



# Marine Defenders Lesson Plan

Grade Level: **High School**

Subject: **Biology/ Environmental Science**

Duration: **3 Days**

Written by: **Lottie Peppers, Master of Science, Teacher of  
Biological Science, July 2012**

For more information about oil pollution,  
visit [MarineDefenders.com](http://MarineDefenders.com)

Marine Defenders is an educational project created by SUNY Maritime College and Common Good Productions with funding from the National Fish and Wildlife Foundation.



**MARINE DEFENDERS**  
**3-DAY LESSON PLAN**  
**HIGH SCHOOL BIOLOGY/ ENVIRONMENTAL SCIENCE**



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## **What is the Marine Defenders Project?**

While the media tends to focus on dramatic accidental discharges of oil like the recent Deep Water Horizon spill in the Gulf of Mexico, most of the oil spilled into the world's oceans by humans actually comes from intentional spills from ships.

One recent study estimated that more than 88 million gallons of oil is intentionally spilled into US waters each year – nearly eight times more than the amount of oil spilled by the Exxon Valdez into Alaskan waters.

Because chronic oil pollution is intentional, it represents the single most easily controlled aspect of oil pollution in US waters. Changing attitudes about illegal dumping will decrease the amount of oil entering our waters and improve the health of our coastal environment.

Marine Defenders is an educational program designed to reduce chronic oil pollution along US coastal waters in New Jersey and New York.

The goal is to raise awareness about the extent of chronic oil pollution, its impact on the marine environment, and the key laws that govern oil pollution.

Marine Defenders has created lesson plans for high school and college students about chronic oil pollution as well as a short educational film and a mobile reporting tool that turns concerned citizens into Marine Defenders.

The Marine Defenders mobile reporting tool allows real-time reports of oil spills and marine debris to be mapped geospatially on the Marine Defenders website and reported to the Coast Guard via the National Reporting Center.

### **National Fish and Wildlife Credit**

Marine Defenders is a public educational project created by the SUNY Maritime College and Common Good Productions with funding from the National Fish and Wildlife Foundation.

### **National Fish and Wildlife Disclaimer**

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## **Marine Defenders High School Lesson Plan**

**Developed by Lottie Peppers, July 2012**

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**Grade Level: High School Biology or Environmental Science course**

### **National Science Education Standards:**

**Content Standard C:** As a result of their activities in grades 9-12, all students should develop an understanding of the interdependence of organisms.

- Human beings live within the world's ecosystems. Increasingly, humans modify ecosystems as a result of population growth, technology, and consumption. 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.

**Content Standard E:** As a result of their activities in grades 9-12, all students should develop understandings about science and technology.

- Humans have a major effect on other species. For example, the influence of humans on other organisms occurs through land use, which decreases space available to other species, and pollution which changes the chemical composition of the air, soil, and water.

**Content Standard F:** As a result of their activities in grades 9-12, all students should develop an understanding of natural resources, environmental quality, and natural and human-induced hazards.

- The earth does not have infinite resources; increasing human consumption places severe stress on the natural processes that renew some resources and it depletes those resources that cannot be renewed.
- Many factors influence environmental quality. Factors that students might investigate include population growth, resource use, population distribution, overconsumption, the capacity of technology to solve problems, poverty, the role of economic, political, and religious views, and the way different people view the earth.
- Natural and human-induced hazards present the need for humans to assess potential danger and risk. Many changes in the environment designed by humans bring benefits to society, as well as cause risks. Students should understand the costs and trade-offs of various hazards- ranging from those with minor risk to a few people to major catastrophes with major risk to many people. The scale of events and the accuracy with which scientists and engineers can (and cannot) predict events are important considerations.

**New Jersey Core Curriculum Standards for Science**

- 5.1.12.A.2 Develop and use mathematical, physical, and computational tools to build evidence based models and to pose theories.
- 5.1.12.B.2 Build, refine, and represent evidence-based models using mathematical, physical, and computational tools.
- 5.3.12.B.1 Cite evidence that the transfer and transformation of matter and energy links organisms to one another and to their physical environment.
- 5.3.12.C.2 Model how natural and human-made changes in the environment will affect individual organisms and the dynamics of populations.
- 5.4.12.G1 Analyze and explain the sources and impact of a specific industry on a large body of water (e.g., Delaware or Chesapeake Bay)
- 5.4.12.G2 Explain the unintended consequences of harvesting natural resources from an ecosystem.

**Length of Lesson:** Three days- 2 class periods and one field trip to collect oil and marine debris data using the Marine Defenders app.

**Materials Required:**

- Internet access for Marine Defender website
- “Oil in Our Waters” DVD, streaming video, or download from marine defenders website.
- Marine Defenders mobile app for smart phone (iPhone, Android)

**Resources:**

- Marine Defenders Website ([www.marinedefenders.com](http://www.marinedefenders.com))
- “Oil in Our Waters” video is online at [www.marinedefenders.com/video](http://www.marinedefenders.com/video)

**Preparation:**

- Download Marine Defenders app on smart phone
- Explore Oil Pollution Facts at [www.marinedefenders.com](http://www.marinedefenders.com)
- Download Marine Defender engage powerpoint
- Download and copy Marine Defenders Tic-Tac-Toe note template, and Oil in Our Oceans 3 column note template.
- Download Marine Defenders review powerpoint

**Essential Question: What impact do humans have on marine environments?**

**Day 1 Objective: Students will be able to describe the effect of human activity on oceans and marine organisms, using information from the Marine Defenders website and video.**

**Engage (5 minutes):** A variety of images illustrating oil and marine pollution will be displayed and students will be asked to brainstorm responses to the essential question,

“What impact do humans have on marine environments?” The slide show will automatically advance and continuously loop if viewed as full screen (Engage powerpoint is available [here](#)). Following the brainstorming activities, students will briefly share their thoughts in small groups or with the class.

**Explore (30 minutes):**

This section of the lesson provides students with an opportunity to explore oil pollution and ocean debris. Students will gather and share information from the Marine Defenders [website](#). A Tic-Tac-Toe note template is provided for students to summarize key information (page 7).

(15 minutes) For students to explore an overview of the website, a Jigsaw protocol will be employed. Working together in small groups, students will navigate the website and answer guiding questions on the note sheet for a small number of the webpages. Each group will be responsible for different webpages/note squares (based on class size/reading levels).

(15 minutes) Students will be regrouped such that each member of the new group will have studied different portions of the website. Students will share out their brief summaries while displaying the webpage of interest. Fellow group members will record information from peer presentations on their Tic-Tac-Toe note sheets.

**Explain (22 minutes):**

Students will watch the documentary “Oil in Our Waters”, noting the effects of human activities on marine environments using three column notes to record facts about Oil Pollution, Ecology, and Justice from the film (page 8).

Day 1 Exit Ticket (3 minutes): Students will summarize the day’s learning by responding to the essential question, “What impact do humans have on marine environments?” Students should write a one or two paragraph summary, citing evidence from the website and/or film.

**Day 2 Objective: Students will be able to collect and analyze pollution data in a marine environment with the Marine Defender app.**

**Elaborate**

Students will conduct a field study exercise using the Marine Defenders app to collect marine debris and oil pollution data. ([Link](#) to Marine Defenders app instructions) The teacher will select an appropriate marine destination for a field trip and students will gather data using the Marine Defenders app.

**Day 3 Objective: Students will predict the consequences of oil and debris pollution on marine organisms through a RAFT writing assignment.**

Warm-up (5 minutes): As students enter the classroom, a map of student generated data will be displayed ([link](#) to Marine Defenders map). Students will be asked to reflect on their field trip and the previous day's observations. The prompt, "Please describe evidence of human activities impacting marine environments that you observed yesterday," may be used to elicit student reflections.

Review (10 minutes): The teacher will lead a class discussion about the types of debris and pollution observed during the field trip, as well as reviewing key information about marine debris and oil pollution from the Marine Defenders website (available [here](#)).

**Evaluate** (45 minutes):

Students will prepare a RAFT work product to demonstrate their understanding of the impact of humans on marine environments. Students take on the **Role** of an author who is communicating with a specific **Audience** (whom the product is being directed). Students will create a work product with a specific **Format**, and communicating a specific **Topic** for the product. A template with a number of possible RAFT ideas (page 9) is attached as well as a grading rubric (page 10).



<p>Oil is a Toxin- Why is oil dangerous to the environment?</p>	<p>Recognizing Oil Spills- What are the types of oil and how do they affect the environment?</p>	<p>Sources of Oil in Water- Where does oil in the ocean come from?</p>
<p>Illegal Dumping- Why do ships dump oil in the oceans?</p>	<p>Key Oil Pollution Laws- What laws regulate oil pollution?</p>	<p>Oil and Marine Life-How does oil affect fish, birds, and marine mammals?</p>
<p>Oil Toxicology- What is one way scientist can tell if fish have been exposed to oil?</p>	<p>What is Marine Debris?</p>	<p>How Does Marine Debris get into the Ocean?</p>
<p>Impact of Marine Debris- Why is marine debris important?</p>	<p>Marine Debris Laws- What laws regulate marine debris?</p>	<p>Marine Debris Prevention- What are some ways mariners can avoid generating marine debris?</p>





As you watch the film, "Oil in Our Waters", please record factual information about Oil Pollution, Ecology, and Justice.

Oil Pollution	Ecology	Justice



## Marine Defenders RAFT Assignment

Role	Audience	Format	Topic
Ship Engineer	Lawyer	Whistleblower Letter	Intentional oil pollution by a cargo ship.
Red Knot (small shorebird)	Other migrating shore birds	Dining Guide	Interconnection of organisms in ecosystems.
Scientist	TV audience	Public Service Announcement	Costs of oil industry to the environment.
Pink Salmon	Self	Diary	Effects of oil on marine organisms.
Mid-ocean fish	US Coast Guard	Instructions	Catching polluting ships.



Name: \_\_\_\_\_

*R.A.F.T. Assignment Assessment and Feedback Rubric*

Assignment Traits	←				
<b>Accuracy</b> How correct is your information? Is it fully supported by your web research, field trip observations, and/or the film?	5	4	3	2	1
	<u>Comments:</u>				
<b>Perspective</b> Did you stay in role? How effective are you at convincing your audience?	5	4	3	2	1
	<u>Comments:</u>				
<b>Focus</b> Does your work product demonstrate the assigned format? Did you fully satisfy the chosen topic with numerous details and examples?	5	4	3	2	1
	<u>Comments:</u>				
<b>Mechanics</b> Does your writing contain a minimum of mechanical errors?	5	4	3	2	1
	<u>Comments:</u>				
<b>Benchmark</b> How is the overall quality of your work compare with both past work and ever increasing expectations of better work?	5	4	3	2	1
	<u>Comments:</u>				
<b>GRADE:</b> (based on levels attained for each criteria)					
<u>Scoring key</u> 25-24 = A+ 23-21 = A 20 = A- 19 = B+ 18-16 = B	15 = B- 14 = C+ 13-12 = C 11 = C- 10 = D 9 = D-			<u>Assessment guide</u> 5 = Exceptional 4 = Effective 3 = Developing 2 = Emerging 1 = Not Yet	