

Prince William's Oily Mess: A Tale of Recovery

For Teachers

[Ideas for the Classroom](#)

[Printable Materials](#)

[Links to Lesson Plans](#)

[Online Resources for Teachers](#)

[National Science Education Standards](#)

[Scilinks Icon Information](#)



Exxon Valdez tanker encircled with a containment boom. (Photo credit: *Exxon Valdez* Oil Spill Trustee Council)

Ideas for the Classroom

You may want to create a photo time series of your own. Each year, photograph a local habitat that has been disturbed by some human activity and is now in a process of [recovery](#). Then, compare the photos to see how the plant life or marine life has changed over time. You could also create a similar photo series of a similar undisturbed site and compare that to the disturbed site. Some possibilities include: a farm field that is no longer used, an area along a road or drive that was disturbed sometime in the past and is now recovering, a walking path that is no longer used, or an area where oil or antifreeze or some other pollutant was spilled. There are as many possibilities as there are ways that people disturb habitats!

For a class project, teachers may want to print (on a color printer) the large images of Mearns Rock. Then, cut out the images and ask your students to put them in chronological order. How closely matched are the students' results with the actual chronological order of the photos? Have students summarize what is happening in each photo as a type of assessment requiring key points made here about Mearns Rock.

Have students or student groups prepare one or more public education programs about a major oil spill. Examples of major oil spills can be found by consulting NOAA's *Oil Spill Case Histories* (for spills from 1967-

Learn More:

- [Working with Real Data](#)
- [Thinking Like a Scientist](#)
- [Student Guide](#)
 - [Web Resources](#)
 - [Glossary](#)
- [Take the Quiz!](#)
- [For Teachers](#)

1. [Welcome](#)
2. [The Infamous *Exxon Valdez*](#)
3. [Remaining Impacts of the Spill](#)
4. [How Much Oil Remains?](#)
5. [An Ecosystem in Transition](#)
6. [Lessons Learned From the *Exxon Valdez*](#)
7. [Has Prince William Sound Recovered?](#)
8. [Dr. Mearns' Rock - You Be the Scientist!](#)
9. [References](#)

[Oil Spill Trajectory Model](#)

[An Oil Spill Primer for Students](#)

[How Toxic is Oil?](#)

[Ask an Expert](#)

[Report a Spill](#)

1992) at <http://response.restoration.noaa.gov/oilaidspilldb.pdf>, NOAA's *Oil and Hazardous Materials Response Reports* (for spills from 1993-1999) at <http://response.restoration.noaa.gov/oilaidspillreps/spillreps.html>, or NOAA's *Historical Incidents Database* at <http://www.incidentnews.gov/incidents/history.htm>. Encourage students to consider various media, including publications (e.g., flyers, posters, fact sheets), visual publications, videos, drama, music, etc.

Have students write a short essay on how oil spills might affect their own lives.

Have students delve deeper into the *Exxon Valdez* oil spill and investigate the type of [remedial](#) or cleanup methods that were used and their success (see NOAA's Oil Spill Case Histories, Oil and Hazardous Materials Response Reports, or NOAA's Historical Incidents Database for detailed information—see links above).

These days, cleaning up oil spills involves a lot of technology. Have students prepare a report on the technologies that were used to clean up the *Exxon Valdez* oil spill. Alternatively, have them prepare a report on the new technologies for oil spill cleanup that have been developed since the *Exxon Valdez* oil spill in 1989.

Have students write a short essay in which they [predict](#) the impacts of a major oil spill in a local or regional body of water—a bay, harbor, large lake or river, etc. How would such a spill affect their own lives?

Have students prepare a report outlining the safety precautions that are now required for ships that carry oil.

Pose the following critical thinking questions to your students:

- How do you decide what constitutes a [control](#) site?
 - Does an organism's role in the [ecosystem](#) (i.e., food chain) correlate to its rate of recovery following an event like an oil spill? In other words, does it matter whether it is a predator, an herbivore, a plant, etc.?
 - Why do [volatile](#) chemicals evaporate more quickly?
-

[\(top\)](#)

Printable Materials

Click on the link to view or print for use as handouts, including all the text and images of the Web site content.

Chapters (with Glossary):

▶ [Prince William's Oily Mess: A Tale of Recovery](#) (pdf, 860Kb), includes:

- Chapter 1: Welcome to *Prince William's Oily Mess: A Tale of Recovery*
- Chapter 2: The Infamous *Exxon Valdez*
- Chapter 3: Remaining Impacts of the Spill
- Chapter 4: How Much Oil Remains?
- Chapter 5: An Ecosystem in Transition
- Chapter 6: Lessons Learned from the *Exxon Valdez*
- Chapter 7: Has Prince William Sound Recovered?
- Chapter 8: Dr. Mearns' Rock: You Be the Scientist!
- Chapter 9: References
- Glossary

Chapter Supplements:

- ▶ [How Toxic is Oil?](#) (pdf, 136Kb)
- ▶ [Whodunit? Fingerprinting Oil](#) (pdf, 90Kb)
- ▶ [An Oil Spill Primer for Students](#) (pdf, 142Kb)
- ▶ [Oil Spill Trajectory Model](#) (pdf, 92Kb)
- ▶ [Oil Spill Trajectory Model Animation](#) (gif, 1.7Mb)

Supporting Resources:

▶ Working with Real Data: [Graphing Changes in Marine Life Abundance](#) (pdf, 10.5Mb); includes the complete hands-on activity.

- [Field Guide](#) (pdf, 136Kb)
- [Data Table](#) (pdf, 47Kb)
- [Percentage Cover and Color Chart](#) (pdf, 104Kb)
- [Graphs for Plotting](#) (pdf, 129Kb)
- [Example Graph](#) (pdf, 100Kb)
- [The Data: Quadrat Photos](#) (pdf, 2.3Mb)
- [Yearly Mearns Rock Photos](#) (pdf, 4.6Mb)

▶ [Thinking Like a Scientist: Dr. Alan Mearns](#) (pdf, 380Kb); includes Summary, Profile of a NOAA Scientist, and the Full Interview

▶ [Student Guide](#) (pdf, 180Kb); includes Web Resources and Glossary

▶ [Glossary Only](#) (pdf, 128Kb)

▶ [Take the Quiz!](#) - Microsoft Word text version (doc, 48Kb)

▶ [Quiz Answers](#) - Microsoft Word text version (doc, 56Kb)

▶ [For Teachers](#) (pdf, 120Kb)

[\(top\)](#)

Links to Lesson Plans

Oil Spill! Remote-sensing Activities

<http://www.mcps.k12.md.us/departments/eventscience/EBS.EOS.OS.html>

For middle or high school students. Oil Spill! is an event-based science module about oceanography. It uses the 1989 spill of over 10 million gallons of oil from the tanker *Exxon Valdez* to establish the context for exploring concepts related to shoreline oceanography. The task in *Oil Spill!* requires students to examine competing locations for a new oil terminal. Students acquire, then use, their new knowledge of tides, currents, marine life, and harbor topography to advise an oil company.

Oil, Water, and Chocolate Mousse

http://www.ec.gc.ca/ee-ue/pub/chocolate/experiment_e.asp

For middle or high school students. Have your students try to clean up an oil spill for themselves! This experiment will help them understand why it is such a difficult task. All of the tools they will need are environmentally friendly and easy to find. This Web site, from *Environment Canada*, has an excellent tutorial that provides an explanation of oil spills and their effects, along with some ideas for experiments.

Liquid Density and Oil Spills

<http://www.nationalgeographic.com/xpeditions/lessons/14/g68/>

[trythisoil.html](#)

Grades 6-8 (easily adapted for high school level). In this lesson, students conduct a simple experiment demonstrating the variable densities of corn syrup, water, glycerin, and vegetable oil. Teachers could also add molasses to this list. Students then transfer this concept to an examination of cleanup methods used in the *Exxon Valdez* oil spill. They conclude by writing paragraphs hypothesizing what would happen during an oil spill if oil and water were the same density and therefore mixed easily.

Ecological Impact of Galápagos Oil Spill

<http://cnstudentnews.cnn.com/2001/fyi/lesson.plans/01/22/galapagos.spill/>

Grades 9-12. In this lesson, students read a January, 2001 CNN article, "Oil spill threatens rare Galápagos Islands species," and use it as a starting point for further online research on oil spills. This lesson is correlated to the National Standards, and several activities and lesson extensions are suggested.

Sediment Penetration Exercise

<http://response.restoration.noaa.gov/kids/expermts/sediment.html>

For Grades 9-12 (or older). This exercise demonstrates how lighter and heavier oils behave differently when spilled onto fine-grained, medium-grained, and coarse-grained [sediment](#).

An Oil Spill Response Exercise

<http://response.restoration.noaa.gov/oilaid/spiltool/train/scenario.html>

For middle or high school students (or older). Instructor's kit for an exercise using NOAA's *Spill Tools* software to make decisions during an oil spill response.

[\(top\)](#)

Online Resources For Teachers

Office of Response and Restoration (OR&R)

<http://response.restoration.noaa.gov/>

This Web site provides tools and information for emergency responders and planners to understand and mitigate the effects of oil and hazardous material spills in coastal waters.

Damage Assessment and Restoration

<http://www.darp.noaa.gov/>

This Web site provides information about NOAA's Damage Assessment and Restoration Program, which conducts natural resource damage assessments and [restoration](#) of coastal and marine resources that have

been impacted by oil spills, releases of hazardous materials and ship groundings.

Historical Incidents Database

<http://www.incidentnews.gov/incidents/history.htm>

This database contains reports and images from about 1,000 incidents such as oil spills and chemical accidents that happened from 1977 to 2001. It is searchable by name or keyword. The database includes mainly U.S. incidents, but also significant incidents that occurred elsewhere. Generally, it includes only those incidents that occurred either in navigable waters (including large freshwater bodies such as the U.S. Great Lakes) or in coastal waters.

Oil Spill Case Histories

<http://response.restoration.noaa.gov/oilaidspilldb.pdf>

This summarizes significant U.S. and international spills between 1967 and 1991. These summaries are also available in the Historical Incidents Database—see the link below (pdf, 2.2Mb).

Questions and Answers About the *Exxon Valdez*

<http://www.evostc.state.ak.us/facts/qanda.html>

This Web site includes facts about the *Exxon Valdez* oil spill from the *Exxon Valdez* Oil Spill Trustee Council, which was formed to oversee restoration of the injured [ecosystem](#) using the \$900 million civil settlement.

NOAA Restoration Portal Web Site

<http://restoration.noaa.gov/>

The NOAA Restoration Portal Web site provides centralized access to information about NOAA [restoration](#) programs, projects, and activities through a single point-of-entry. This site serves as a gateway to more detailed NOAA restoration publications, Web sites, audiovisual materials, and case studies.

The *Exxon Valdez* Oil: How Much Oil Remains?

http://www.afsc.noaa.gov/Quarterly/jas2001/feature_jas01.htm

This provides results of a 2002 survey that measured the amount of oil remaining in the intertidal zone of Prince William Sound. There is also data on the rate of decline of oil on beaches, the persistence of the remaining oil, and the correlation of remaining oil to geomorphological features.

Oil Spill Impacts and the Biological Basis for Response Guidance

<http://response.restoration.noaa.gov/oilaidspilldb/TM125.pdf>

This March 1998 report summarizes the effects of oiling on intertidal communities, especially the alga, *Fucus*, and mussels, as well as recovery rates for these communities (pdf, 2.8Mb).

Integrating Physical and Biological Studies of Recovery from the Exxon Valdez Oil Spill: Case Studies of Four Sites in Prince William Sound

<http://response.restoration.noaa.gov/oilaid/TM114.pdf>

This 1997 report describes findings from monitoring studies of four sites differing both in shoreline type and cleanup treatments received (pdf, 2.2Mb).

Exxon Valdez Publication List

<http://response.restoration.noaa.gov/spotlight/pubs.html>

This Web site lists publications authored by scientists in NOAA's Office of Response and Restoration (OR&R) from 1990 to 1999 that address the recovery of Prince William Sound from the *Exxon Valdez* oil spill. It includes instructions on how to obtain publications directly from OR&R.

Oil Spill Prevention and Response: A Selected Bibliography on the Exxon Valdez Oil Spill

http://www.evostc.state.ak.us/pdf/biblio_prevention.pdf

This is a broad-based bibliography of literature published on oil spill prevention and response as they relate to the *Exxon Valdez* oil spill.

[\(top\)](#)

National Science Education Standards

SciLinks, a major product of the National Science Teachers Association (NSTA), identifies Web-based, educationally appropriate science content that provides useful background information to students and teachers. All Web pages cited in SciLinks adhere to rigorous NSTA criteria and have been formally evaluated by NSTA professionals. NSTA members may access this material directly from NSTA's SciLinks Web site (www.scilinks.org) through a list of keywords. SciLinks also supports most major textbook publishers and is directly referenced in more than 45 science textbooks, and other publications as well, enabling all teachers and students to access its database of vetted resources.

Below, you will find the SciLinks Web site keywords featured on the SciLinks Web site that are appropriate to the topic of oil spills (*Prince William's Oily Mess: A Tale of Recovery*) and the corresponding National Science Education Standards arranged by subject, topic and concept:

SciLinks Keyword

• Subject

◦

Topic

>Concept

SciLinks Keyword: Ocean Pollution

• **Subject:** Life Science

◦ **Topic:** Interdependence of organisms

> **Concept:** An example of habitat destruction is the pollution of the oceans. (9-12)

• **Subject:** Life Science

◦ **Topic:** Interdependence of organisms

> **Concept 1:** Human destruction of habitats through direct harvesting, pollution, atmospheric changes, and other factors is threatening current global stability, and if not addressed, ecosystems will be irreversibly affected. (9-12)

> **Concept 2:** Human beings live within the world's ecosystems. (9-12)

• **Subject:** Science in Personal and Social Perspectives

◦ **Topic:** Natural and human-induced hazards

> **Concept:** Pollutants are dumped into the oceans of the Earth. (9-12)

• **Subject:** Science in Personal and Social Perspectives

◦ **Topic:** Science and technology in local, national, and global challenges.

• **Subject:** Science in Personal and Social Perspectives

◦ **Topic:** Risks and benefits

> **Concept:** Students should understand the risks associated with chemical hazards (pollutants in air, water, soil, and food).

• **Subject:** Science in Personal and Social Perspectives

◦ **Topic:** Changes in environments

> **Concept:** Pollution is a change in the environment that can influence

the health, survival, or activities of organisms, including humans.

SciLinks Keyword: Pollution

• **Subject:** Life Science

◦ **Topic:** Interdependence of organisms

> **Concept:** Human beings live within the world's ecosystems. (9-12)

• **Subject:** Science and Technology

◦ **Topic:** Understanding about science and technology

> **Concept:** Technological solutions have intended benefits and unintended consequences. Some consequences can be predicted, others cannot.

• **Subject:** Science in Personal and Social Perspectives

◦ **Topic:** Changes in Environments

> **Concepts:** Pollution is a change in the environment that can influence the health, survival, or activities of organisms, including humans.

• **Subject:** Science in Personal and Social Perspectives

◦ **Topic:** Personal Health

> **Concepts:** Maintaining environmental health involves establishing or monitoring quality standards related to use of soil, water, and air.

• **Subject:** Science in Personal and Social Perspectives

◦ **Topic:** Natural Hazards

> **Concepts:** Human activities can induce hazards through resource acquisition. Such activities accelerate many natural changes.

• **Subject:** Science in Personal and Social Perspectives

◦ **Topic:** Risks and Benefits

> **Concepts:** Students should understand the risks associated with chemical hazards (pollutants in air, water, soil, and food).

• **Subject:** Science in Personal and Social Perspectives

◦ **Topic:** Natural and human-induced hazards

> **Concepts:** Pollutants are dumped into the oceans of the Earth. (9-12) .

SciLinks Keyword: Human Impact

• **Subject:** Science in Personal and Social Perspectives

◦ **Topic:** Natural and human-induced hazards

> **Concept:** Human activities can enhance potential for hazards.

SciLinks Keyword: Ecology

• **Subject:** History and Nature of Science

◦ **Topic:** Science as a human endeavor

> **Concept:** ** Ecology is the study of relationships between living things and their environment.

In addition, the following standard applies to: *Working With Real Data: Graphing Changes in Marine Life Abundance*

• **Subject:** Science as Inquiry

◦ **Topic 1:** Abilities necessary to do scientific inquiry

◦ **Topic 2:** Understandings about scientific inquiry

**** Non Standard Web Page - NSES Concept Correlation:**

Some of the keywords featured in SciLinked publications don't have a perfect fit to the National Science Education Standards. These keywords may rely wholly or in part on customized Standards Concepts. NSTA educators have written these concepts in the spirit of the standards, but they don't appear in the official NSES publication.

[\(top\)](#)

Scilinks Icon Information

The icons below are used on NSTA's SciLinks Web site (www.scilinks.org) to identify characteristics of the Web pages in its database. Resources available in *Prince William's Oily Mess: A Tale of Recovery* include:

-  Lesson Ideas
-  Online Interactivity
-  Graphics / Multimedia
-  Ask an Expert
-  Career Info
-  Core Content
-  Hands-on Investigation
-  Inquiry Materials

[\(top\)](#)

