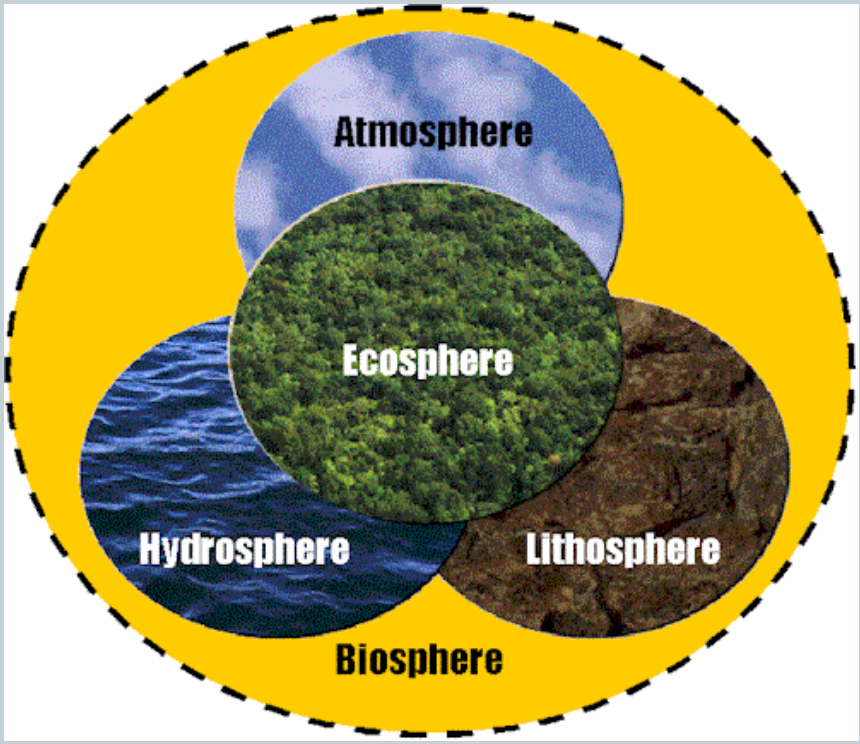
Chapter I

AN INTRODUCTION TO ENVIRONMENTAL SCIENCE
(PGS. 1 - 23)

The Biosphere:

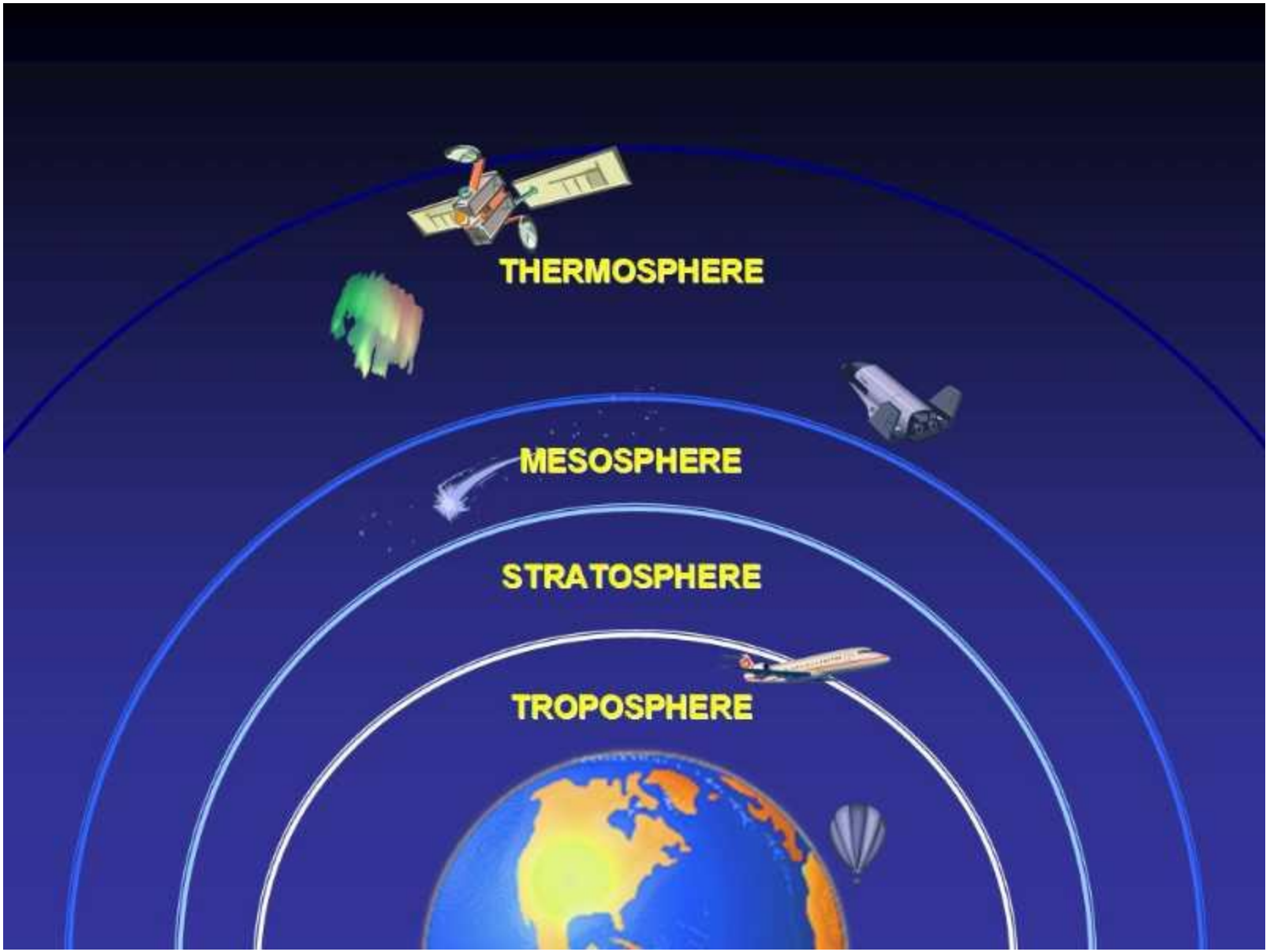
- The part of the Earth that can support life.



1. The Atmosphere:

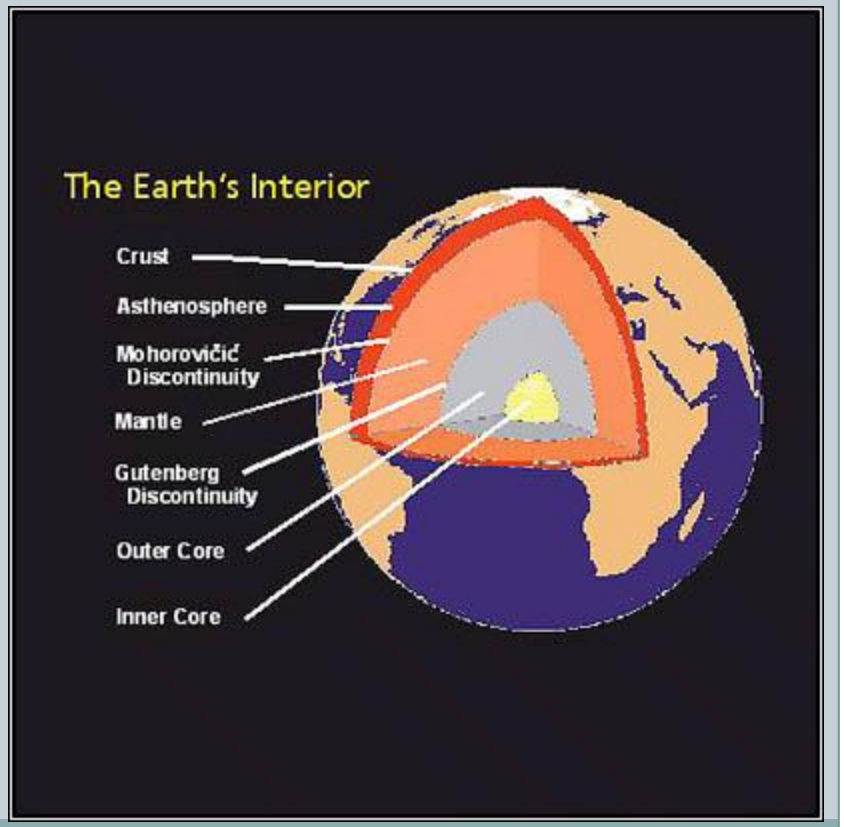
- The layers of gases surrounding the Earth (Troposphere, Stratosphere, Mesosphere, Ionsphere, & Exosphere).

- This is responsible for weather which helps a planet evolve.


THERMOSPHERE
MESOSPHERE
STRATOSPHERE
TROPOSPHERE

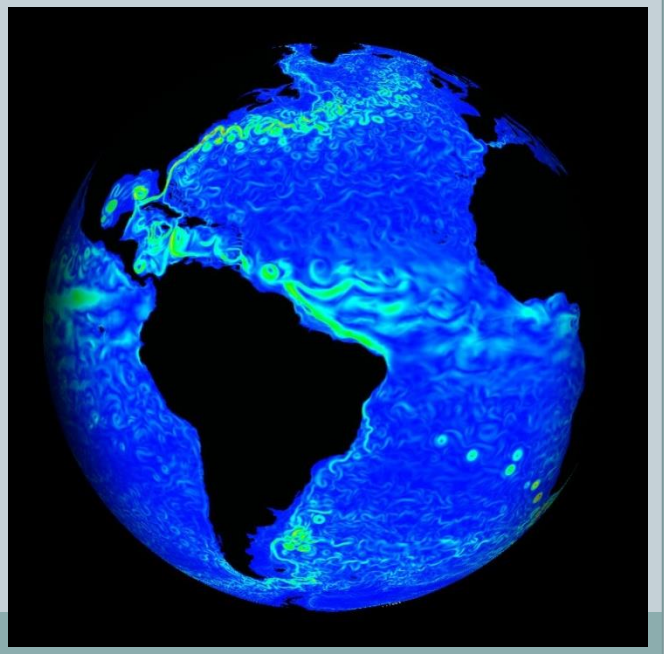
2. The Lithosphere:

- The hard or rocky part of the Earth.



3. Hydrosphere:

- All of the water found on Earth including oceans, lakes, rivers, rain & ice that make up the water cycle.
- Approx. **71%** of the Earth is covered by water.
- 97% salt water.
- 3% fresh water.



- All 3 of these work together to make what we have on Earth.

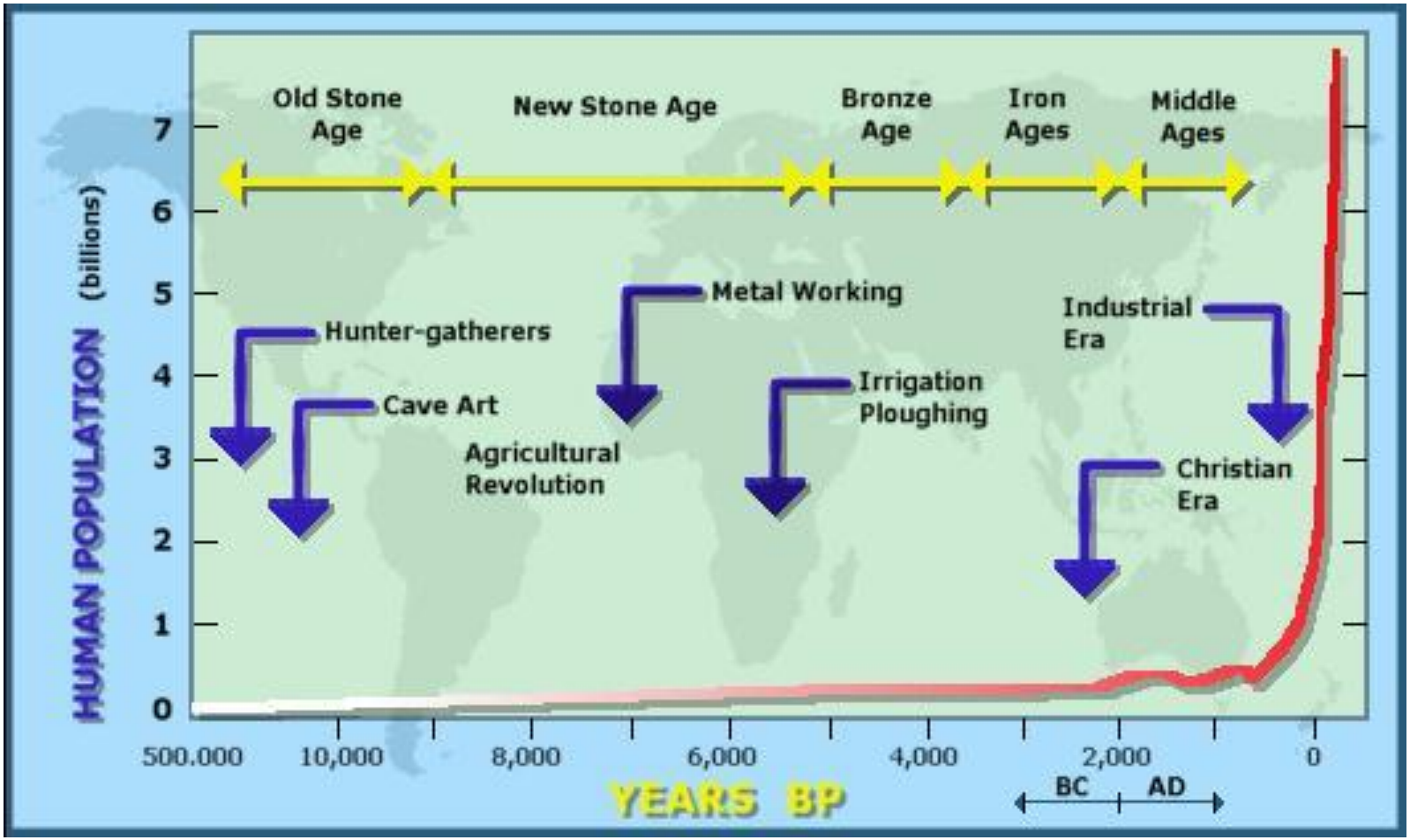
- In fact, if it wasn't for the "greenhouse effect" in our atmosphere our planet would be an ice planet.

Gannets at Cape St. Mary's, NL

Human Impact:

- Most native peoples years ago always talk about "respecting and using the land."
- Using, **BUT** not **ABUSING** the land, its plants and the other animals that live on it.
- BUT, the human population is growing every day, and its needs for **RESOURCES** (food, shelter, energy) are also increasing.
- Unfortunately the other resources are decreasing.

Human History:



1. Hunter's and Gatherer's:

- 10's of 1000's of years ago.
- Nomads that followed the food.
- Small moving populations.

2. Agricultural Revolution:

- 10,000 years ago.
- Growing crops/domesticated animals gave people a steady/more reliable secure source of food.
- People stopped moving around and started having bigger families.
- Metal working, irrigation, better sanitation & medical care caused population booms.

3. Industrial Revolution:

- 200 years ago.
- Factories/mass production/tool making caused great need for more resources.
- Iron, coal, and oil produced.
- Industrial areas were growing and cities that had industries had huge **POPULATION EXPLOSIONS**.
- Therefore, an even greater demand for resources, with a greater impact on Earth every day!

- The Human Population has exploded over the last 200 years because of **INDUSTRIAIZATION**, **FOOD PRODUCTION METHODS** and **MEDICINE.**

- BUT as the Human Population grows or “explodes” so does our impact on the Earth and its resources.

- High Growth Rates are excellent in the financial world – you can turn $5 into 1000’s very quickly.

- BUT, a high Human Growth Rate means increase needs for drinking water, land, food, fuels and other resources.

- http://www.youtube.com/watch?v=z7rNYzSH-BA&feature=related

Examples:

- China is causing Earth's oil $ to increase.
- Increased demand for fish in the 1980's led to overfishing.
- Changing patterns towards Western lifestyles means more energy is used and wasted.
- Canada, Japan, US, France, Britain, Germany, Italy, and Russia use up 80% of world's resources BUT make up only 20% of its population.

Results:

- Practices that are **SUSTAINABLE** must be encouraged.
- **SUSTAINABILITY:** using resources to maintain one's lifestyle, BUT also ensuring that the resource (and lifestyle) is there for future generations.
- Conserving the Environment may also mean maintaining (**BUT** not harvesting) an untouched environment.

Environmental Attitudes:

Paradigm:

- Ways of thinking about the world.

- **<u>Example</u>:** Flat Earth, smoking is good for you.

Paradigm Shift:

- When attitudes shift.

Environmental Ethics:

1. Development Ethics:

- Use Resources for our benefit.

2. Preservation Ethics:

- Nature has worth apart from human uses.

3. Conservation Ethics:

- Preserve the environment through sustainable use.

The History of Environmentalism:

- Environmentalism conservation dates back 200 years to the Industrial Revolution.

- **<u>Early problems included</u>:**

1. Forests in Great Britain were being cleared too fast (nature could not catch up)

2. Burning coal, to power the factories, was leaving soot on buildings and forests.

- Because of this some people began speaking out.

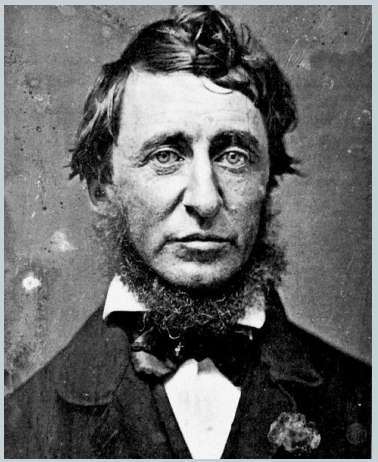
- **ENVIRONMENTAL CONSERVATISM** is a polticial and social movement that promotes the "protection, improvement and wise use of natural resources for all of societies' benefits."

Important People:

Henry David Thoreau (1817 – 1862):

- 1st environmentalist who explored how people could live in harmony with nature – he decided to live in the wilderness for a while in order to figure it out. (2 years)

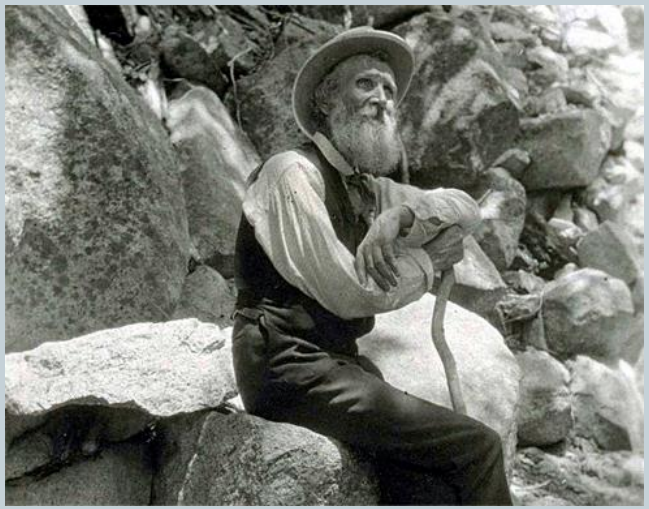
- "Respect for Nature" philosophy.



John Muir (1838 – 1914):

- 1st person to suggest protecting wilderness areas. (the idea of National Parks)

- Co-founder of the **SIERRA CLUB** – one of the most important conservation org. in the U.S.



Sir Clifford Sifton (1861 – 1929):

- Father of Canadian conservation and was a Minister in the Federal Government.

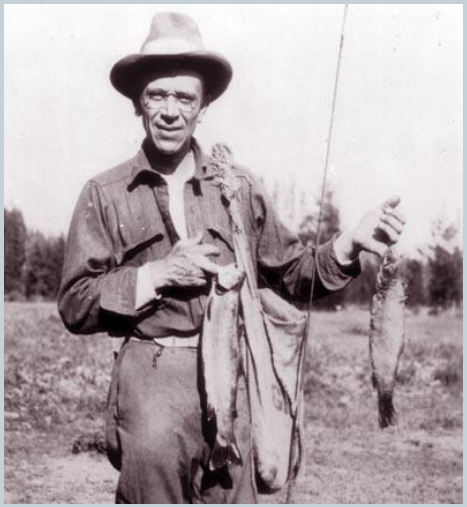
- Understood the value of the forests and developed strong laws protecting forests from clear-cutting.

Ecological Society of America (1915):

- Founded to enhance the study of ecology (the study of the environment).
- Has about 9,000 members.

The Wilderness Society (1935):

- Founded by **ALDO LEOPOLD** and focused on wildlife and preserving wilderness areas.
- Currently has over 300,000 members and supporters.



THE WILDERNESS SOCIETY

Environmental Science – A True Science:

- Is considered a science because we use scientific ideas and principals to determine things such as **CONSERVATION** and **SUSTAINABLE DEVELOPMENT**.

- **<u>It is still based on</u>:**

A. A scientific method.
B. Hypothesis (a possible idea/explanation for something)
C. Experiments.
D. Conclusions.

Two Groups of People Involved:

1. **ENVIRONMENTALISTS:** works to preserve the environment from destruction or pollution.

2. **CONSERVATIONISTS:** focus their work on sustainable resource use, allocation and protection.

- **BUT**, Environmental science is a difficult science to work in because the world isn't as black and white as we'd like it to be.

- People still **NEED** – jobs, shelter, food, and space.

- Science **can't solve** all of the problems, because society has to be looked at too.
- Science also isn't always right – mistakes can be made.
- Science also sometimes is only used for the wrong reasons – it's not always for everybody's good. (e.g: Mining companies scientist vs. Environmental scientists)

- Science also can be solved using different methods.
- Science is **ALSO** heavily influenced by **SOCIETY**.
- Lots of parts of government – also get involved in Environmental Science issues.

Applications of Environmental Science?

1. **Environment Impact Assessment** (EIA) – How will a project affect the environment?
2. **Monitoring** – keeping track of possible pollution.
3. **Risk Assessment** – What bad effects can a project cause?
4. Helps form public policy.

Food Chains:

- **ECOLOGY**: is the study of the way organisms interact with each other and with their nonliving surroundings.
- The interactions involve energy and matter.
- Living things require a constant flow of energy and matter to ensure their survival.

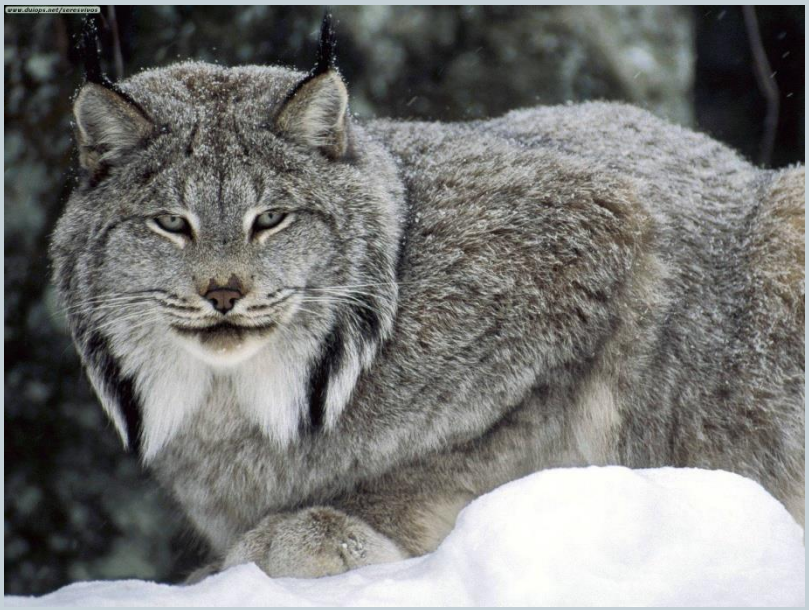
- If the flow of energy and matter ceases, the organisms die.
- All organisms are dependent on other organisms in some way.
- One organism may eat another and use it for energy and raw materials.

Autotrophs:

- Are the foundation of all food sources within the environment.
- Are organisms capable of making their own food.
- Examples: green plants, trees, pitcher plants, lichens and seaweed.
- Also called **PRODUCERS**.

Hetrotrophs:

- An organism that consumes food (eats).
- Ex: cows, lynx, fox, bears, etc…
- Also called **CONSUMERS**.



Herbivores:

- Eats plants.
- Ex: Moose, Rabbits

Carnivores:

- Eats meat.
- Ex: Tigers, lions, etc…

Omnivores:

- Eats plants and meat.
- Ex: bears, dog, coyotes, “us.”

Scavengers:

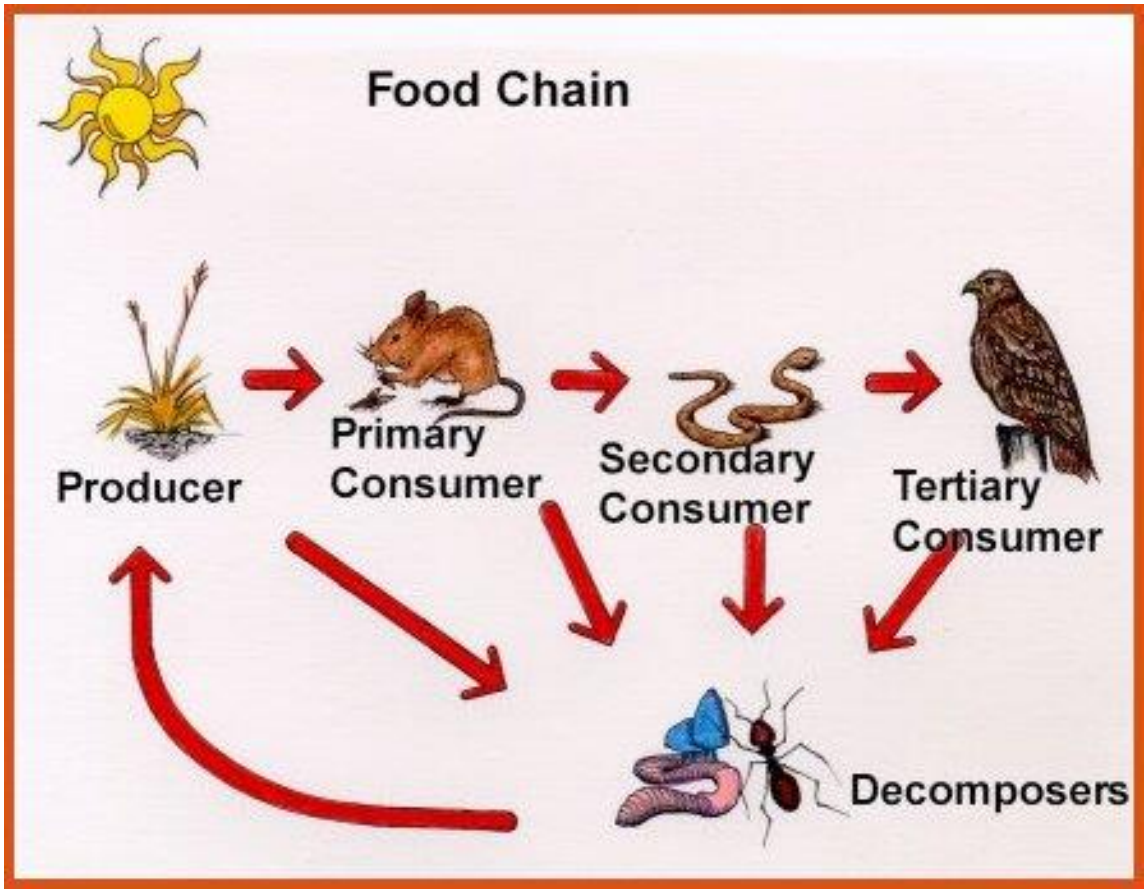
- Help “clean up” the remains.

Decomposers:

- Organisms that break down dead material or wastes to nutrients in the soil.

- Ex: bacteria, fungi.
- They close the circle.

- The resulting nutrients enrich the soils and are used by the growing vegetation.
- This vital and somewhat complex relationship between decomposers, producers, and consumers is known as a **FOOD CHAIN**.
- Most food chains are interconnected.


Food Chain
Producer
Primary Consumer
Secondary Consumer
Tertiary Consumer
Decomposers

Food Web:

- Animals typically consume a varied diet and, in turn, serve as food for a variety of other creatures that prey on them.

- These interconnections create **FOOD WEB**.

- **PRIMARY CONSUMERS** – HERBIVORES

- **SECONDARY CONSUMERS** – CARNIVORES THAT FEED ON HERBIVORES

- **TERTIARY CONSUMERS** – CARNIVORES THAT FEED ON CARNIVORES

Energy Flow through Food Chains:

- Pyramids of energy usually illustrate the amount of living material (or its energetic equivalent) that is present in different trophic levels, or feeding levels.
- It also shows how energy travels through a food chain or food web.
- At each feeding level or trophic level 10% is the average conversion efficiency from producers to primary consumers.
- More energy gets lost through heat.