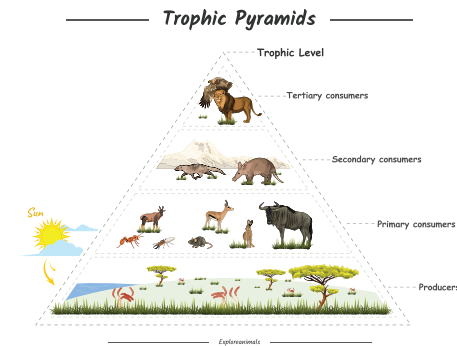
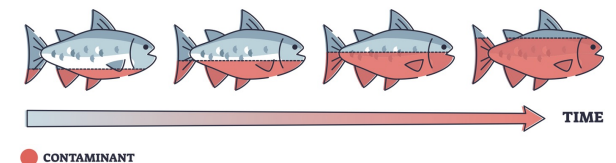


Bioaccumulation and Biomagnification

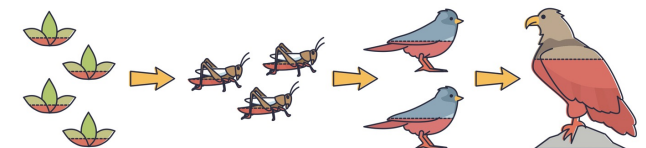
- DDT
- Bioaccumulation
- Biomagnification
- Causes and Factors
- Impacts of Bioaccumulation and Biomagnification
- Case Study – Mercury in Fish and Minamata Disease
- Case Study – PCBs in the Hudson River



BIOACCUMULATION



BIOMAGNIFICATION



Preview File

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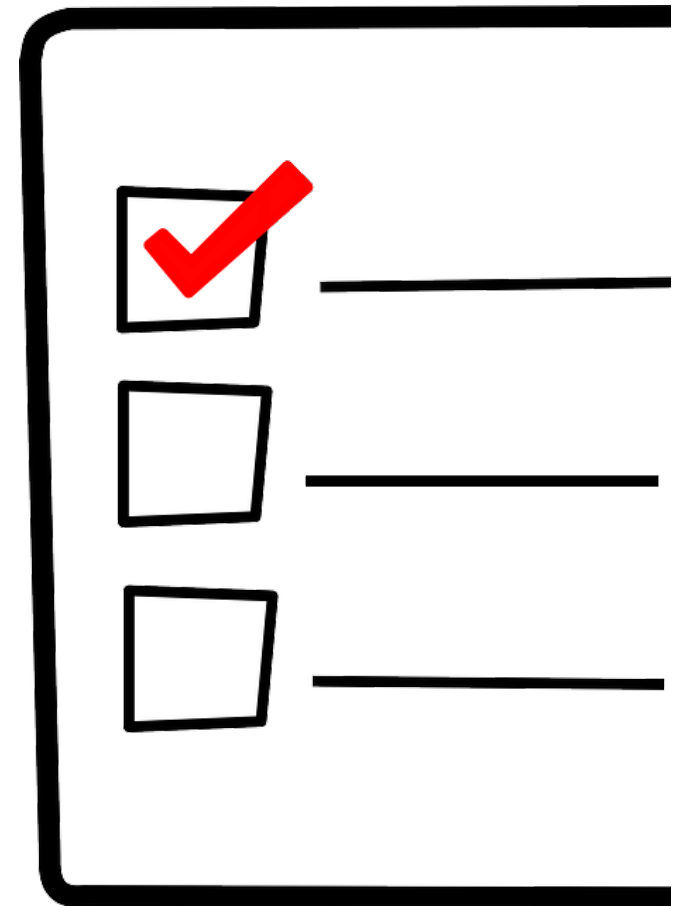
- Some slides appear blank because they have been removed
- Student versions have portions of the text removed which is given in the teacher version and appear as _____ which the students are to fill in
- Other slides may have on them, this represents writing that has been removed on this sample

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Lesson Objectives

1. To understand the concepts of bioaccumulation and biomagnification.
2. To recognize the impacts of pollutants on ecosystems and human health.



☒	_____
☐	_____
☐	_____

DDT

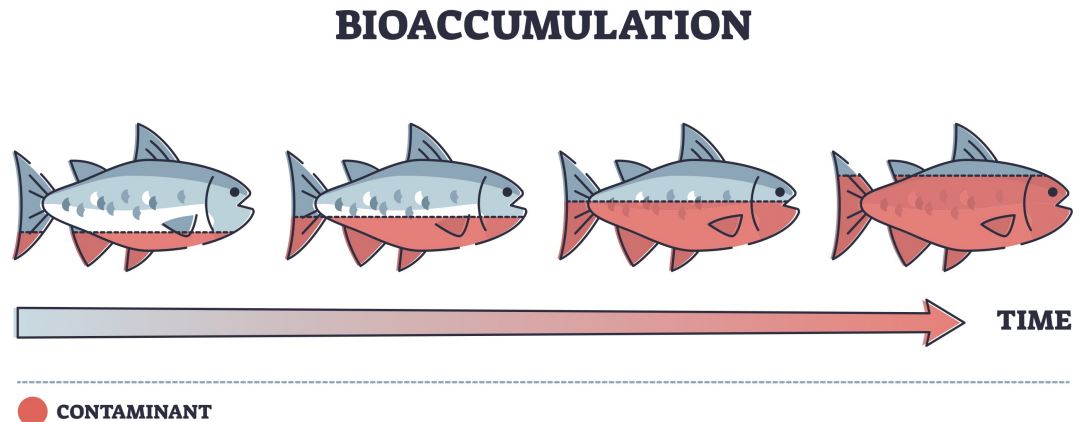
(dichlorodiphenyltrichloroethane)

- DDT was widely used as an insecticide in the mid-20th century to control pests in agriculture and combat diseases like malaria
- It was highly effective and inexpensive, _____



Bioaccumulation

- Bioaccumulation refers to the process by which pollutants or toxic substances (such as DDTs) build up in the tissues of living organisms over time
- _____



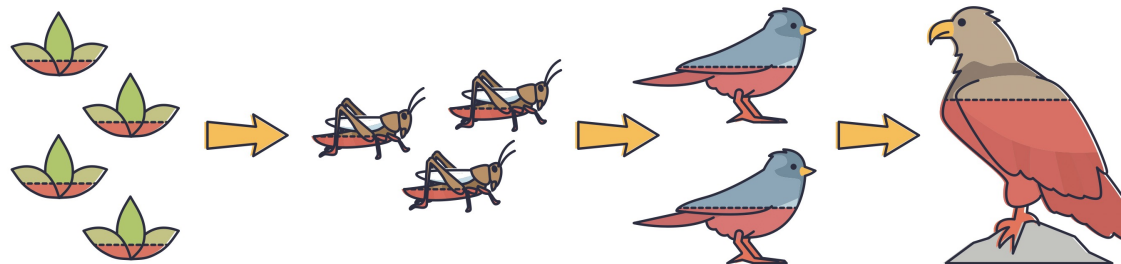
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Biomagnification

- _____
- Organisms at higher trophic levels, such as predators, accumulate higher levels of the pollutant compared to organisms at lower trophic levels

● CONTAMINANT

BIOMAGNIFICATION



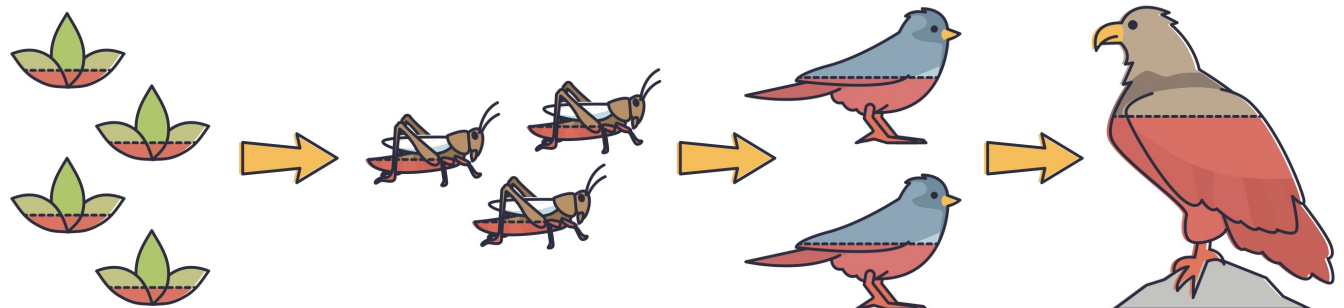
Biomagnification

- As organisms consume other organisms, the pollutants present in their prey are transferred to the predator

- _____

● CONTAMINANT

BIOMAGNIFICATION

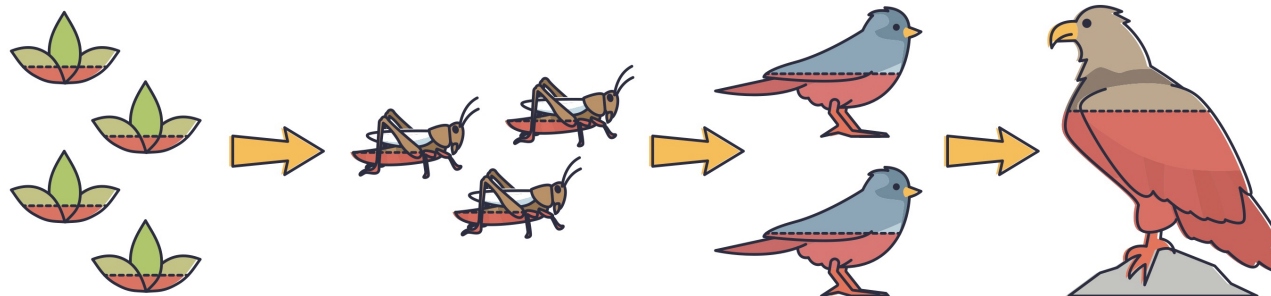


Biomagnification

- For example, birds, such as bald eagles, occupy the top of the food chain and are considered apex predators
- When bald eagles consume fish contaminated with DDT, they ingest a high concentration of the pesticide
- _____

● CONTAMINANT

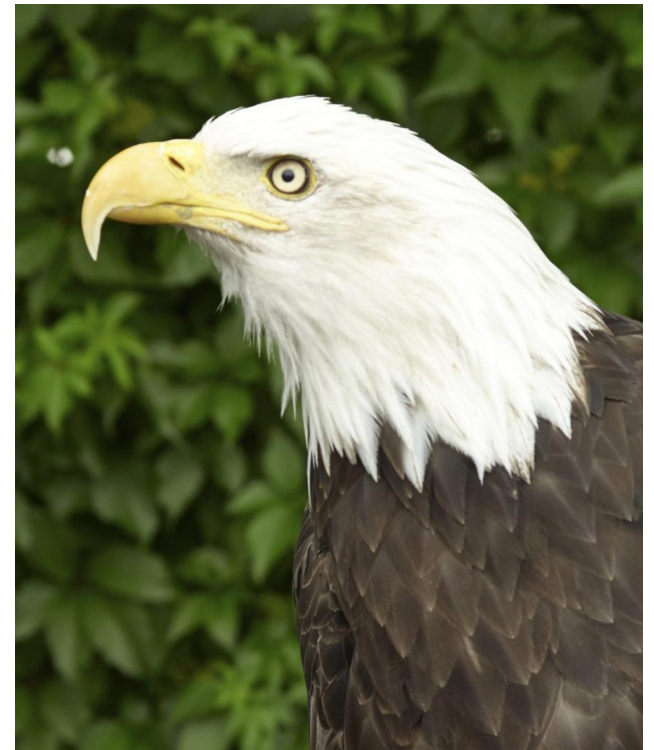
BIOMAGNIFICATION



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Conservation Efforts

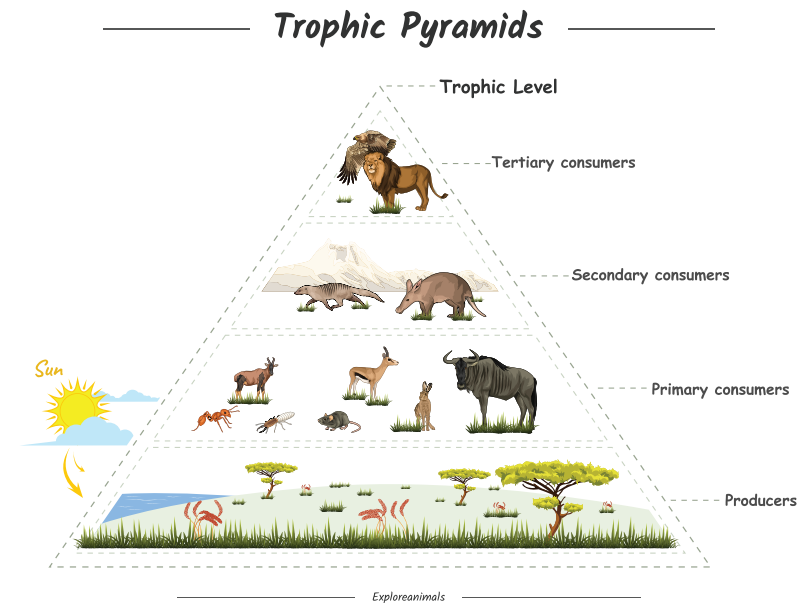
- _____
- In 1972, DDT was banned in the United States through the implementation of the Environmental Protection Agency's (EPA) ban on its use in agriculture
- The recovery and conservation efforts, including habitat protection and reintroduction programs, have resulted in the remarkable recovery of bald eagle populations in recent decade



Causes and Factors of Bioaccumulation and Biomagnification

1. Position in the Food Chain - Organism's Trophic Level:

- Higher trophic level organisms, such as top predators, tend to accumulate higher concentrations of pollutants compared to organisms lower in the food chain



Causes and Factors of Bioaccumulation and Biomagnification

2. Chemical Properties of the Pollutant:

- _____

- These pollutants are more likely to bioaccumulate and biomagnify since they are not easily broken down by natural processes



Spraying pesticides

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Causes and Factors of Bioaccumulation and Biomagnification

3. Environmental Conditions:

- _____
- Pollutants in water or soil need to be in a bioavailable form for organisms to absorb them
- Factors such as pH, temperature, and the presence of other chemicals can influence the bioavailability of pollutants

Causes and Factors of Bioaccumulation and Biomagnification

4. Biological Factors:

- _____
- Some organisms have specialized mechanisms to get rid of certain pollutants more efficiently, reducing the amount of bioaccumulation

Causes and Factors of Bioaccumulation and Biomagnification

4. Biological Factors:

- Organisms with a diet composed of other organisms (i.e. carnivores) are more likely to bioaccumulate and biomagnify pollutants compared to those with plant-based diets (herbivores)

- _____



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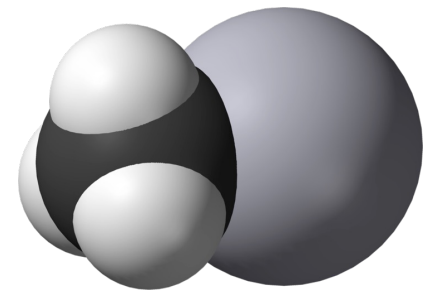
Impacts of Bioaccumulation and Biomagnification on Human Health

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Case Study: Mercury in Fish and Minamata Disease

- Minamata Disease is a neurological disorder caused by the bioaccumulation of methylmercury in the food chain, primarily affecting humans

- _____



Methylmercury

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Case Study: Mercury in Fish and Minamata Disease

- Humans who consumed contaminated fish from Minamata Bay experienced high levels of mercury accumulation in their bodies
- The methylmercury biomagnified as it moved up the food chain, resulting in severe neurological effects in individuals who ingested the contaminated fish, including symptoms such as tremors, ataxia, and cognitive impairments

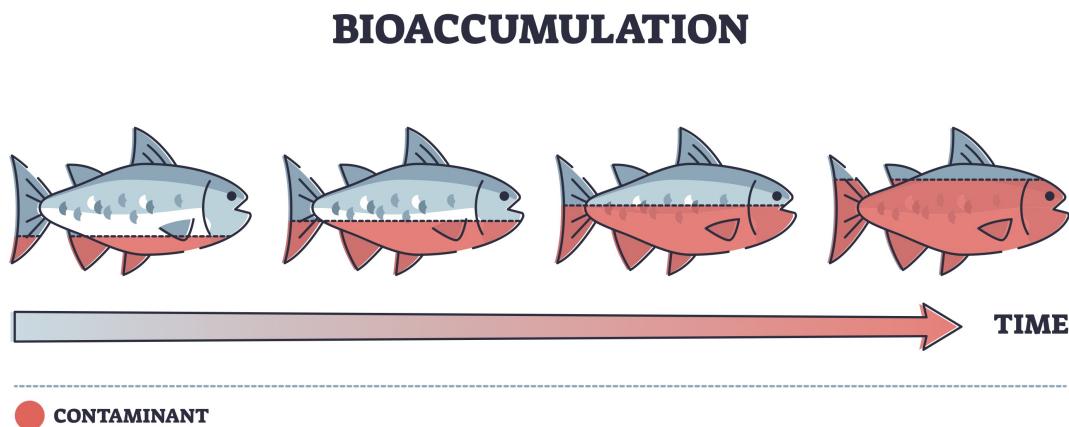


Case Study: PCBs in the Hudson River

- Polychlorinated biphenyls (PCBs) are a group of persistent organic pollutants that were widely used in electrical equipment and industrial applications until their ban in the 1970s
- In the Hudson River in New York, PCBs were dumped by industries for several decades
- The PCBs entered the river, where they were absorbed by plankton and small organisms
- _____

Case Study: PCBs in the Hudson River

- _____
- As predatory fish consumed these contaminated fish, the PCBs biomagnified, leading to elevated levels in their bodies
- This poses risks to both wildlife and humans who consume the contaminated fish, as PCBs are known to have toxic effects on the nervous, reproductive, and immune systems



Striped bass

Case Study: PCBs in the Hudson River

- PCBs are known to be toxic and can have significant health impacts on humans
- _____
- PCB exposure has been linked to developmental delays in children, immune system dysfunction, hormonal imbalances, and an increased risk of certain types of cancer

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Bioaccumulation and Biomagnification Review

- Bioaccumulation refers to the buildup of pollutants in the tissues of living organisms over time
- _____
- Bioaccumulation and biomagnification can have ecological impacts as food webs become disrupted
- Human health implications of consuming contaminated organisms include exposure to toxic substances, neurological and developmental effects, hormonal disruption, and increased cancer risk

Think – Pair – Share

Take a moment to think about the potential risks and impacts of bioaccumulation and biomagnification in your local environment. Consider the pollutants that might be present, the organisms that could be affected, and the potential consequences for ecosystems and human health. You will probably need to do some research here.



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Think – Pair - Share

As a pair, share your findings and insights with another pair or two. Each pair can take turns presenting their local observations, discussing the pollutants identified, the organisms that may be at risk, and the possible consequences for ecosystems and human health. Encourage the group to engage in a collective discussion, highlighting common themes and differences among the various local examples.