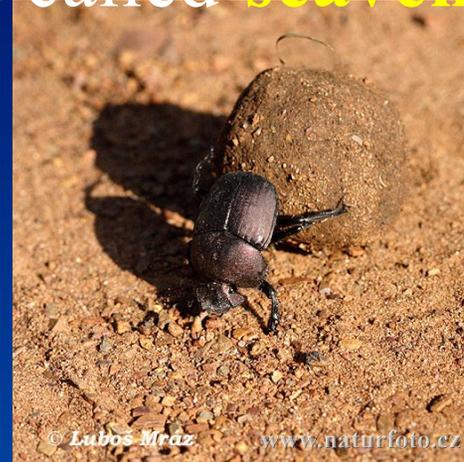


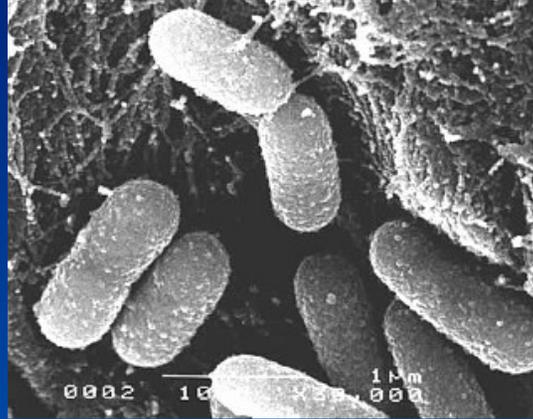
Roles of Organisms in Ecosystems

- Organisms that feed off dead organisms or the waste of other organisms are called **scavengers**.



Roles of Organisms in Ecosystems

- Organisms that break down dead organisms or the waste of organisms into their basic chemical parts are called **decomposers**.



Decomposers in our Food

- There are two basic ways to prevent decomposers, such as **mold** and **bacteria**, from growing on our food.
 - ▶ **Keep them off the food in the first place**, by making sure our hands are clean before handling food, using clean utensils to prepare food and by keeping food well covered and sealed.
 - ▶ **Slow down or prevent the growth of decomposers** by using methods like refrigeration, canning, vacuum packing, freezing, freeze-drying or radiation.

Decomposers in our Food

- **Drying** removes moisture which all organisms require to survive.
Freezing removes warmth thus slowing or stopping reproduction
- **Radiation** kills bacteria.
- **Canning and vacuum packing** removes air. Without oxygen most organisms cannot survive.
- **Salting** food prevented growth of bacteria ex salt cod or pickling food in brine
- **Pickling** food prevents harmful bacteria from growing, since bacteria have a hard time surviving in vinegar.

Decomposers in our Food

- Sometimes the growth of these decomposers are helpful to us
- For example, we use a friendly form of bacteria to produce yogourt and sour cream. This type of bacteria will not make us sick, in fact, it helps keep us healthy by preventing harmful bacteria from growing in our intestines.
- There is a type of yeast (a form of fungus), that will turn sugars into alcohol and produce carbon dioxide bubbles. We use this yeast to make bread, cheese, beer and wine.
- The main reason for using yeast in making bread is to get the dough to rise so that when baked it is light and fluffy. The yeast does this with the carbon dioxide bubbles. The alcohol produced is evaporated when baked.

Food Chains, Food Webs & Energy Transfer

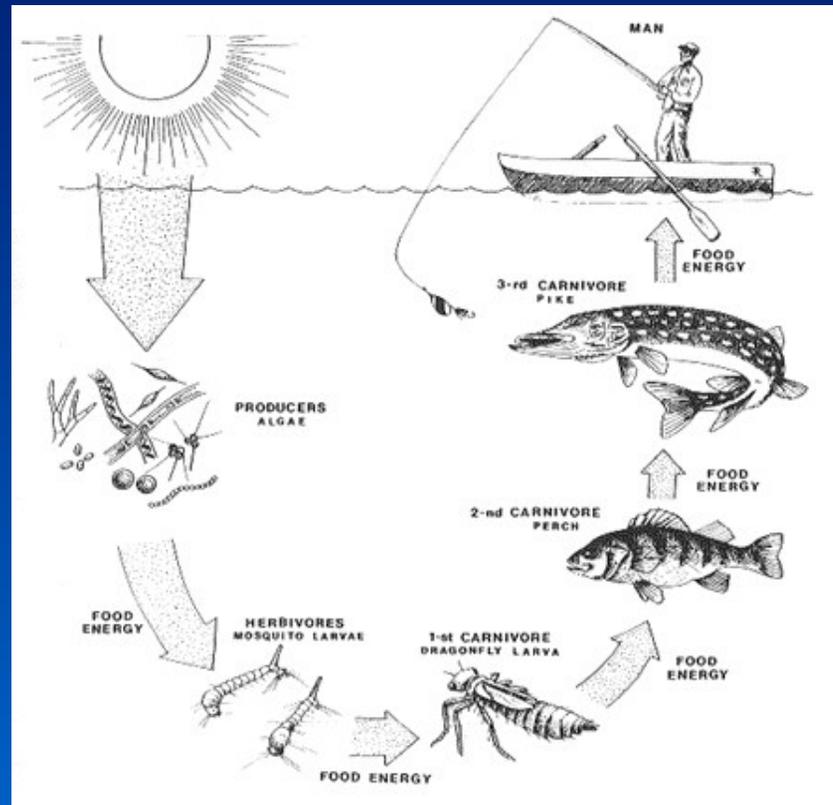
Food Chains

- Green plants and algae require energy from the sun to make food.
- The plants and algae use some of this energy for their own life processes. When a herbivore eats them, **some** of the trapped energy is passed on to the animal.
- A carnivore eats the herbivore and **some** of the energy the herbivore consumed is passed on to the carnivore.

Food Chains, Food Webs & Energy Transfer

Food Chains

- The transfer of energy from organism to organism is referred to as a **Food Chain**.

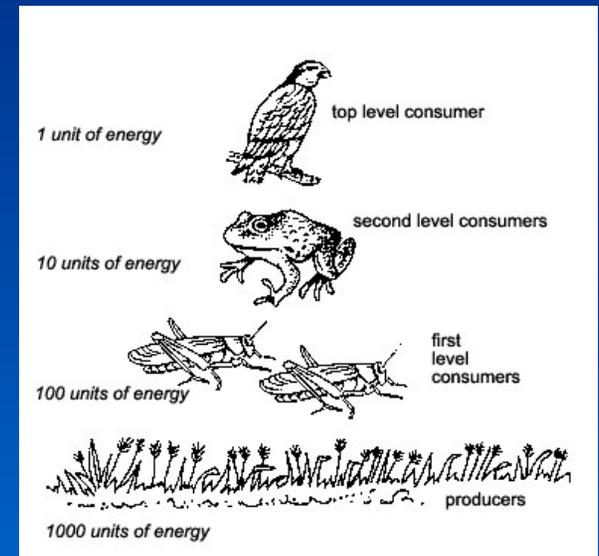


Roles of Organisms in Food Chains

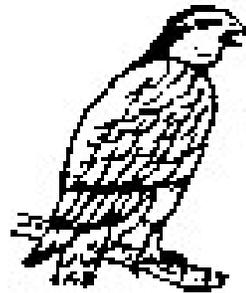
- Each type of organism has a role in the food chain.
- Every food chain **must** have a **producer** at the bottom.
- **Producers** trap the energy from sunlight through a process called **photosynthesis**. It is this energy that is passed up the food chain.
- The next level of a food chain are organisms called herbivores. They eat plants only and are called **primary consumers** because they are the first in the line of consumers in any food chain.

Roles of Organisms in Food Chains

- The next level of consumers are those that eat other consumers. We often call them carnivores, but in a food chain they are called **secondary consumers**.
- Food chains usually have up to four links, but it can't be too much longer since energy begins to run out as the food chain gets longer.



1 unit of energy



top level consumer

10 units of energy



second level consumers

100 units of energy



first
level
consumers



producers

1000 units of energy

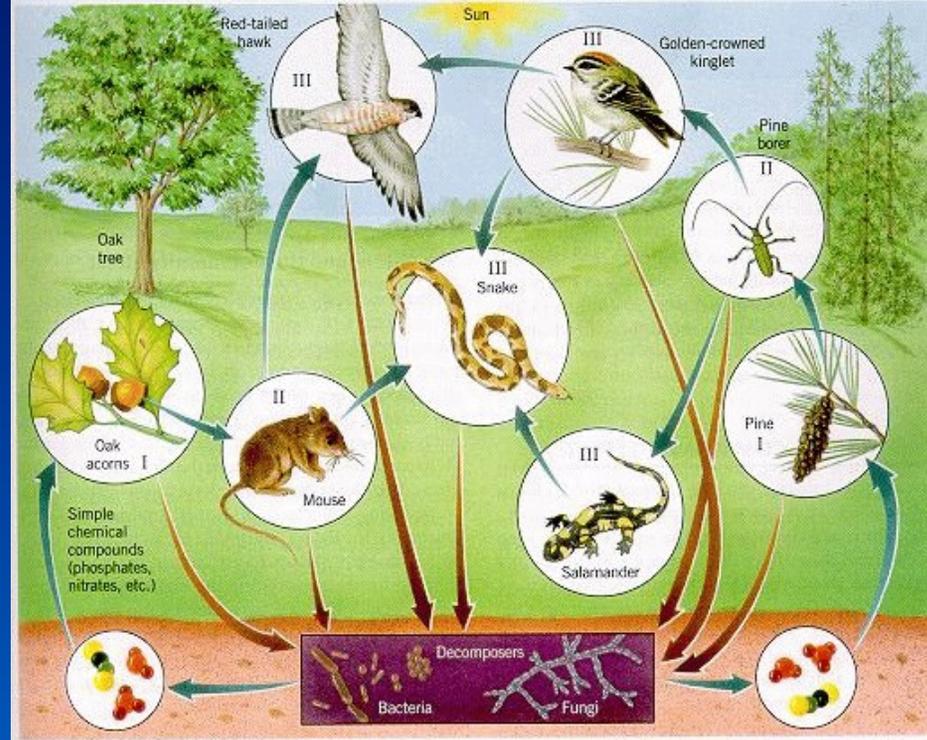
Roles of Organisms in Food Chains

Food Webs

- Every organism is a member of a food chain. However, it is rare that an organism is a member of only one.
- In fact, most organisms are members of several food chains. When several food chains cross over one another in the same ecosystem like this we call it a **food web**.
- Of course, the last stage of any food web are the decomposers. Anything that dies in the food web will be broken down by decomposers.

Food Web

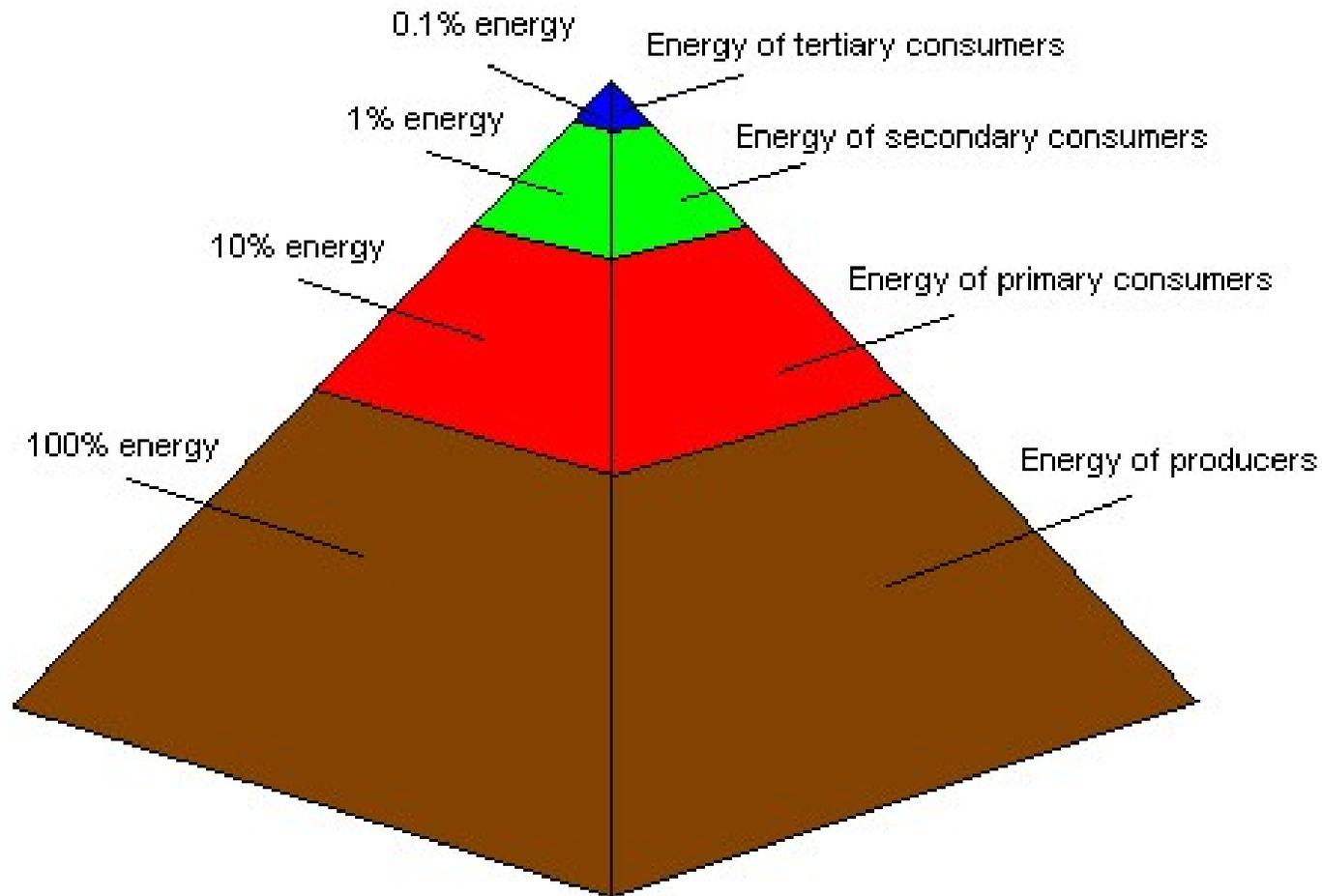
FIGURE 6.3 Food webs: (a) a typical terrestrial food web. Roman numerals identify trophic levels.



Energy Transfer in Food Chains

- When an organism eats, it is consuming food for energy. Most of this energy is being used for life processes such as respiration, growth and movement.
- Another large portion of the energy is passed out of the animal in the form of waste products such as gases, solid waste or urine.
- Only about 10% of all the energy that an organism consumes is actually stored in the animal's living tissues.
- That means the second organism that eats this first organism is only getting about 10% of all the energy that it consumed.

Energy Pyramid



Cycles of Matter in Ecosystems

Nutrients

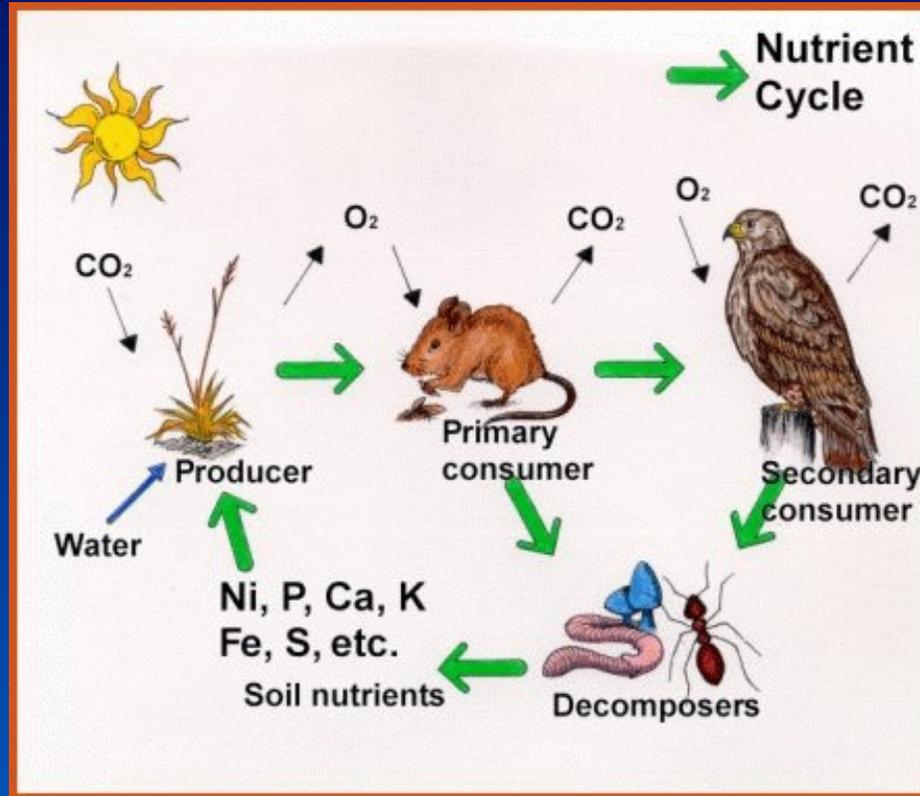
- Food provides more than just energy to organisms.
- Nutrients such as **carbon** and **nitrogen** are also contained in food.
- Nutrients are used for **growth** and **repair** of the organisms body.
- Producers get their nutrients from the soil, water and air.
- Consumers get their nutrients from the foods that they eat.

Cycles of Matter in Ecosystems

Nutrients

- There is only a limited supply of nutrients on the planet. Therefore, nutrients must be used over and over again.
- When the nutrients are in the soil, air or water they are **abiotic** but when these nutrients are used in the growth and repair of an organism they are **biotic**.
- The process that moves nutrients from organisms to the soil and from soil to organisms is called the **nutrient cycle**.

Nutrient Cycle



Cycles of Matter in Ecosystems

Steps in the Nutrient Cycle

- 1) Plants absorb nutrients from the soil, water or air.
- 2) Primary consumers eat plants and Secondary consumers eat other animals. In both cases, nutrients are passed to them.
- 3) The consumers release some of these nutrients by breathing out or excreting waste products (urine or feces).
- 4) The rest of the nutrients are held in their body structure until they die.
- 5) Decomposers take the dead organisms apart and place the nutrients back into the environment to be used again by plants.

Natural Disturbances & Succession

- Ecosystems are constantly changing.
- Sometimes these changes are gradual and other times they are sudden and destructive.
- **Natural**, sudden changes include things like hurricanes, tornados, floods, volcanoes, earthquakes, forest fires or landslides.
- Other sudden changes can be **man-made**, such as clearing large areas of forest for factories or shopping malls, paving over huge areas of land for roads or parking lots.

Natural Disturbances & Succession

Succession

- These sudden changes can leave an area bare of any life.
- If left long enough, these areas will become re-populated by organisms.
- The first organisms to re-populate these types of areas are those that are adapted to dry and very exposed areas.
- By doing this, they change the environment and make it more suitable for other organisms.
- Eventually (thousands of years), the environment will recover and be re-populated by plants and animals.
- The process of a biological community changing over time is called **succession**.

Natural Disturbances & Succession

Primary Succession

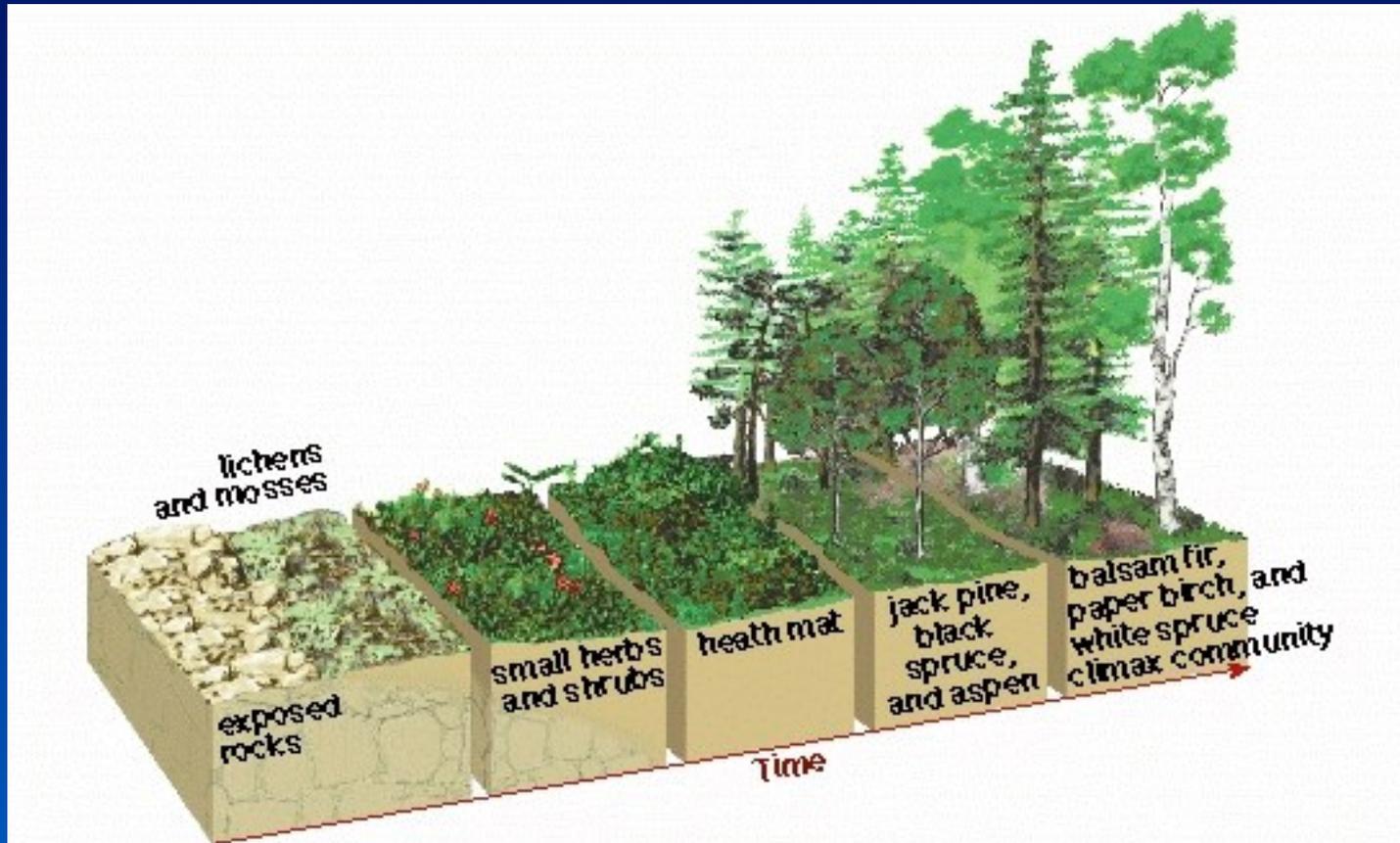
- Ecosystems do not start off with lots of vegetation.
- The early stages of ecosystem growth starts with a habitat that is without soil or shelter. These habitats are very hostile to life and only special types of organisms can survive there.
- Species that can begin life in areas without soil or shelter are known as **pioneer species**.
- Examples of pioneer species include bacteria, moss and lichens.

Natural Disturbances & Succession

Primary Succession

- Lichens are a species that can begin life on bare rock as long as there is plenty of water and light.
- Pioneer species begin a chain of events that allow more complex organisms to grow in an area. This is called **primary succession**.
- If this process of succession is left to continue to its final stages, we end up with a climax community.
- A **climax community** is a mature, stable ecosystem that can remain unchanged for centuries.

Primary Succession



Natural Disturbances & Succession

Secondary Succession

- Succession in an ecosystem does not always start from bare rock.
- Sometimes an ecosystem that already exists is disturbed in a big way. For example, a landslide or forest fire could wipe out a large section of forest.
- **Secondary succession** is the process of change in an ecosystem after it has been disturbed. Since part of the previous ecosystem still surrounds the damaged area, the recovery of the ecosystem takes much less time than in primary succession.

Impact of People on Ecosystems

- People have such a large impact on ecosystems mainly due to our powerful technologies and our large and ever growing populations.
- Examples of impacts include
 - ▶ Destruction of habitats
 - ▶ Introduction of non-native species
 - ▶ Stripping of natural resources
 - ▶ Pollution of air and water
- Much of the impact we have on the earth is because of our need to have natural resources.

Impact of People on Ecosystems

- **Natural Resources** are things that are found in nature that people require for their basic needs.
- Examples of this are water, oil, wood, metal and land (for building or farming).



Fish caught in the water near Fort Chipewyan. Water is polluted from the tar sands.

Impact of People on Ecosystems

Habitat Loss

- Many human activities result in loss of habitat.
- This can be a **direct effect** like the removal of vegetation and soil which removes food and shelter for many animals.
- Or, it may be an **indirect effect** like digging large holes in the earth that change the flow of rivers and streams that will in turn affect the ecosystems in lakes and ponds that could be hundreds of kilometers away.

Impact of People on Ecosystems

Endangered Species

- Some species of plants and animals are very adaptable to change and can live in many types of ecosystems. Ex. Coyotes can adapt and survive in just about any habitat
- Other species cannot adapt at all to large scale changes in their environment. When habitat gets destroyed, it places pressure on that species for finding food and shelter since it can't adapt to any other ecosystem.
- A species becomes **endangered** when the population is so low it is in danger of becoming extinct. **Extinct** means that there is no more of that species anywhere on the planet.

Impact of People on Ecosystems

Introduced Species

- Species of plants and animals that live in an ecosystem that are supposed to be there are called **native species**.
- Sometimes humans introduce a species of plant or animal to an ecosystem that is NOT native.
- This can be done by accident like the Europeans bringing the Norway Rat and diseases like influenza and smallpox to North America.
- Or it can be deliberate like the introduction of moose to the island of Newfoundland back in the 1800's.

Impact of People on Ecosystems

Introduced Species

- Whether it was deliberate or not, introducing a non-native species to an ecosystem can have destructive results.
- For example, the purple loosestrife was brought to Canada from Europe because people like the way it makes their gardens look. However, this species of plant grows so well in wetlands that native species cannot establish and the loosestrife removes so much water that it becomes an unsuitable habitat for wetland organisms.

Impact of People on Ecosystems

Overharvesting

- **Renewable resources** are the living resources in the environment, like fish or trees, that can grow back in a short period of time.
- A resource is **sustainable** when it can replace itself as quickly as it is harvested.
- A resource is **unsustainable** when it is harvested faster than it is being replaced.
- When a resource becomes unsustainable it is due to **overharvesting**.

Impact of People on Ecosystems

Causes of Unsustainability

- **New Technology** - new technologies allow the harvesting of natural resources, faster and in larger quantities.
- **More Demand** - increasing human population has created more demand for the resources.
- **Lack of Conservation** - governments do not follow the advice of scientists that warned about overharvesting.
- **Unsustainable Harvesting** - governments set harvesting limits that are too high. The resources cannot replace itself fast enough to keep up.

Impact of People on Ecosystems

Effects of Pollution

- **Monoculture** is when farmers plant a single crop in a large open field. The obvious reason for this is to grow food for people, however, these crops are also a food source for insects.
- To prevent the insects from eating all the crops, the farmers use **pesticides**.
- To make the crops grow faster and larger, the farmers use **fertilizer**.

Impact of People on Ecosystems

Effects of Pollution

- **Pollutants** are anything that harms the air, water, soil or living things.
- The fertilizer and pesticide that is put on farm crops are examples of pollutants.
- Pesticides eaten by insects are passed up the food chain to higher consumers. This can harm a lot of organisms in the ecosystem.
- Fertilizers get washed into rivers and lakes and cause water plants to grow much faster than they should. Too many plants can cause problems in an ecosystem.

Impact of People on Ecosystems

Effects of Pollution

- Humans introduce pollutants into the environment in many ways
 - ▶ Exhaust from cars and trucks
 - ▶ Chemicals leaking into ground water from dumps
 - ▶ Oil spills from ships
- Burning fossil fuels creates waste gases like nitrogen and sulfur. When these chemicals combine with moisture in the air, the result is **acid rain**.
- Since most organisms can only stand a certain acid level (called pH level), changing it with acid rain can have a negative effect on an ecosystem.