Lesson 5 Components

I. Presentation 5: The Story of Santa Catalina Island
II. Activity 5: Santa Catalina Island Restoration Activity

I. Presentation 5: The Story of Santa Catalina Island
slideshow

Description

- Explains how Montrose Chemical Corporation disposed of hundreds of tons of DDT in Los Angeles sewers feeding into the Pacific Ocean.
- Describes how scientific data was used to discover the DDT and used by the federal government and the State of California to bring a lawsuit against Montrose Chemical Corporation and others.

Goals

- Students apply information from lessons one through four to understand how researchers followed clues to bring a lawsuit against Montrose.
- Using Santa Catalina Island as a case study, students learn about why using unbiased data is absolutely essential.

Materials

Download Files from Lesson 5:

- "Presentation 5"
- "Lesson5_WB"
- "Lesson5_WB_KEY"
- "TeacherManual5"

Other:

- Copies of the student workbook for presentation 5 for all students
- Equipment to show slideshow or transparencies

II. Activity 5: Santa Catalina Island Restoration Project group or class activity

Description

- Students read about actual restoration projects.
- Students evaluate Santa Catalina Island restoration project using information given in the restoration background information sheets and lesson notes.

Goals

- Students gain knowledge about the restoration work scientists are doing to restore the natural resources that were harmed by the DDT discharge.

- Students learn about the difficulty in restoring animal habitat after it has been damaged.

Materials

Download Files from Lesson 5:

- "Activity5_Restoration"
- "Activity5_Restoration_KEY"

Other:

- Copy of Activity5_Restoration for each student.
- Slide or transparency of Slide 20 from Presentation 5

Introduction to Lesson 5

Lesson 5: The Story of Santa Catalina Island

Lesson 5 is a capstone unit that brings together main concepts from each of the previous lessons. Presentation 5 emphasizes the importance of using non-biased data. It does so by introducing the role government and academic researchers played in discovering the polluted ocean floor near Santa Catalina Island. Once again, students will review food webs, bioaccumulation and biomagnification as it applies to the DDE contamination in the ocean ecosystem in the vicinity of Santa Catalina Island. The methods of data analysis introduced in Lessons 3 and 4 are the same ones as were used by the researchers who found that DDT was continuing to contaminate the marine food web around Santa Catalina Island even after the 1972 ban on DDT.

I. Presentation 5: The Story of Santa Catalina Island

In the notes below, a ♣ indicates that students are asked to answer a question about this slide in their presentation workbook. Answers are given to these questions in these notes when it is advisable to discuss the answers with the class. Otherwise, answers are provided on the answer key for the student workbook. The slideshow notes in this outline can also be found in the notes section of each slide. To view the slides to which these notes refer, see the slide presentation, "Presentation 5".

Teacher Preparation

1. Download the files, "Presentation 5", "Lesson5_WB" and "Lesson5_WB_KEY".
   - "Presentation 5" contains the powerpoint presentation.
   - "Lesson5_WB" and "Lesson5_WB_KEY" contain, respectively, the student workbook and key for Presentation 5. Students will answer questions and take notes about the presentation in their workbooks.

2. Print and copy enough handouts of the student workbook to give one to every student.

3. Prepare equipment for slideshow or transparencies. Make transparencies if needed.

Slide 1

The Story of Santa Catalina Island

In this unit teachers will tell the story of how the concentration of DDE in the marine environment of Southern California remained high even after the 1972 ban of DDT. The following gives a summary of the involvement of the Montrose Chemical Corporation in dumping DDT into the Los Angeles sewer system and the resulting DDT contamination of the Southern California Bight.

For additional background on the contamination of the Southern California Bight please refer to the following website:
The Montrose Story – http://www.darcnw.noaa.gov/montrose.htm

From the late 1940's to the early 1970's, millions of pounds of DDT were discharged into the ocean waters off the Southern California coast from the Montrose Chemical Corporation's manufacturing plant in Torrance, CA. The DDT traveled through Los Angeles County sewers and treatment plants that discharge into the Pacific Ocean at White Point, on the Palos Verdes shelf. Montrose also dumped hundreds of tons of DDT-contaminated waste directly into the ocean near Santa Catalina Island.

In 1992 and 1993 surveys by the United States Geological Survey (USGS) found more than 100 metric tons of DDT in the sediments on the ocean bottom of the Palos Verdes Shelf. The highest concentrations of DDT were near the mouth of the White Point sewer outfall, at water depths from 40 to 80 meters deep. Subsequent surveys by Southern California Bight Pilot Project showed that elevated concentrations of DDT in bottom sediments extended from the Palos Verdes Shelf and into Santa Monica Bay.

The United States Government and the State of California filed a lawsuit under the federal Superfund Law, alleging that a number of defendants were responsible for releasing DDT and other hazardous substances into the environment. The lawsuit charged that the DDT injured natural resources, including fish and wildlife that live in and around coastal waters in Southern California.

Sport and Commercial Fish – The State of California has issued health advisories for many common sports fish in the L.A. area (approximately 50 species). These fish have concentrations of DDT that exceed the State of California trigger concentration (0.1 µg/g), which was set to protect local residents who could frequently consume these contaminated fish. The State has also banned commercial fishing for white croaker near the Palos Verdes Shelf.

Bald Eagles and Peregrine Falcons – Because DDT is slow to break down, it bioaccumulates and becomes more concentrated in animals at higher concentrations in the food web. When DDT was heavily used in the U.S., populations of many birds, including bald eagles and peregrine falcons declined. After the U.S. banned the used of DDT in 1973, populations of bald eagles and peregrine falcons rebounded almost everywhere except in the Southern California Bight. Peregrine falcons have returned to the Northern Channel Islands, but these birds were either bred in captivity and released, or are the wild-born offspring of the reintroduced birds. However, these birds continue to lay eggs with shells that are thinner than normal and the peregrine falcon populations are still depressed.

Bald eagles were extirpated from the Channel Islands by the 1960's. Eagles were reintroduced to Catalina Island in the 1980's. Seventy-three bald eagles have been reintroduced to Santa Catalina Island as of 2000. Many of the eagles released onto Santa Catalina Island leave the Island; this is normal behavior for juveniles who travel hundreds

of miles before establishing a breeding territory at maturity. Some of the eagles released on the Island have returned to breed. However, as of the year 2000, DDT has continued to damage the eggs of these birds, making the eggs weak and porous and preventing the eagles from reproducing naturally. Wildlife teams have rescued 47 of the approximately 61 eggs that were laid in Santa Catalina Island nests since 1989. These eggs were taken to a special facility at the San Francisco Zoo for incubation. Eight chicks have successfully hatched from these 47 eggs.

Litigation Ends, Restoration Begins – On December 19, 2000, the state and federal governments settled the final remaining legal claims brought in 1990 against a number of defendants for releasing millions of pounds of DDT into the coastal waters off Los Angeles. A total of $140 million in damages was paid under four separate settlement agreements. These funds are being used for two different types of activities, as required under the Superfund Law:

- The U.S. Environmental Protection Agency and the California Department of Toxic Substance Control are sharing the funds to reduce the exposure of people and wildlife to DDT. For example, these agencies are considering covering the contaminated sediments with clean sediments and conducting additional efforts to reduce public consumption and to prevent commercial catch of contaminated fish.

- The Trustees will use approximately $30 million to restore public resources harmed by release of DDT off the coast of Southern California.

Source: Montrose Settlements and Restoration Program, http://www.darcnw.noaa.gov/montrose.htm

Slide 2

♣ 1. *What are some possible explanations why the sediments in Pales Verdes Shelf have high DDE concentrations from 1989 – 2000?*

Unlike the *Opening Questions* for Lessons 1-4, the students will not likely know the answer to the *Opening Question* of Lesson 5. Students can discuss different ways they believe DDE concentrations are high on Santa Catalina Island and this will lead into the discussion of what actually happened.

Slide 3

Slide 3 provides some basic facts about Santa Catalina Island.

♣ 1. *Where is Santa Catalina Island?*

In the Southern California Bight off the coast of Los Angeles, California

♣ 2. *In 1960 how many bald eagle pairs lived on Santa Catalina Island?*

Zero

Slide 4

Santa Catalina Island Bald Eagle Time Line – Part I

Slides 4 and 5 introduce a timeline of the activities on Santa Catalina Island. Teachers can refer to the introduction given with Slide 1 to tell this story. More details about Montrose, the eagle reproduction problems found on Santa Catalina Island, the litigation and current restoration efforts will be introduced in subsequent slides.

Slide 5

Santa Catalina Island Bald Eagle Time Line – Part II

Slide 6

This slide gives an outline of the problem of DDT contamination of habitat on and around Santa Catalina Island. This slide provides an outline for the remainder of the talk.

- 3. *What corporation was responsible for dumping DDT into the LA sewer system and into the ocean waters surrounding Santa Catalina Island?*

  Montrose

- 4. *Who filed a lawsuit against the corporation responsible for dumping DDT into the Pacific Ocean?*

  The United States Government and the State of California

- 5. *How many years did it take to settle the lawsuit?*

  10

- 6. *Other than bald eagles what are some other birds that were harmed by the dumping of DDT on Santa Catalina Island?*

  peregrine falcons, brown pelicans, gulls, and cormorants

Slide 7

From the Montrose Story, the presentation transitions into the general feeding habits of bald eagles and how this puts them at particular risk from DDE biomagnification. At this point, teachers may want to review the concepts of food webs, bioaccumulation, and biomagnification.

A feeding trial is an experiment where animals are fed given quantities of a substance to determine the effects of that substance on the health of the animal. In feeding trials animals are usually fed different doses of the substance in order to record the effect of a substance at different doses.

- ♣ 7. Name three symptoms adult bald eagles demonstrate when suffering from DDE poisoning?

  Body Tremors, Eye Twitching, and Lack of Coordination

Slide 8

Slide 8 review food webs, bioaccumulation, and biomagnification. Specifically it reviews how bald eagles were harmed by the dumping of DDT by Montrose Corporation.

Slide 9

Slide 9 illustrates the ways in which fish are exposed to DDT when it enters an aquatic ecosystem. When DDT is present in water, fish can take in DDT through their gills and by eating benthic invertebrates that feed on DDT-laden sediment.

- ♣ 8. *Name three pathways through which DDT moves through an ecosystem:*

  Diffusion, Volatilization, and Biomagnification

Slide 10

Slide 10 gives an outline of the Santa Catalina Island bald eagle diet. At this point, teachers may want to compare bald eagle diets with osprey diets. Osprey eat 99+% fish and this is another reason that scientists do not compare osprey to bald eagles when looking at concentrations of DDE concentration that cause reproductive damage in the two species.

Slide 11

Slide 11 breaks down the types of food eaten by bald eagles and how each food source adds DDE to the bald eagle's diet. Fish make up a large portion of the diet of bald eagles on Santa Catalina Island, but fish do not necessarily contribute the highest amount of DDE to the bald eagle's diet, because many of the fish eaten by bald eagles are low on the food chain. However, a high percentage of the fish have detectable concentrations of DDE, suggesting that fish do contribute some concentration of DDE found to the bald eagle's diet.

Marine mammals (seals and sea lions) and birds (gulls and seabirds) that are eaten by bald eagles have the potential to contribute large amounts of DDE to the bald eagle's diet due to biomagnificaiton. These birds and sea mammals eat fish that may already be several steps up on the food chain. Gulls also scavenge on marine mammals carcasses

and dead birds. When bald eagles eat such birds and mammals they can be exposed to high doses of DDE.

♣ 9. *What is the average concentration of DDT in the following animals?*

Gulls – 5.9 µg/g
Sea Lions – 3 µg/g

Slide 12

To compare the concentration of DDE in osprey and bald eagles, students can refer back to their graphs from Lesson 3.

Slide 13

Scientists compared the concentration of DDE in bald eagle eggs from Santa Catalina Island with concentration of DDE in bald eagle eggs from other locations throughout the United States. They found that the concentration of DDE in the Santa Catalina Island eggs was much higher than the concentration in eggs from other locations in the country. This is the same analysis the student did in Lessons 3 and 4.

♣ 10. *Ultimately, what type of data analysis was used to demonstrate that the DDE discharged by Montrose was responsible for reproductive impairment in eagles and other birds?*

Scientists used the same method of analysis as done in Lessons 3 and 4.

Slide 14

Slides 14 through 18 introduced details of the lawsuit against Montrose and other Chemical Corporations.

Slide 15

A majority of the DDT originated from the Montrose Chemical Corporation's manufacturing plant in Torrance, CA, and was discharged into Los Angeles County sewage treatment plants that empty into the Pacific Ocean at White Point, on the Palos Verdes shelf near Santa Catalina Island. Montrose also dumped hundreds of tons of DDT-contaminated waste into the ocean near Santa Catalina Island.

♣ 11. *How many tons of DDT did Montrose discharge into Los Angeles sewers from 1940-1970?*

Approximately 1800 tons of DDT

Slide 16

Slide 16 gives more details about the litigation settlement between the Montrose Chemical Corporation and the United States Government and the State of California. For additional information refer to the background introduction given in the notes for Slide 1.

♣ 12. *How much money was awarded in the settlement with Montrose and other parties?*

$140 million

♣ 13. *For what will the majority of the settlement funds be used?*

The funds will be used to reduce the exposure of people and wildlife to DDT.

♣ 14. *How much of the settlement money will be used for restoration programs?*

$30 million

Slide 17

♣ 15. *Name two government agencies that are the trustees of the settlement funds.*

NOAA (the National Oceanic and Atmospheric Administration), the U.S. Department of the Interior including the U.S. Fish and Wildlife Service, and the National Park Service; California Department of Fish and Game, California State Lands Commission, California Department of Parks and Recreation.

Slide 18

According to the Superfund Law, government agencies must use settlement monies from damage assessment cases to restore natural resources that were harmed by DDT and to reimburse the government for the cost of performing the damage assessment.

Slide 19

Restoration is the process of assisting the recovery of an ecosystem (or habitat) that has been degraded, damaged, or destroyed. Although it is important that restoration take place after damage has been done to a plant or animal habitat, it is more important to avoid damaging the environment in the first place. The final activity will involve the students learning about the different restoration efforts that are currently taking place on Santa Catalina Island.

♣ 16. Define restoration:

Process of assisting the recovery of an ecosystem (or habitat) that has been degraded, damaged, or destroyed.

Slide 20

At this point the teacher can ask students how they would determine when restoration has taken place. In the case of the bald eagles, is it sufficient that bald eagles exist on Santa Catalina Island, or is the goal for the bald eagles to be able to reproduce naturally on the Island? To make sure students understand restoration, the teacher may want to ask students about restoration activities in their own community and what restoration means at that site.

♣ 17. *What restoration activity is being done on Santa Catalina Island?*

Bald Eagle Restoration

II. Restoration Activity

The Restoration Activity has students read about actual restoration projects that are currently being considered or carried out for Santa Catalina Island. The questions asked in this activity will require that students review concepts presented in Lessons 1 through 4. One of the main goals of the Restoration Activity is to emphasize that a myriad of factors go into the process of restoring natural resources after they have been destroyed and the importance of understanding science and data.

Montrose and other associated corporations were ordered to pay $140 million in fines for discharging DDT into the Pacific Ocean at the Pales Verdes Shelf around Santa Catalina Island and a portion of these fines are being used for the restoration of eagles on Santa Catalina Island.

NOAA and other government agencies want to hear from the public on how this money should be spent. In this exercise, students will be given information about an actual restoration project taking place on Santa Catalina Island. In order to determine whether these projects are worth funding, you will be asked to evaluate the projects. Students will be guided through the restoration plans with a set a questions and then asked to use their own judgement to identify the strengths and weaknesses of the restoration proposal. Students will also be asked to think about what additional information they would need to have to evaluate the restoration proposal.

Teacher Preparation

1. Download the file "Activity5_Restoration".

2. Print and copy one activity handout for each student.

3. Prepare a large piece of butcher paper and a set of markers for each group. (*For the group activity only*)

Student Preparation

1. Students will need to have their student workbooks available so they are able to use the notes as a reference.

2. Have students silently read the directions on the first page of the Restoration Activity worksheet.

Individual Activity

Each student can do the Restoration Activity independently, if the class has less than 15 students or the class period is over 50 minutes. As an individual activity, students should take five minutes to read the directions and make sure they understand the assignment. Students will then read one or both of the restoration projects, answer the related

questions, and determine what additional information they would need to know before they would be able to evaluate the project. 10 minutes should be left at the end of the class to review the answers and talk about the students' evaluations of the restoration projects.

The restoration project evaluation sheet has several categories for which the projects will be evaluated. Under the headings *Likelihood of Success*, *Duration of Benefits* and *Effects of Restoration Activity on Humans*, students are asked a set of questions about that project, which they can answer using information provided in the project description. (Students should also use information from the rest of their lesson notes.)

To answer the next set of questions, under the heading *Interactions with the Other Restoration Project*, students will refer to the descriptions of both projects. Then, they will describe ways that the activities undertaken as a part of one restoration project might affect the other project.

The project descriptions the students have been given are very brief, and students would need much more information to evaluate them. For each of the headings above, students are to come up with at least three pieces of information that would help them to evaluate the project. Then they should suggest a way the information could be collected.

The following are guidelines for the evaluation criteria:

Likelihood of Success

Projects should be evaluated for their potential success, including level of expected return of bald eagles, seabirds, and clean fish. A way to measure success must be defined.

Duration of Benefits

Contamination by DDT is expected to continue for decades. Long-term benefits are the objective of these projects, and each project should be evaluated for how long the benefits of restoration would last.

Effects of Restoration Activities on Humans

Projects should be evaluated for possible public health and safety benefits, as well as possible harm. Consider how the public would feel about the restoration activity. Would they be in favor of it?

Interactions with the other Restoration Project

Read about the other proposed restoration project and consider how the proposed activities from your restoration project will interact with the other restoration projects.

After students have filled out the evaluation sheets, they are to write a paragraph evaluating one of the two projects. Students will need to prioritize what parts of the restoration project they feel are most important and which are not as important.

If time permits, students can share what they have written about the restoration project for which they have written a full proposal.

Group Activity

To do the Restoration Activity as a group activity, first divide the class into groups of threes or fours. Assign one of the two restoration projects to each group. Students can read their assigned restoration project aloud as a group or silently to themselves. When answering the evaluation questions at the end of the restoration project description, each student in the group should fill in the evaluation sheet for their group's restoration project.

The categories of evaluation are identical to those in the individual activity. Because each group will be assigned one of the two restoration projects, they will need to read the description of the restoration project not assigned to them in order to answer what interactions there will be between the restoration projects.

The evaluation process in the group activity can be done as it is in the individual activity with the group writing a paragraph evaluating their restoration project. If time permits, teachers may want to give each group a piece of butcher paper and have them write their evaluation on the butcher paper and present their evaluation to the class.