

## 2.3 Effect of Bioaccumulation on Ecosystems

- ❧ Amphibians (like frogs) live on both land and in the water.
- ❧ They are also sensitive to chemicals changes in the environment.
- ❧ They are therefore valuable indicators of environmental health.



- ❧ Since the 1980s, much of the world's amphibian species have suffered declines in population.
- ❧ There has also been alarming increases in amphibian birth deformities in that time.
- ❧ Many theories attempt to explain these changes, including drought, increased UV rays, pollution, habitat loss, parasites and diseases.



Amphibians, like this frog, have exhibited drastic changes since the 1980s.

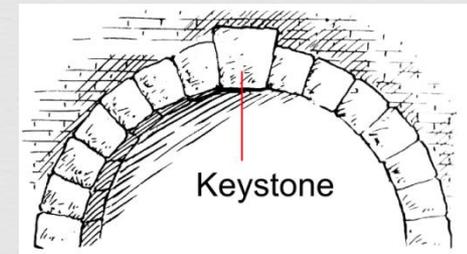


# Bioaccumulation

- ∞ Bioaccumulation refers to an organism slowly building up the amount of chemicals in their bodies.
- ∞ Many harmful chemicals cannot be decomposed naturally.
- ∞ These chemicals can be eaten or absorbed, and sometimes cannot be removed from the body of the organism effectively.



# keystone species



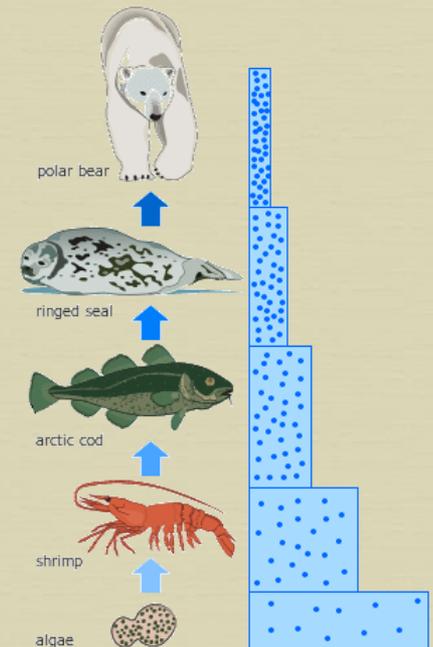
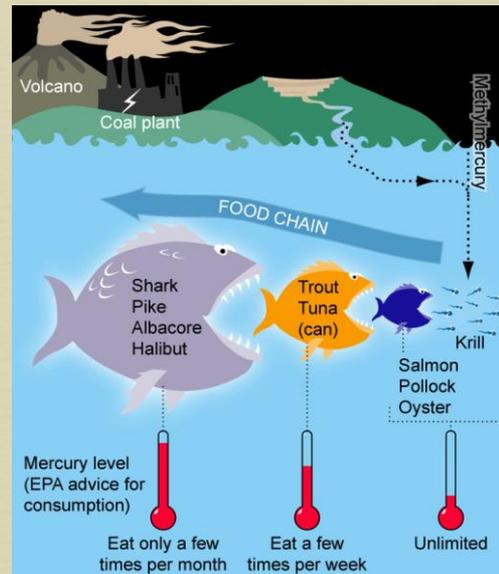
☞ If a keystone species suffers a chemical bioaccumulation, it can affect every other organism in its far reaching niches.

A keystone species is a vital part of an ecosystem.



# Biomagnification

- ❧ Biomagnification refers to the animals at the top of the food pyramid receiving huge doses of accumulated chemicals.
- ❧ At each level of the food pyramid, chemicals that do not get broken down build up in organisms.
- ❧ When the consumer in the next trophic level eats organisms with a chemical accumulation, they receive a huge dose of the chemical(s).



**CAUTION**

**CONTAINS**

**PCBS**

**(Polychlorinated Biphenyls)**

**A toxic environmental contaminant  
requiring special handling and disposal in  
accordance with U S Environmental  
Protection Agency Regulations 40 CFR 761  
For Disposal Information contact the  
nearest US E.P.A. Office.**

**In case of accident or spill, call toll free the  
US Coast Guard National Response Center:  
800-424-8802**

**Also Contact \_\_\_\_\_**

**Tel. No. \_\_\_\_\_**

video

# Bioaccumulation

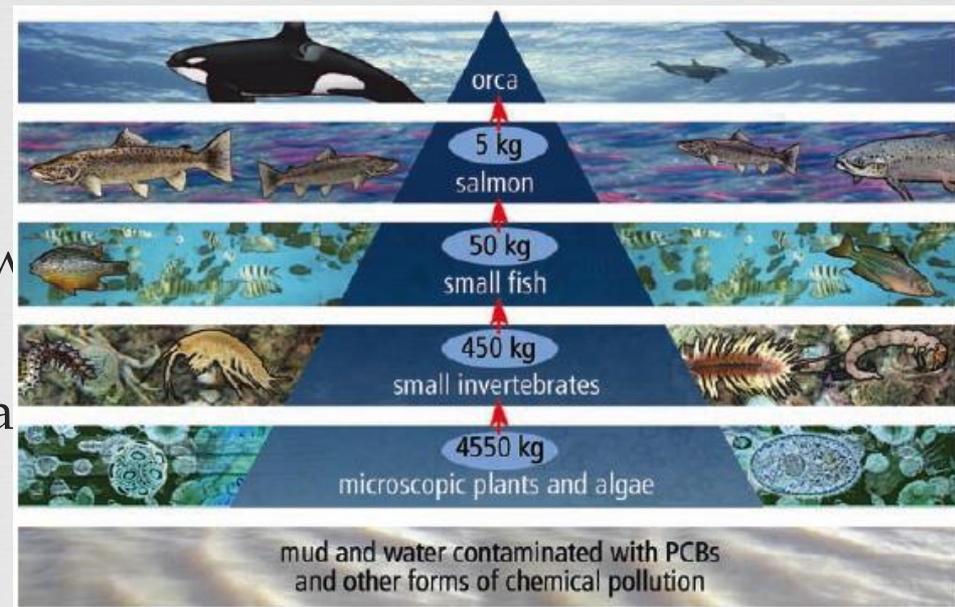
∞ An example of bioaccumulation in BC is the effect of PCBs on the Orca.

∞ PCBs are a chemical that were used for many industrial and electrical applications in the mid 20th century.

∞ PCBs were banned in 1977 because of fears of their environmental impact.

∞ PCBs bioaccumulate, and also have a long-half life (they break down very slowly)

∞ PCBs will affect the reproductive cycles of Orca until at least 2030.



The bioaccumulation of PCBs begins with the absorption of the chemicals by microscopic plants and algae.

# Bioaccumulation

- ❧ Chemicals like PCBs and DDT are called persistent organic pollutants (POPs)
  - ❧ POPs contain carbon, like all organic compounds, and remain in water and soil for many years.
  - ❧ Many POPs are insecticides, used to control pest populations.
    - ❧ DDT was introduced in 1941 to control mosquito populations, and is still used in some places in the world.
    - ❧ Like PCBs, DDT also bioaccumulates and has a long half life.
    - ❧ At even low levels (5 ppm), DDT in animals can cause nervous, immune and reproductive system disorders.
      - ❧ ppm = parts per million



Spraying DDT, 1958

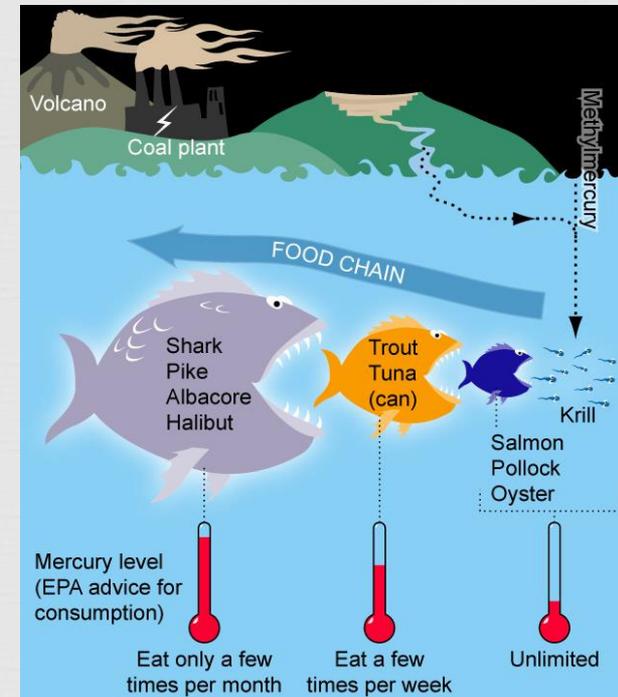
# Bioaccumulation

- ❧ Heavy metals also bioaccumulate.
  - ❧ Lead, mercury and cadmium of the most polluting heavy metals.
  - ❧ Lead is found naturally at low levels, but levels have increased.
    - ❧ Lead is not considered safe at any level.
    - ❧ Many electronics contain lead, and must be recycled carefully.
    - ❧ **Lead can cause anemia, nervous and reproductive system damage.**
  - ❧ Cadmium is also found in low levels naturally.
    - ❧ Cadmium is used in the manufacture of plastics and nickel-cadmium batteries.
    - ❧ It is toxic to earthworms, and causes many health problems in fish.
    - ❧ In humans, the main source of cadmium exposure is cigarette smoke.
      - ❧ **Cadmium causes lung diseases, cancer, nervous and immune system damage.**



# Bioaccumulation

- ☞ Mercury also is found naturally.
- ☞ Much more has entered ecosystems through the burning of fossil fuels, waste incineration, mining and the manufacture of items like batteries.
  - ☞ Coal burning adds 40% of the mercury released into the atmosphere.
- ☞ Mercury bioaccumulates in the brain, heart and kidneys of many animals.
  - ☞ Fish bioaccumulate mercury compounds, adding risk for any organisms eating fish.



Shellfish are filter feeders so they accumulate toxins



Eating shellfish with high levels of certain toxins can lead to serious or potentially fatal illnesses such as: Paralytic Shellfish Poisoning commonly known as Red Tide, Amnesic Shellfish Poisoning and Diarrhetic Shellfish Poisoning **Cooking bivalve shellfish does not destroy the toxins that cause illnesses. Cooked shellfish can still be toxic.**

## ∞ Reducing the effects of chemical pollution

- ∞ By trapping chemicals in the soil, they cannot enter the food chains as easily.
- ∞ Bioremediation is also used, as micro-organisms or plants are used to help clean up, and are then removed from the ecosystem.
  - ∞ The oil industry will often use bacteria to “eat” oil spills.
- ∞ Certain natural species are also excellent at bioremediation.



[Take the Section 2.3 Quiz](#)