

Biological Magnification and Bioaccumulation

Biological magnification Video: <http://www.youtube.com/watch?v=E5P-UoKLxIA&feature=related>

Bioaccumulation is when an organism accumulates a material in its body at a concentration greater than the environment.

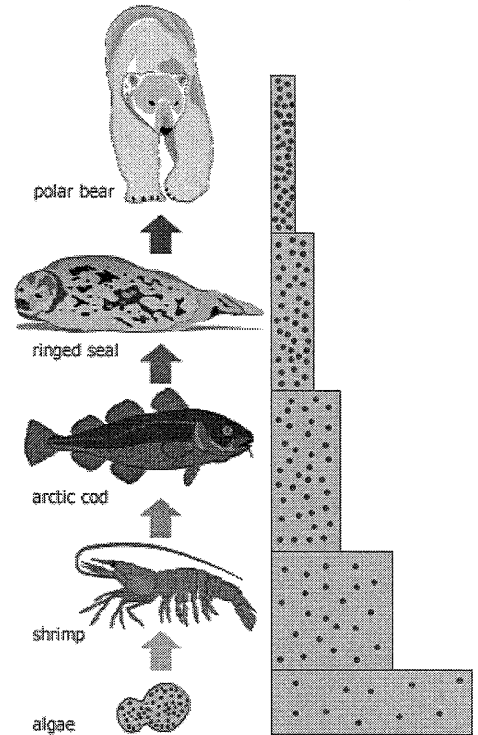
Biological magnification occurs when bioaccumulation occurs in several links in a food chain. A consumer (of any level) has to consume a lot of biomass from the lower trophic level. If that biomass contains the pollutant, the pollutant will be taken up in large quantities by the consumer.

This can happen when the material is:

1. long-lived (does not degrade, or is not easily broken down by organisms).
2. concentrated in the organism's body (is not excreted).

This often occurs with pollutants soluble in fat. Water-soluble pollutants usually cannot biomagnify in this way because they would dissolve in the bodily fluids of the consumer.

Examples of biomagnification include organic compounds (e.g. DDT, PCBs) and heavy metals. In the early 1960's scientist Rachel Carson published "*Silent Spring*" which led to the banning of DDT, the search for pesticides that would not biomagnify, and the birth of the "modern" environmental movement.



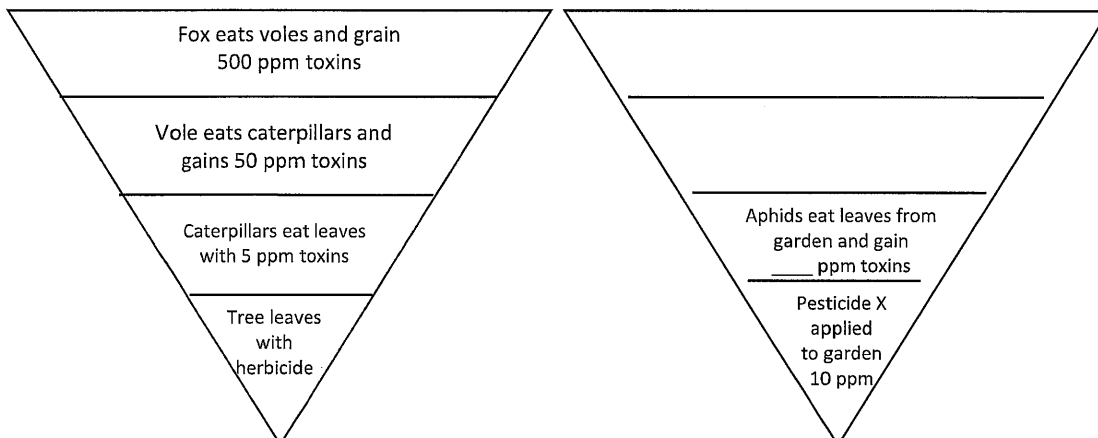
Uncle Bob's Garden

Uncle Bob takes pride in his roses. Every day he spends the afternoon weeding and watering. Unfortunately the bugs love his roses too. To control the pests Uncle Bob went to the store and bought Pesticide X, the strongest pesticide on the market. Pesticide X (bug killer) has a chemical that is harmless to vertebrate organisms in small quantities, but hazardous to vertebrate organisms in large quantities or concentrations. He uses the pesticide on the entire garden just to make sure.

1. Construct a **food chain** using the following organisms Rose Bush, Aphid, Sun, Dragonfly, Restless Flycatcher. . Use **arrows** to show energy movement and label all **trophic levels**.

2. Assuming that each higher level consumer consumes 10 times more toxins than the level before, create a **toxicity pyramid** that shows the bioaccumulation that occurs in the food chain.

Example:



3. According to your **toxicity pyramid** which of the organisms is going to be affected the most by the pesticide? Explain why.

4. If this organism dies (from question 3), what might the secondary effects be on Uncle Bob's garden?

5. When the pesticide was passed from the roses to the aphids to the dragonfly or restless fly catcher, was it moving up the food chain or down the food chain?

6. What happened to the insecticide concentration as it went from roses to restless fly catcher? Would this happen all the time or only sometimes?

7. What would happen if you the restless fly catcher ate more than one dragonfly?

8. Do you think that all birds that eat from the same garden have the same insecticide concentration? Why or why not?

9. Write a letter (on the next page) to Uncle Bob explaining the dangers of using pesticide X in his garden. Make sure to explain "biological magnification" to get your point across.