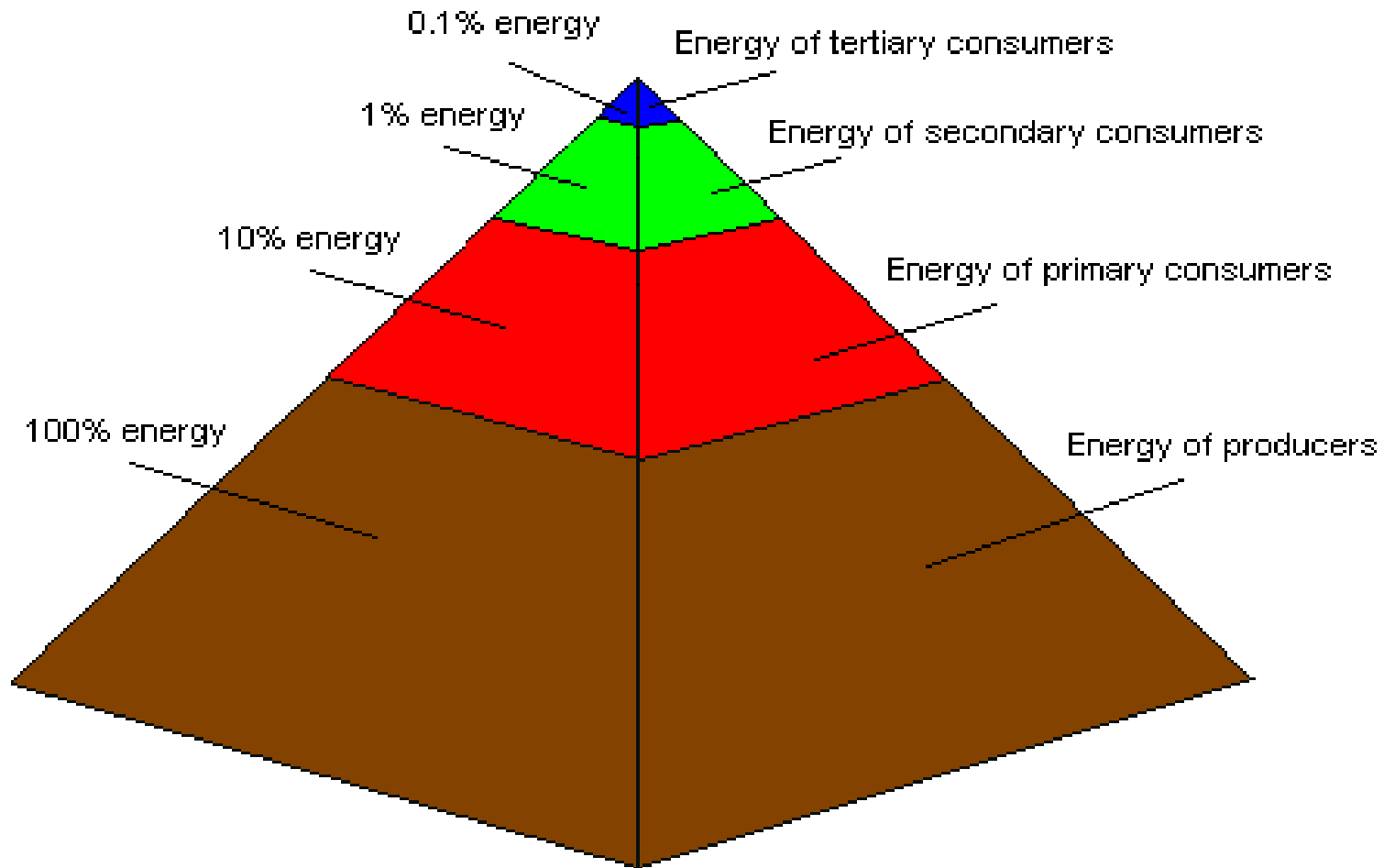
Biomass Distribution



Why a Pyramid?

- Producers must comprise **most** of the mass of the biotic part of an ecosystem
 - This is the **ONLY** place where energy (solar) enters the ecosystem
- Energy is always lost in the form of heat, so energy transfers are no more than 10% efficient
- Each trophic level must be supported by a 10/1 energy ratio below it

Ecological Pyramid



The 10% Rule