

Ocean Frontiers Educator's Guide:

Ocean Frontiers is a unique documentary about conservation, solutions and community. The stories in *Ocean Frontiers* help audiences understand key principles of ecosystem-based management and coastal and marine spatial planning, which are the cornerstones of the National Ocean Policy. These complex concepts come to life and are easy to grasp through the stories and people featured in *Ocean Frontiers*.

The Ocean Frontiers Educators guide is designed to help teachers blend the stories in the documentary into their curriculum and expose students to positive examples of conservation and complementary science concepts. Teachers should view the documentary to be familiar with the stories and science concepts highlighted. Lists of various activities are provided for teachers to consider using in their classrooms. Ocean Frontiers would easily fit into many subject areas; please share with us how you have used this film in your classroom.

"It is widely agreed that education is the most effective means that society possesses for confronting the challenges of the future. Indeed, education will shape the world of tomorrow."

Chapter 1 (Introduction and Massachusetts Bay)

Intro:

Essential Questions:

How do we use our Oceans?

How do we protect our Oceans?

Video Summary: As the blue planet's burgeoning populace faces an uncertain future, never before have the world's oceans been called upon to serve so many, while suffering so much. To address this, people around the world have begun using new approaches to ocean management. It is a movement of scientists, businesses, farmers, fishermen, governments and citizens who care for the sea.

Green Fire Productions has traveled the country from coast to coast, capturing stories of these ocean pioneers—people who are embarking on a new course of stewardship, in defense of the seas that sustain them. We can learn many lessons from these ocean pioneers; in a sense, we're all ocean pioneers, steering uncharted waters in a sea of rapid change.

Teaching Tips

The Ocean is one of Earth's most valuable natural resources. It provides food in the form of fish and shellfish—about 200 billion pounds are caught each year. It's used for transportation—both travel and shipping. It provides a treasured source of recreation

for humans. It is mined for minerals (salt, sand, gravel, and some manganese, copper, nickel, iron, and cobalt can be found in the deep sea) and drilled for crude oil.

The ocean plays a critical role in removing carbon from the atmosphere and providing oxygen. It regulates Earth's climate. The ocean is an increasingly important source of biomedical organisms with enormous potential for fighting disease. These are just a few examples of the importance of the ocean to life on land. (<http://marinebio.org/oceans/ocean-resources.asp>)

The Activities highlighted here will help students explore the ocean in greater detail to understand why we must keep the ocean healthy for future generations.

Engage:

Have students create a concept map around the question, “How do we use our Oceans?” Concept maps are an excellent way to assess student’s prior knowledge on a topic and also to notice any misconceptions students may have as you begin a unit of study.

Explain/Explore:

Building on student’s current knowledge, pose several questions such as: “How might these uses of the ocean conflict with another?” “Do you think the East Coast and the West Coast of the United States might have similar issues?” “What issues might be unique to either the Atlantic or Pacific coast/ocean?” The Introduction to Ocean Frontiers presents the concepts of how we use our ocean resources and the importance of sustainable management. Students may also want to add new connections as they watch the film and discover the many ways we use our ocean resources. Now show the introduction to Ocean Frontiers.

Chapter 1 Massachusetts Bay (Time: 5:51)

Essential Questions:

- What are the different ways that problems can be researched?
- What are some ways to find creative solutions?
- What are the different factors that must be taken into account when solving technological problems?

Video Summary: Saving Whales at Stellwagen Bank

In the bustling shipping lanes of Boston Harbor, what was once a recurring collision of giant vessels and endangered whales, has become a model for conservation in a crowded sea. Marine biologists, shipping executives and an energy company have come together, taking cues from the great whales’ travelways, and finding room for both commerce and wildlife.

Ocean Literacy Principles

The video and activities support:

- Essential Principle # 5: The ocean supports a great diversity of life & ecosystems
- Essential Principle # 7: The ocean is largely unexplored

Teaching Tips:

Engage:

One of the most exciting ocean activities is whale watching. Witnessing the size and majesty of these large marine mammals is a special experience. A fascinating acrobatic feat performed by whales is breaching, where the whales, weighing many tons, build up enough velocity underwater to launch themselves above the ocean's surface, twist in the air and fall back, producing a tremendous splash.

Using a guided inquiry approach is an effective way to launch the activities associated with whale behavior, migration and ocean communication. You could start, perhaps, by asking "Where do you find whales?" (Whales travel up and down both coasts of the United States and can often be seen within a couple miles of the shore) "What is breaching and why do whales engage in this activity" (Whale researchers still aren't sure why whales do this, but they have a number of guesses. It may be that the huge splashing sound is used to **communicate** with other whales, especially when there is a lot of other noise underwater. Another idea is that the whales are trying to **knock off crustaceans and other parasites attached to their body**. Some researchers think breaching may be a **demonstration of prowess**, and that it could play some role in **courting rituals**. One of the most popular ideas is that whales breach simply **for the fun of it**. Most likely, breaching serves many different purposes that vary depending on the species and situation.) "How do whales communicate?" (Whales are still a mystery of sorts. A lot of information gathered by whale researchers has raised new puzzles about the animals. **Whale communication** is particularly perplexing. Male humpbacks (also known as **bulls**), the most vocal whales, emit a **complex sequence of low moans, high squeals and clicking noises**. These noises are sometimes combined in **songs** that last as long as 30 minutes. The astounding thing about these songs is that whales will repeat them over and over again, verbatim. And in a particular region, every male will sing the same song, making small changes every once in a while so that it evolves into a completely different song over time.) (See the following link for continued background information <http://science.howstuffworks.com/environmental/life/zoology/marine-life/whale9.htm>) Now show the video, and have the students listen for a few answers to these questions then implement one or more of the following activities suggested.

Explain/Explore:

To test their ideas, in the following activities students will have a chance to investigate whale behavior, migration and ocean communication and begin to draw conclusions about how scientists gain new knowledge by analyzing data.

Suggested Activities:

The following activities would be complementary to Ocean Frontiers Chapter 1: Saving Whales at Stellwagen Bank. There are several concepts in this video segment worth exploring in depth with students and making a connection to the real world examples of the science and stewardship at Stellwagen Bank.

1) CONCEPTS: Whale Behavior, Migration and Ocean Communication

ACTIVITY: 2009 Challenge Theme: What about Whales; Activity Tracking Marine Mammals

http://smile.oregonstate.edu/SMILEOceanScience/Club_Activities_%26_Resources.html

Description:

These resources will give your students a wealth of rich classroom experiences. Be sure to help your students make the connection to the solutions highlighted in Ocean Frontiers and students will have a great tie in to real world applications.

2) CONCEPT: Whale Watching

ACTIVITY: See A Spout, Watch Out Program

<http://stellwagen.noaa.gov/education/welcome.html>

Whale Watcher Game Lesson

<http://www.pbs.org/kqed/oceanadventures/educators/whales/gamelesson.html>

Gray Whale obstacle course

<http://www.pbs.org/kqed/oceanadventures/episodes/whales/>

Description:

These are some shorter activities about whales that your students may enjoy.

3) CONCEPT: National Marine Sanctuary

ACTIVITY: Exploring the National Marine Sanctuaries: A Lesson in Habitats and Human Impacts

<http://sanctuaries.noaa.gov/education/teachers/features/lpexplore.html>

Description:

By learning about the biodiversity, ecological integrity, and cultural legacy of these marine sanctuaries, students can place into context what they are learning about the interdependence of living things on our planet.

EXPAND/ADAPT/CONNECT

Revisit the concept maps created by your students, ask if they can make any more connections after their viewing of Ocean Frontiers Chapter 1 and the activities they have done.

The Stellwagen Bank Marine Sanctuary also supports several art contests for students in grades K-12, your students may wish to participate.

<http://stellwagen.noaa.gov/education/welcome.html>