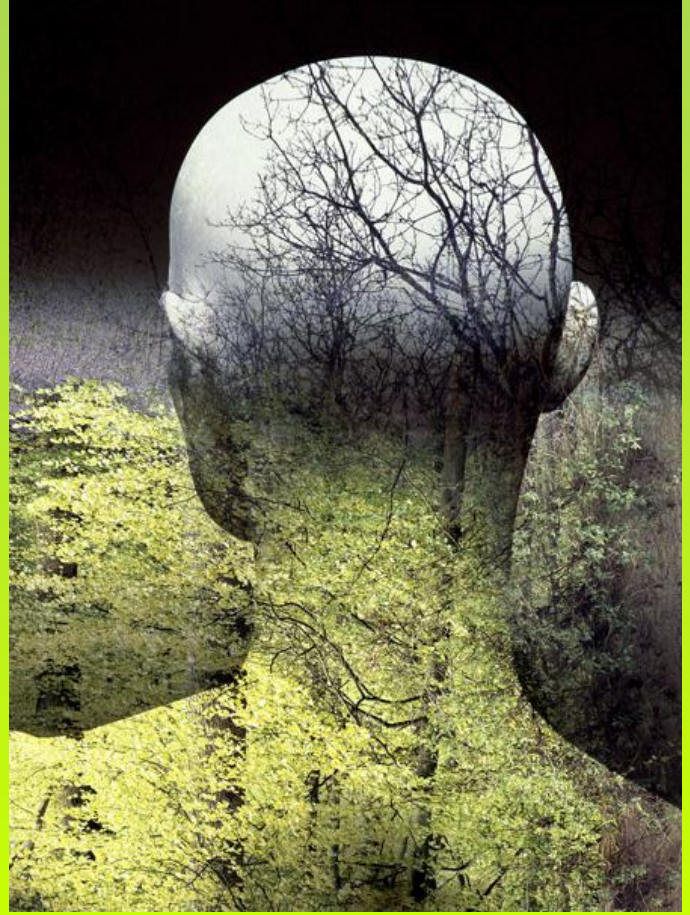


SCIENCE 1206 – UNIT 1 – INTRODUCTION TO ECOLOGY

ECOLOGY

- The study of the interrelationships between organisms , and between those organisms and their environment.

What are some <u>natural resources</u>, both RENEWABLE and NON-RENEWABLE, that are found on Earth?

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

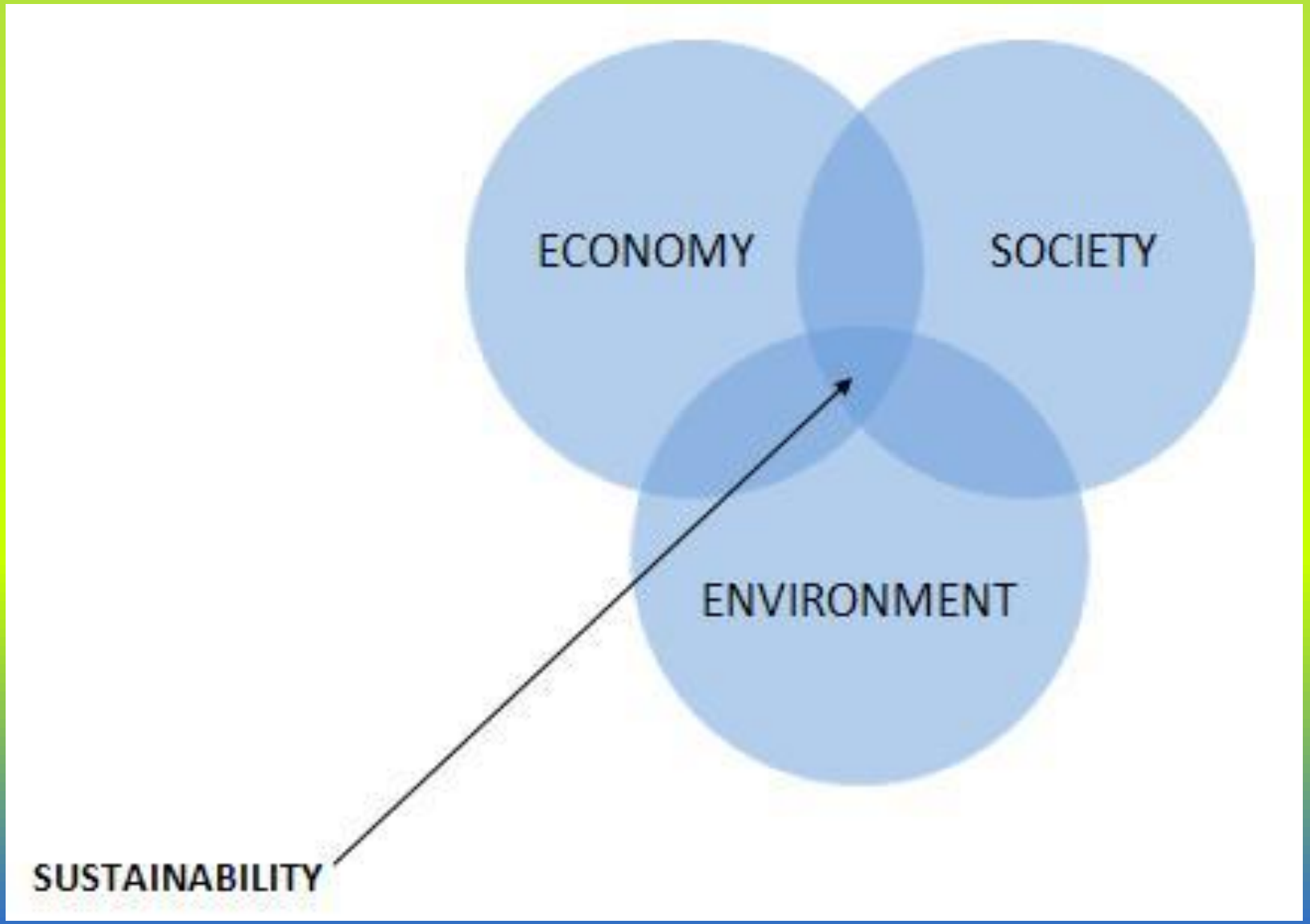
Let's pick one of these resources, the FISHERIES:

- *How did people view the fisheries resource in the past?*
  - It was believed that fish was an UNLIMITED resource that could be EXPLOITED (i.e., take as much as you want).

- *What HAPPENED historically to change the view?*
  - 1.**Fish stocks depleted** with overfishing
  - 2.**Advancements in Fishing Technology** (ex: fishfinders, dragnets, big trawlers)
  - 3.**Scientific research** led to greater understanding

- *What FACTORS do people consider when managing the fisheries industry TODAY?*
  - **Social Factors** – culture, politics, values, needs
  - **Economic Factors** – industry, jobs
  - **Environmental Factors** – nature, beauty

SUSTAINABILITY DIAGRAM



SUSTAINABILITY

- It means living ***WITHIN the EARTH's LIMITS***.
- It means meeting the needs of the **PRESENT** without compromising the ability of the **FUTURE** to meet their needs.

- Another name:
  - **SUSTAINABLE DEVELOPMENT**

Blue Man Group – Earth to America

- http://www.youtube.com/watch?v=QM-mfEMssy8

Paradigm and Paradigm Shift

- **PARADIGM**
  - The way humans view the world.

- **PARADIGM SHIFT**
  - A rare and significant change in the way humans view the world (i.e., a change in our paradigm!).

Paradigm Shifts . . .

- Examples:
  - ***IDEA: SHAPE OF THE EARTH***
    - PAST: The Earth is FLAT.
    - PRESENT: The Earth is ROUND.
  - ***IDEA: ORBITING OF PLANETS***
    - PAST: The Sun revolves around the Earth.
    - PRESENT: The EARTH revolves around the Sun.
  - ***IDEA: SANTA CLAUS***
    - PAST (children): Santa Claus brings us presents!
    - PRESENT (adults: There is no Santa Claus? What?

THE ECOLOGY PARADIGM SHIFT

- **PAST: EXPLOITATION**
  - It was believed that resources were UNLIMITED and put on the Earth for the SOLE benefit of HUMANS. Humans can take as much as we want as often as we want.
- **PRESENT: SUSTAINABILITY**
  - Earth's Resources are in LIMITED SUPPLY. Humans are CARETAKERS of the Earth and need to practice SUSTAINABILITY in our management of resources.

Ecosystem

- A community of organisms and the physical environment in which they live.

Habitat

- The place where an organism lives.
- Not the organisms "home"! It's habitat!

Abiotic Factors

- The NON-LIVING FACTORS which affect life in an ecosystem.
- Examples include:
  - _____
  - _____
  - _____
  - _____
  - _____
  - _____
  - _____

Biotic Factors

- The LIVING factors in an environment.
- Biotic factors include both:
  - the ORGANISMS *AND*
  - the interactive RELATIONSHIPS BETWEEN organisms
- Examples include:
  - _____
  - _____
  - _____
  - _____
  - _____
  - _____
  - _____

Symbiotic Relationship

- Relationships in which TWO ORGANISMS LIVE in CLOSE ASSOCIATION such that at LEAST ONE BENEFITS.

5 Types of Symbiotic Relationships

- 1. Mutualism
- 2. Commensalism
- 3. Parasitism
- 4. Parasitoidism
- 5. Predator-Prey

1. Mutualism

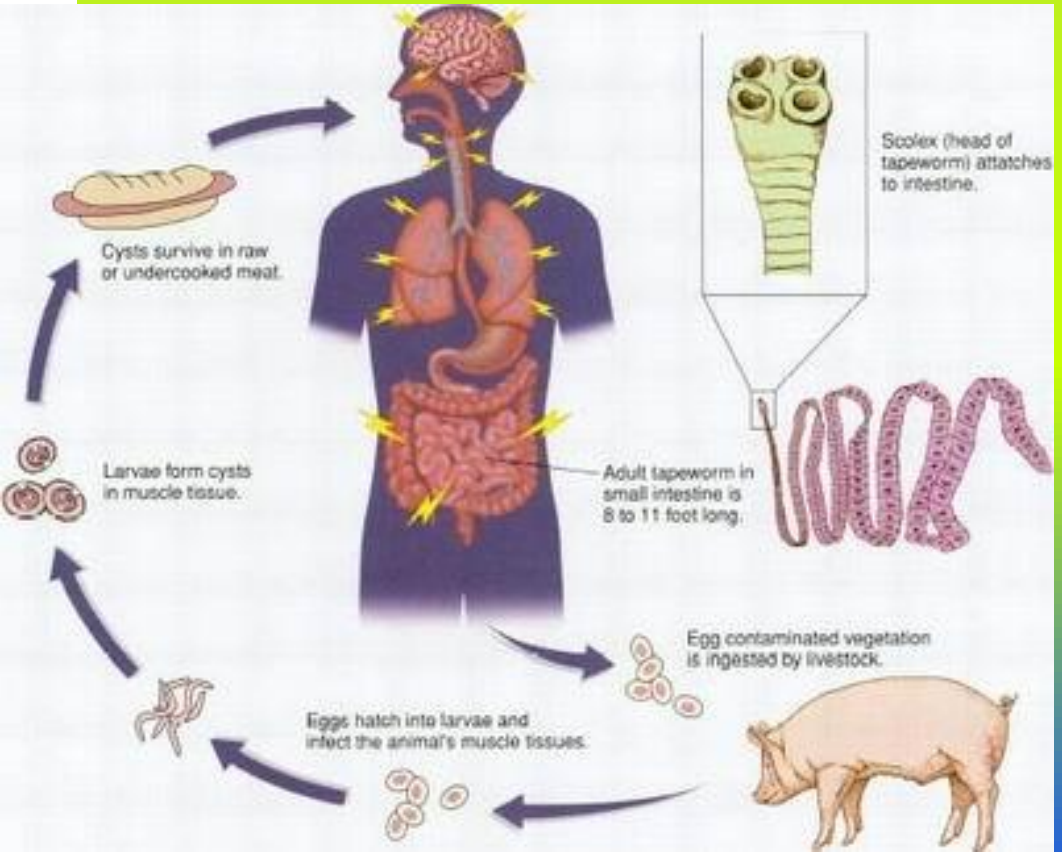
- BOTH organisms BENEFIT.
- Examples:
  - Polyp and hermit crab
  - Pollination
  - Egyptian plover and crocodile

2. Commensalism

- ONE organism benefits, ONE organism is neither benefited nor harmed
- Examples:
  - Beaver and fish
  - Trees and nesting birds
  - Clown fish/anemone

3. Parasitism

- One organism, the PARASITE, benefits.
- One organism, the HOST, is harmed.
- Examples:
  - Tapeworm and human



4. Parasitoidism

- One organism benefits, one organism is killed a slow death
- Example:
  - Parasitic wasp and other insects
  - http://video.nationalgeographic.com/video/player/animals/bugs-animals/bees-and-wasps/wasp_attacks_spider.html

5. Predator-Prey

- One organism benefits, one organism is harmed/killed quickly
- Example:
  - Lion and zebra
  - Lynx and snowshoe hare
- http://www.youtube.com/watch?v=DxVMnJXWvdM

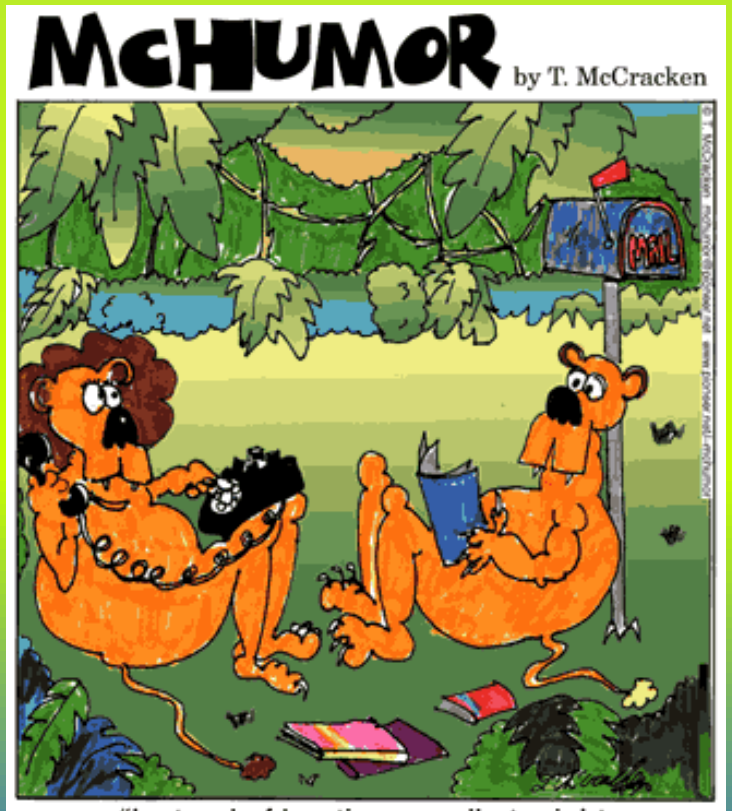
FEEDING RELATIONSHIPS in ECOSYSTEMS

- Trophic Structure
- Types of Organisms
  - Producer
  - Consumer
  - Decomposer
- Food Chain VS. Food Web
- Pyramid of Energy
- Population VS. Community
- Ecotone
- Microecosystem

TROPHIC STRUCTURE

- Feeding relationships within an ecosystem

- *Types of Feeders*
  - PRODUCER
  - CONSUMER
  - DECOMPOSER



"Instead of hunting gazelle tonight,
how about ordering a pizza
and eating the delivery man when he arrives?"

PRODUCERS

- Also known as **AUTOTROPHS** ("self-feeders")
- Organisms that ***CAN*** produce their own food and oxygen through **PHOTOSYNTHESIS**.
- Examples:
  - Plants
  - Algae

CONSUMERS :

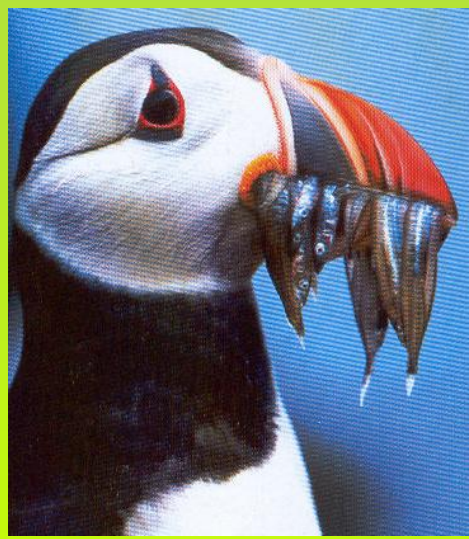
- Also known as **HETEROTROPHS** ("other-feeders")
- Organisms that ***CANNOT*** produce their own food and feed on OTHER organisms to survive.

TYPES OF CONSUMERS:

- **Types based on WHAT the organism eats**
  - **HERBIVORE**
    - Eats plants
    - Ex: _____
  - **CARNIVORE**
    - Eats other consumers
    - Can be either a **PREDATOR** or a **SCAVENGER** (or both)
    - Ex: _____
  - **OMNIVORE**
    - Eats plants AND animals
    - Ex: _____

CATEGORIES OF CONSUMERS:

- **Category based on where organism is LOCATED in food chain**



- ***Categories:***
  - **PRIMARY (1°)**
    - Also known as **FIRST ORDER consumers**
    - Feed on PRODUCERS
    - Considered the **SECOND trophic level**.
  - **SECONDARY (2°)**
    - Also known as **SECOND ORDER consumers**
    - Feed on PRIMARY CONSUMERS
    - Considered the **THIRD trophic level**.
  - **TERTIARY (3°)**
    - Also known as **THIRD ORDER consumers**
    - Feed on SECONDARY CONSUMERS
    - Considered the **FOURTH trophic level**.

DECOMPOSERS:

- Also known as **DETRITIVORES** or **SAPROBES**
- Organisms that get their nutrients by breaking down **DETRITUS**
  - **Detritus *is decaying plant* and *animal material***

FEEDING RELATIONSHIP DIAGRAMS

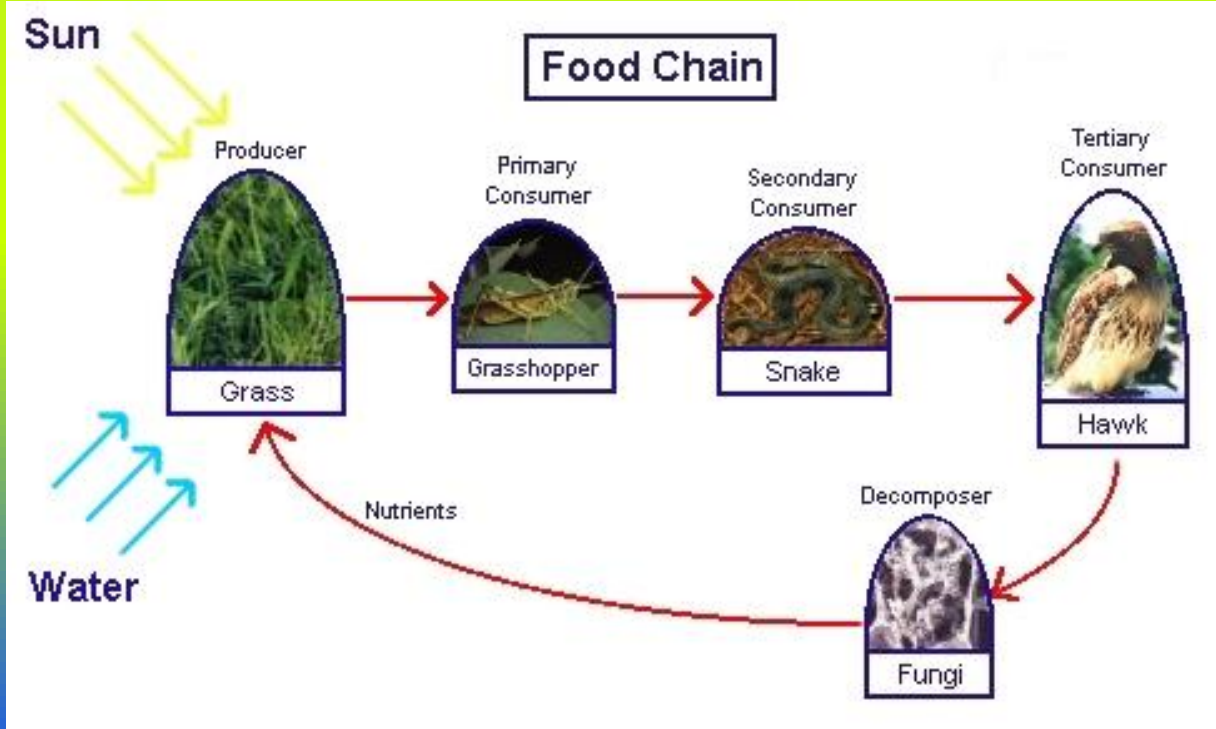
- FOOD CHAIN
- FOOD WEB
- PYRAMID OF ENERGY

FOOD CHAIN

- A diagram that defines *ONE SINGLE CHAIN* of feeding relationships in an ecosystem
- Starts with PRODUCERS and **connects with arrows** up to the TOP CARNIVORES
- Ex:

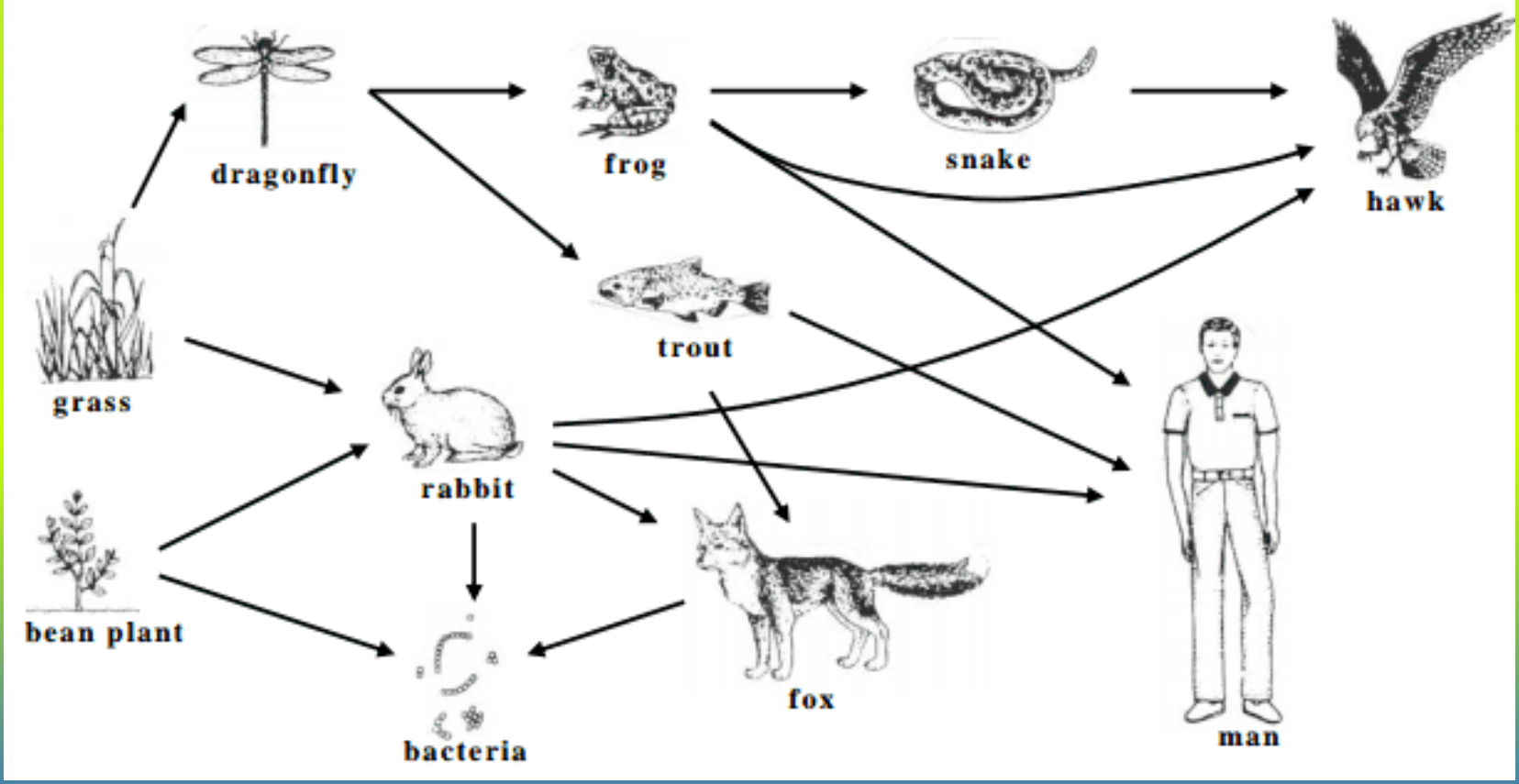
FOOD CHAIN...

- ***Why do food chains usually only go up as high as the third order, or tertiary consumer?***
  - Energy decreases as it is passed up the food chain, and the top levels have the least energy, so they are limited in levels.



FOOD WEB

- A diagram that defines ALL OF THE POSSIBLE FOOD CHAINS in an ecosystem.
- Ex:



PYRAMID OF ENERGY

- A diagram that defines the passage of ENERGY though a food chain.
- Energy is measured in ***Joules, symbol J***.
- PRODUCERS always have the most energy (bottom of pyramid).
- TOP CARNIVORES always have the least energy (top of pyramid).
- About **10 % of the total energy is passed on** from one trophic level to the next.
- That is, ***90% is lost*** due to processes such as:

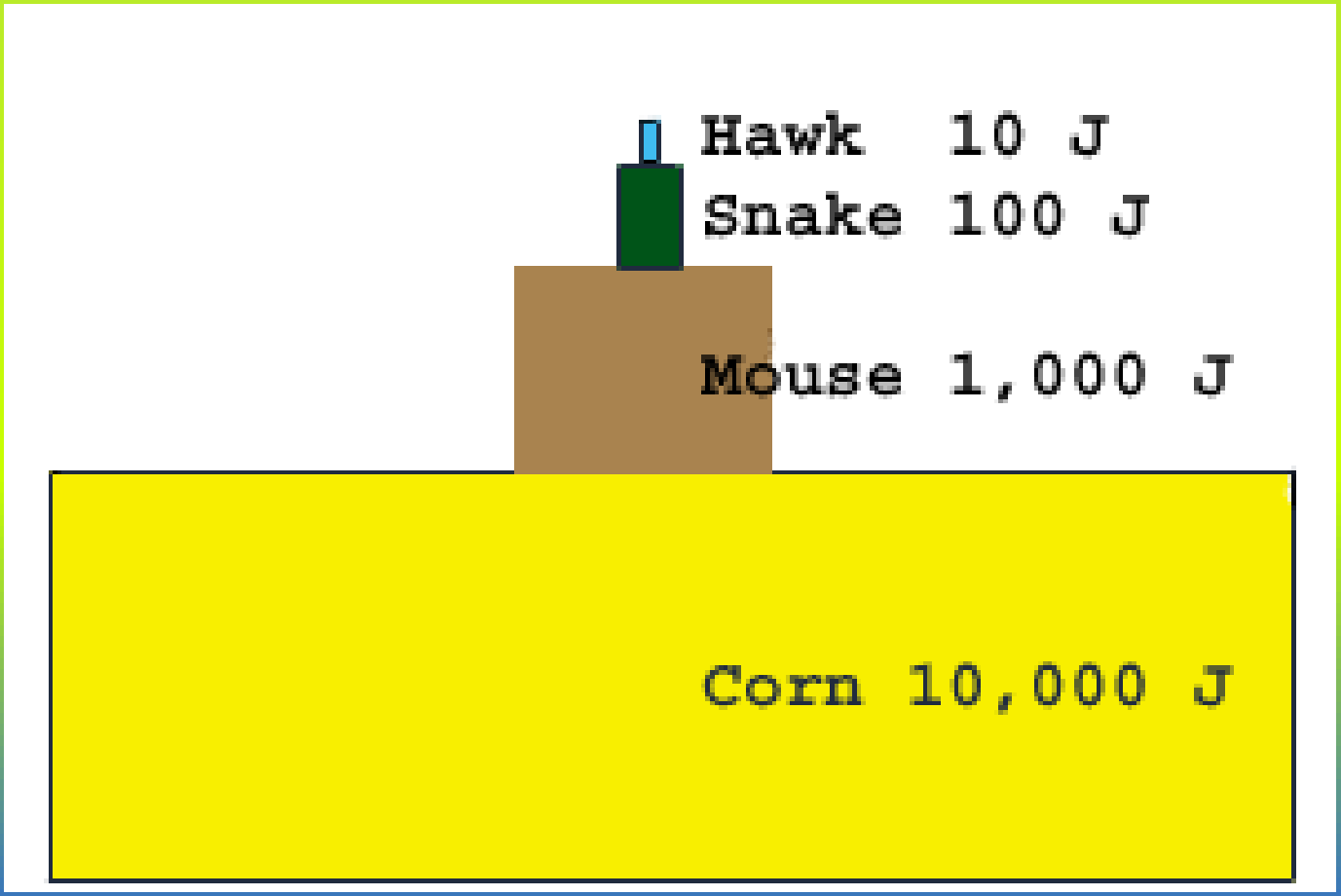
_____

_____

_____

PYRAMID OF ENERGY...

- **Example:**
  - Corn (10000 J) → Mouse (1000 J) → Snake (100 J) → Hawk 10 J



POPULATION

- Describes members of the SAME SPECIES living in the same ecosystem or habitat
- Examples:
  - Caribou population in Labrador
  - Hedgehog population in New Brunswick

COMMUNITY

- Describes ALL POPULATIONS of the variety of species in the same ecosystem or habitat.
- Examples:
  - Newfoundland & Labrador Community
    - _____
      _____
      _____

ECOTONE

- The transition zone BETWEEN two different ecosystems
- "Border ecosystems"
- Ex: area between:
  - _____
  - _____
  - _____
- Because they have species from TWO ecosystems, they have a high variety of life
- **BIODIVERSITY:** The variety of life .

ECOTONE . . .

- ***Why is biodiversity important to an ecosystem?***
  - The higher the level of biodiversity, the more STABLE that ecosystem is in the long-term.

MICROECOSYSTEM

- A **very small** ecosystem
- Example:
  - The ecosystem in a decaying fallen log.
  - The ecosystem in a puddle of water.

Succession

- is the observed process of change in the species structure of an ecological community over time.
- The community begins with few plants and animals, overtime the community grows to include more plants and animals
- Once it becomes stable, and self sustaining it is called a **Climax Community**

Causes of Succession

- **Biotic Factors**
  - Appearance of new animals
  - Human activity
- **Physiographic factors**
  - Natural Disasters (Fires, Floods, etc.)
  - Erosion
- **Climate Changes**