Lesson Plan #2 - Mercury in the Food Chain

Lesson Goal:
Show where and how mercury enters the food chain.

Concepts to be developed:
1. Mercury enters the food chain in or near sediments.
2. Mercury progresses through the food chain to the higher animals including humans

Skills to be developed:
1. Listening skills.
2. Read a concept map.
3. Critical thinking skills.
4. Follow a PowerPoint presentation.
5. Make a concept map.
6. Identifying points where mercury enters the food chain.

Objectives:
1. Describe and construct a food chain web.
2. Identify the source of mercury contamination in the aquatic food chain.
3. Analyze the consequences of mercury entering the food chain.

Materials:
1. Animal graphics - laminated
2. Dry erase markers
3. PowerPoint Presentation - technology enhanced
   Overheads or pictures of the PowerPoint Presentation
4. Masking tape
5. Worksheets - Mercury in the Food Chain and answer keys
   Technology Enhanced - on computer - projected
   Standard - On overhead
6. Computer / Projector - technology enhanced - Overhead Projector standard
7. Drawing on white board or butcher paper showing pond and surrounding area - see PowerPoint for diagram

Safety Precautions
Secure computer, projector and cords

Procedure -

Foundation:

People and animals that come into contact with mercury found in water sources and sediments are at health risk. They are also at risk by eating fish and wildlife due to bioaccumulation as it passes through the food chain.

This unit's focus is to inform students, through an environmental education unit, about the properties of mercury, what the effects of mercury contamination is to humans and wildlife and how mercury can be passed through the food chain. It also advises students about the Superfund Site on the Carson River as they trace the sources of contamination from historic mining

Concept Development

Prior to class starting

1. Make a rough drawing of the pond (see PowerPoint Presentation) showing the surrounding ground areas with trees and plants. Drawing could be drawn on the white board or butcher paper. An artist student could do the drawing.
2. Cut out and laminate cards that show the plants and animals of the aquatic food chain.
3. Make a section off to the side of the drawing for the **Sick Bay -** for injured plants and animal cards to to be placed.
4. Make a section that shows the **Dead** - for animals and plant cards that died.
5. Have the template - Mercury in the Food Chain -copied for students to fill in during the activity

During Class

Conduct pre-activity

1. Give students a card that represents a plant or animal in the aquatic food chain.
2. Give students a piece of rolled tape to place on the back of their animal.
3. Call each student to the area where the drawing of the aquatic chain is shown. Have them place their plant or animal in the proper location.
4. Show the PowerPoint Presentation of how mercury enters the food chain
5. Discuss how mercury would have affected each plant and animal shown on the drawing by telling them that 2 out of every 3 plants or animals would be dead or injured by the mercury that entered their food chain. (Arbitrary number)
6. Randomly call up students with their cards - starting with the lowest plants and animals on the food chain - which would be the point of origin of the mercury - if they are in the injured or dead group - have them place their card in the appropriate spot. Randomly select two out of three plants and animals that are sick or injured.

   Show what bioaccumulation is by the doubling of mercury as it goes up the food chain. Show the doubling of mercury by using red dots next to the animal as the mercury progresses. See diagram in the PowerPoint presentation.

7. Have students make a food chain diagram showing the progression of mercury (bioaccumulation). Show sample - **Tailings Food Chain**
8. Write the definition of bioaccumulation, put definition on their diagram.
   Collect the cards at the end of the period and re-use for the next class.

Next Class Session

1. Show the PowerPoint and discuss.
2. Complete the worksheet - Mercury in the Food Chain - discuss answers as a class.

Technology Integration Component

1. The computer and projector will be used for the PowerPoint presentation (Technology enhanced).
2. Questions will be displayed on the computer (technology enhanced) or overhead (standard).
3. PowerPoint presentation.

Evaluation

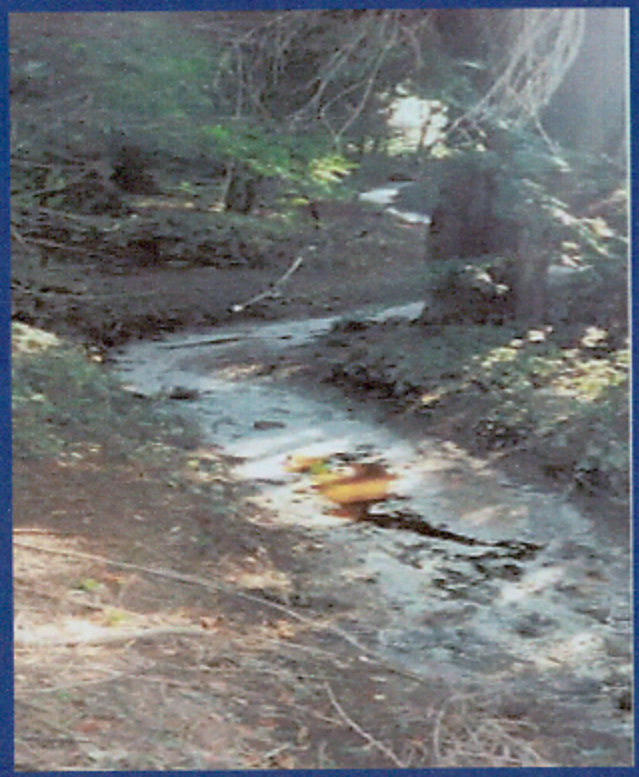
1. Student's participation during activity.
2. Completion of worksheet.
3. Post test at the completion of the unit.

Attachments -

Handouts:

Worksheet – Mercury in the Food Chain

Which of these two rivers looks the most dangerous? Why?



- What is the difference between pollution and contamination?

Pollute- means to make impure

Contaminate- means to make unfit by introduction of undesirable elements.

Mercury

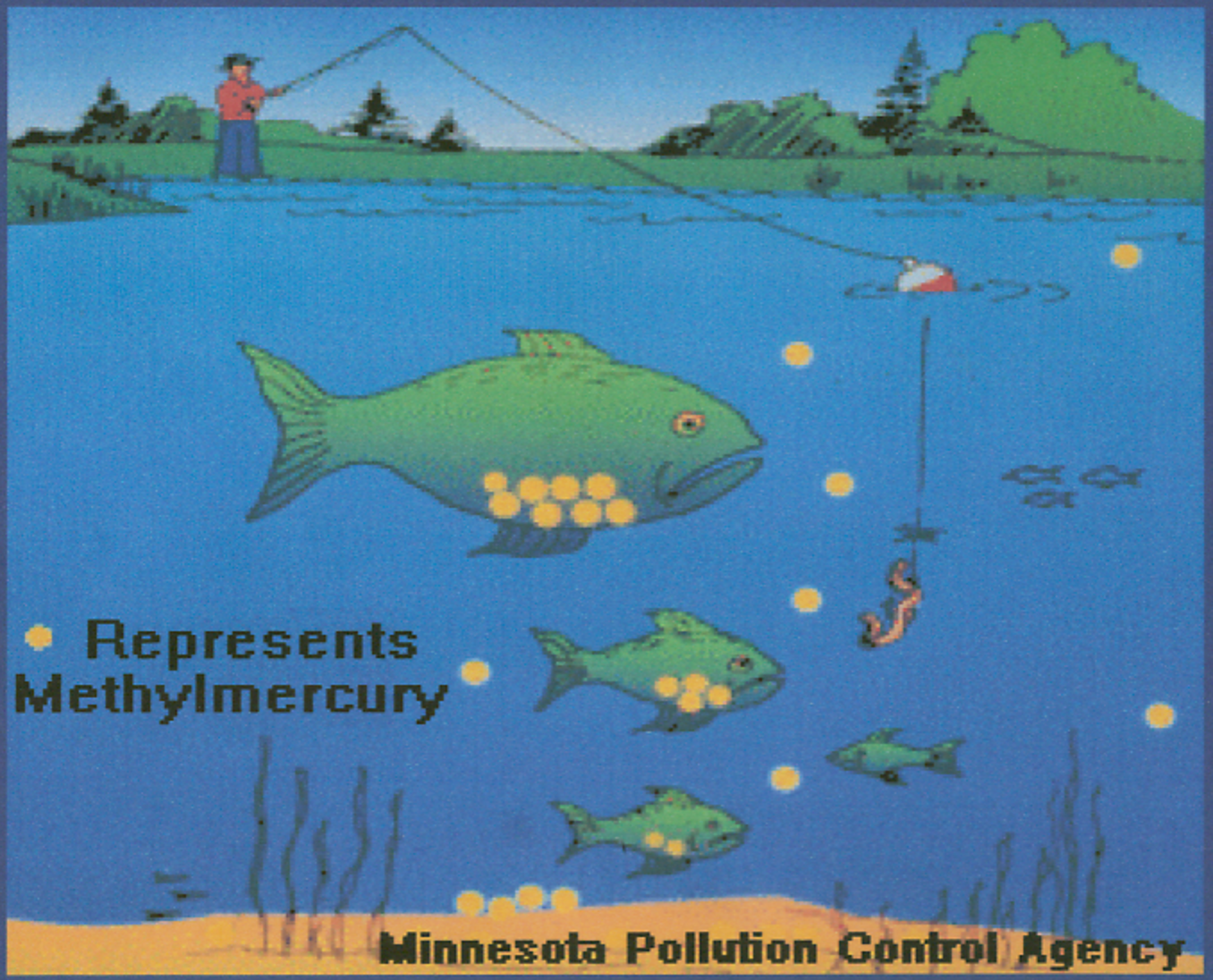
80

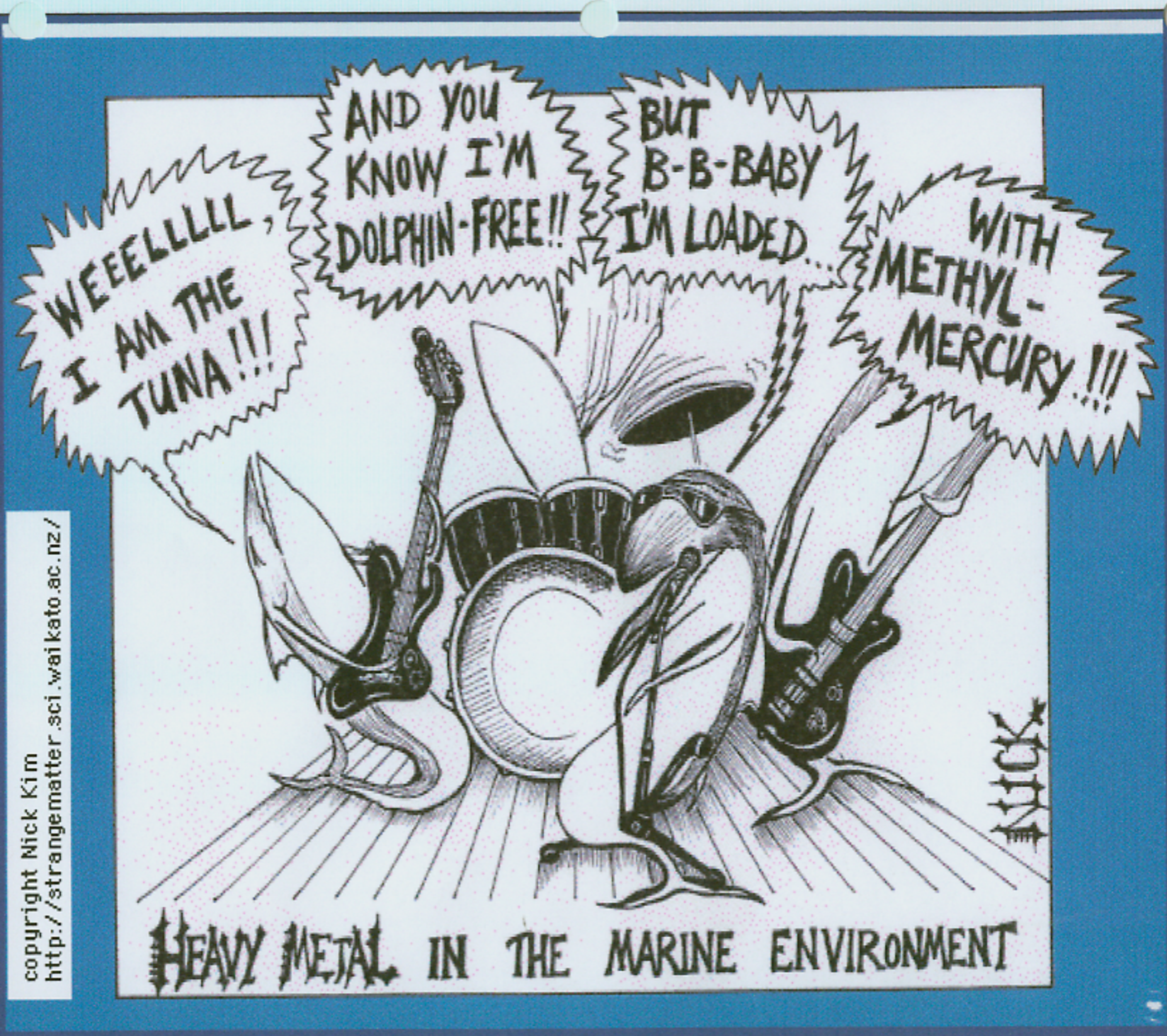
Hg

Mercury

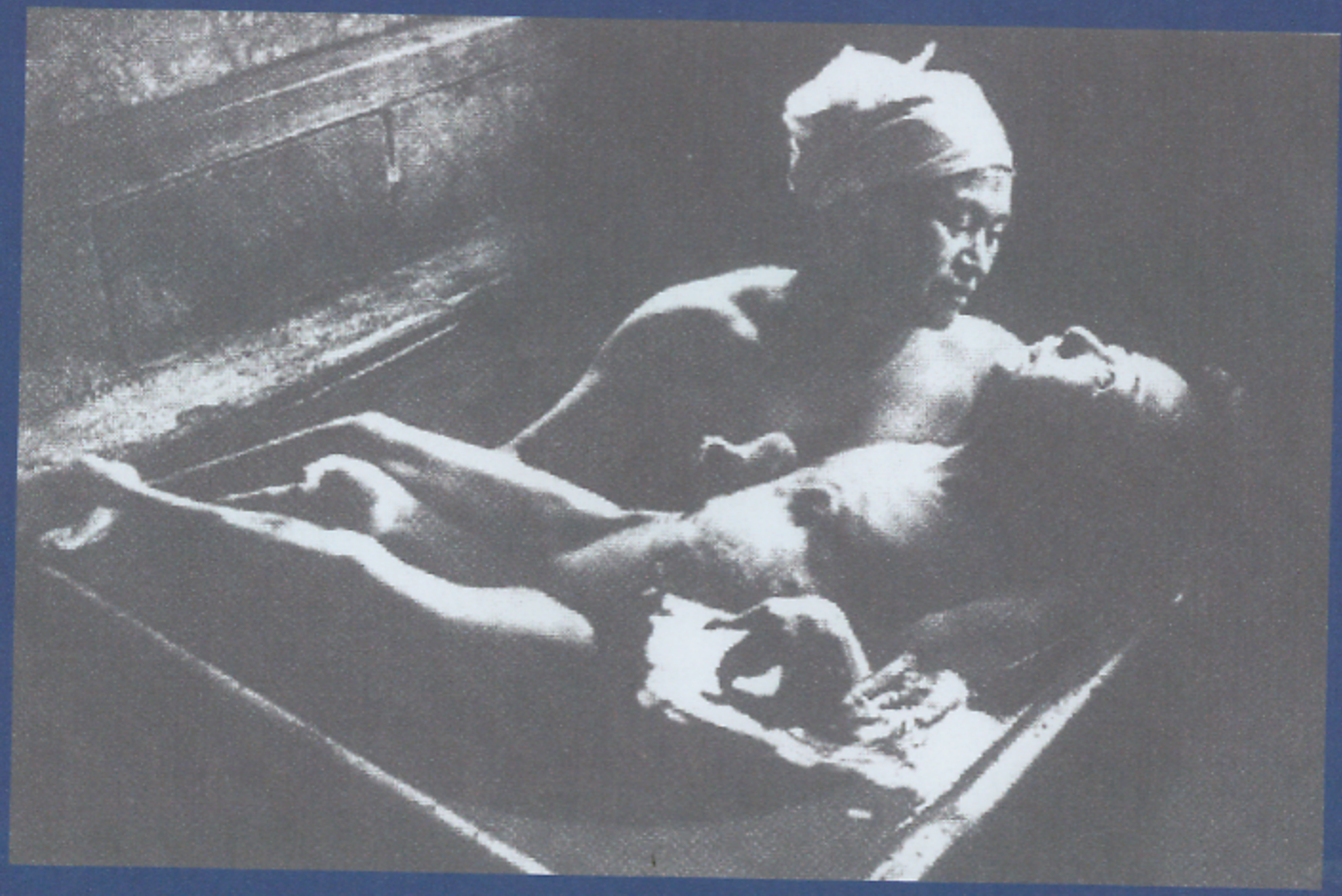
200.592

How does Methylmercury progress through the food chain?





Mercury Poisoning In Japan



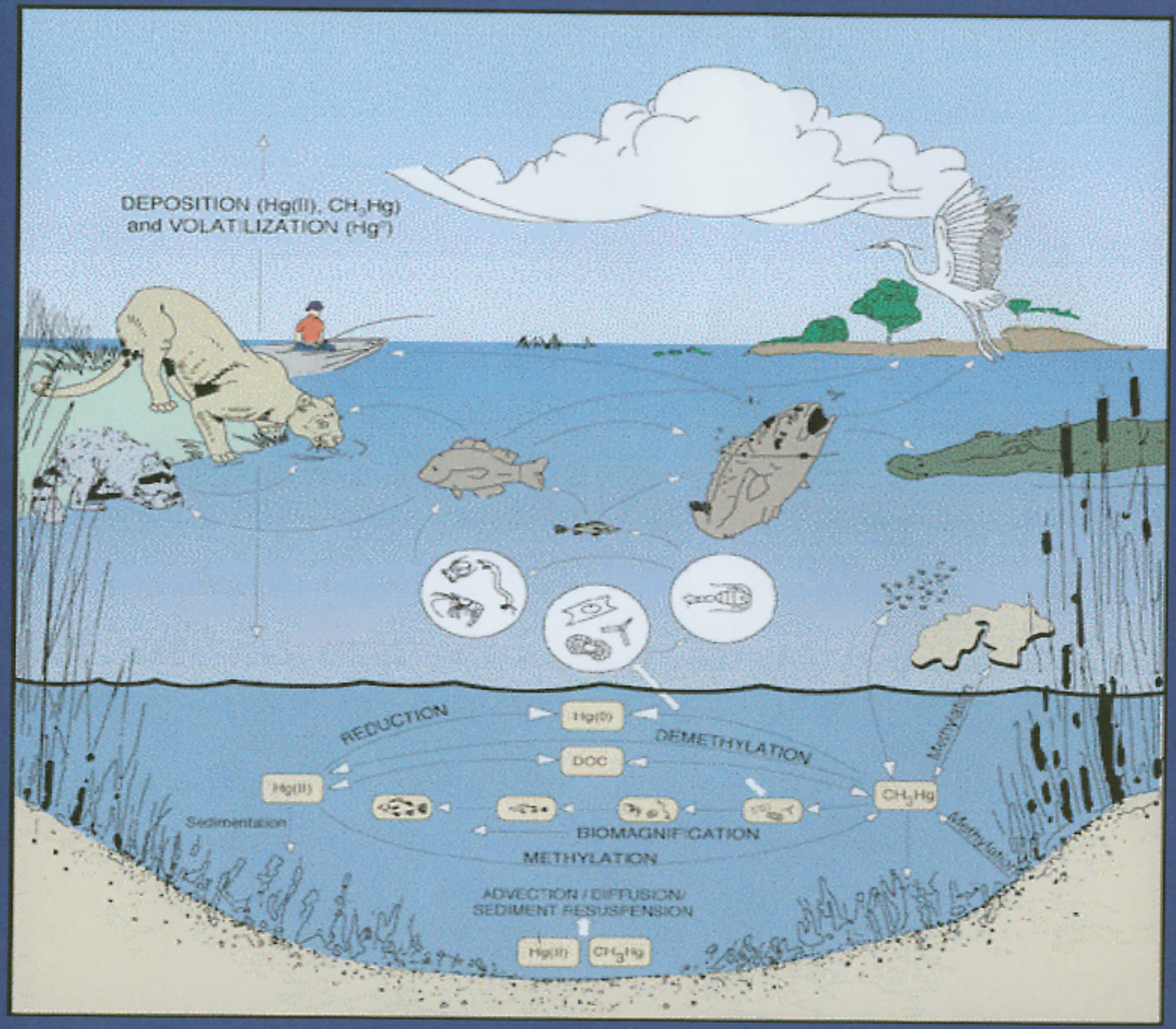
Mercury Poisoning

- Mercury poisoning is the ill effects on humans nervous system and other bodily systems due to the over-exposure of mercury. Mercury is a neurotoxin, meaning it affects the nervous system. The "mad hatters" of the 19th century suffered from mercury poisoning which caused personality changes, nervousness, trembling, and even dementia. The hatters were exposed to mercury in the felting process, where mercury was rubbed onto cloth to preserve it.

Does Mercury affect animals besides humans?

How?

Which animals does it affect?


DEPOSITION (Hg(II), CH_3Hg)
and VOLATILIZATION (Hg^0)
REDUCTION
Hg(0)
DOC
Hg(II)
DEMETHYLATION
CH_3Hg
Sedimentation
BIOMAGNIFICATION
METHYLATION
ADVECTION / DIFFUSION/
SEDIMENT RESUSPENSION
Hg(II)
CH_3Hg

Worksheet

Name_____
Date_____
Period_____

Mercury in the Food Chain - Lesson # 2
(Based on PowerPoint presentation)

1. Which river would you rather play in? Why?

_____
_____

2. Define contamination.

_____
_____

3. Define pollution.

_____
_____

4. What is the difference between pollution and contamination?

_____
_____

5. What is mercury?

_____
_____

6. How does mercury enter the food chain?

_____
_____

7. What is mercury poisoning?

_____
_____

8. How can mercury get into our bodies?

_____
_____

9. What can we do to prevent mercury poisoning?

_____
_____

Answer Sheet

Name_____
Date_____
Period_____

Mercury in the Food Chain - Lesson # 2
(Based on PowerPoint presentation)

1. **Which river would you rather play in? Why?**
   Answers will vary - most students will say the river on the left as it looks dirty and polluted, however, the river on the right is toxic, (contaminated) which is far more dangerous than just polluted.

2. **Define contamination.**
   Contaminate means to make unfit by introduction of undesirable elements**.**

3. **Define pollution.**
   Pollute means to make impure.

4. **What is the difference between pollution and contamination?**
   Pollution can be cleaned up and is temporary. Contamination is difficult if not impossible to clean up and is long-term.

5. **What is mercury?**
   Mercury is a heavy silver-white metallic element, liquid at room temperature.
   Mercury is a neurotoxin.

6. **How does mercury enter the food chain?**
   Mercury enters the food chain by settling into sediments at the bottom of the where fish and wildlife absorb it. As each organism in the food chain eats a lesser organism, the levels of mercury in their systems magnify. This process is called bioaccumulation.

7. **What is mercury poisoning?**
   Mercury poisoning is the ill effects on humans or other animals nervous systems and other bodily systems due to the over-exposure of mercury. Mercury is a neurotoxin, meaning it affects the nervous system.

8. **How can mercury get into our bodies?**
   Mercury can get into our bodies by eating fish and wildlife, inhaled or through direct contact with the skin.

9. **What can we do to prevent mercury poisoning?**
   We can prevent mercury poisoning by having knowledge about mercury in the environment, monitor the fish and wildlife we eat and avoid inhaling mercury and direct contact.

Tailings Food Chain

Tailings

Underground water

Lakes

Little Fish

Birds

Reptiles

Big Fish

Carnivorous Land Animals

People