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Produced by
Michael Graber Productions

STUDY GUIDE

By Mark Cousineau, Pattie Meade,
and Diana Schulz
With an introduction by Pierce Flynn, PhD.,
Executive Director, Surfrider Foundation

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KEEPERS OF THE COAST

A 31-minute video produced by
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Available from:
Bullfrog Films
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KEEPERS OF THE COAST
Study Guide

By
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Introduction by
Pierce Flynn, PhD, Executive Director of
The Surfrider Foundation

Introduction

Last year there were over 3,500 beach closures or advisories in 23 states due to contamination of coastal waters with disease-causing bacteria and viruses. Millions of dollars in tourism and related industries were lost and our coastlines became a health hazard to the millions who go to the beach. With over 50% of the U.S. population living within an hour's drive of the coastline, and much of the remaining 50% using the beach for vacation or pleasure, these sad statistics impact nearly everyone.

The film you are about to show your class provides an overview of some of the environmental threats to the coastline and what surfers, bodyboarders and various ocean people are doing about them. These "Keepers of the Coast" are dedicated environmental watchdogs who spend significant portions of their lives defending our Mother Ocean. While there are many catastrophic events that affect water quality, such as oil tanker spills and sewage breaks, there are even more activities that cause significant damage on a daily basis. We all contribute to ocean pollution and need to be aware of why that is and what we can do about it.

Dr. Pierce Flynn
Executive Director, The Surfrider Foundation

Viewing Guide

This film is presented in 6 basic sections outlined below. These sections are interspersed with exciting action footage of surfing, body boarding and skimboarding, designed to hold a junior high or high school classroom's attention. Appropriate for a science, social studies or political science class, the film's goal is neither to preach gloom nor to lecture, but to inspire a philosophical change in the viewer towards our precious coastal resources. This film can be shown in one viewing or broken into modules depending on your lesson plan and time availability. The sections include the topics of:

- The Water Cycle
- Urban Runoff
- Loss Of Surf Habitat
- The Clean Water Act
- Beach Sand Erosion; and
- Activism

This guide contains a brief summary of each area as well as *Suggested Activities* and laboratories for development of curriculum in support of this film. It is followed by a question and answer section and a glossary of terms used in the film.

Planet Earth — The Water Cycle

Planet Earth is commonly referred to as the water planet due to the fact that over 70% of Earth's surface is covered by water. In addition, our skies retain a significant amount of water in the form of water vapor and our land masses also contain water both beneath the land and in rivers and lakes. Approximately one percent of the total amount of water is fresh water available for use by plants and animals. As water is a key ingredient to life itself, maintaining and managing the quality of that water is essential for our species' survival and life as we know it.

Water flows throughout the earth in a pattern referred to as the water cycle. Rainfall starts the cycle as the sky releases the water it is storing in the form of vapor. That rain water falls both on the land masses as well as on the oceans. When it falls on the land, it percolates into the ground as well as flows into rivers, streams and lakes. This is the water that mankind has been able to use for its survival. Once the water falls from the sky, it either evaporates back into the sky to become rain again or, in most cases, continues to flow into the oceans. Whether the water falls as snow in the Rockies or rain in California, that water ultimately makes its way to the ocean. What it picks up along the way in terms of pollution has an affect on the receiving water. The ocean is the ultimate recipient for our spills and urban practices even for events that happen hundreds of miles away from the ocean.

Suggested Activities

1) Have students make a poster illustrating the steps of the water cycle: 1. Precipitation 2. Ground Water 3. Evaporation 4. Condensation. Have them draw arrows showing the constant flow from one stage to another.
2) Using the water cycle as a guide, explain phase changes. As the sun heats up surface water, the energy makes the water molecules move faster which changes the liquid phase into a gas (evaporation). As the water vapor rises, the air gets cooler which slows down the motion in the water molecules and changes the phase back to liquid which forms clouds (condensation). When the saturation point of the air molecule is reached, which is dependent on the temperature, or relative humidity, then precipitation occurs. If it is below freezing, it falls as snow; above freezing as rain.
3) Have each student write a story answering the following question: "How does the water you drink get from the clouds to your faucet?"
4) Earth is comprised of several different types of bodies of water. Have students write definitions for the following kinds of bodies of water: 1. ocean 2. sea 3. gulf 4. bay 5. strait. Using a world map, locate and label: 1. five oceans 2. five seas 3. two gulfs 4. two bays 5. two straits.

5) Have students make a word-search or crossword puzzle using the following words: brackish, cycle, estuary, evaporation, salt, fresh, marsh, ocean, precipitation, rain, rivers, runoff, salinity, streams, ground water, water table, wetlands.

Urban Runoff

One of the most significant sources of pollution to our coastal waters is urban runoff. Urban runoff, otherwise referred to as "nonpoint source pollution" is the result of rainwater and other wet weather flows coming in contact with the urban environment. Items such as fertilizers and pesticides from agriculture and lawn care, oil and petroleum products from automobiles, sewage from leaking septic tanks and sewer overflows, and other waste products are swept up in the flow of rain water and ultimately impact habitats along the stream as well as the ultimate destination of that water. It has been estimated that over 25,000,000 barrels of oil impact our oceans on an annual basis. Only an estimated 42% comes from tanker spills; the rest is from nonpoint source pollution. Our actions can have a tremendous affect on the ocean, whether we live by the beach or in the heartland; the film attempts to demonstrate that fact.

Under the Clean Water Act, nonpoint source pollution prevention is currently under way with additional measures being evaluated. The typical response to date to minimize nonpoint source pollution from urban runoff is to implement what are referred to as Best Management Practices (BMPs). BMPs are common-sense activities that minimize the introduction of pollutants into rain water in the first place. Examples of BMPs can include street sweeping to remove oils and dirt from coming in contact with rain water, covering sources of chemicals such as paints, oils and solvents at commercial facilities, and use of retention basins to allow pollutants to settle out of the wet weather flow before reaching a stream.

Wetlands are natural areas where water accumulates and which support a rich biotic culture. Wetlands also tend to act as natural

water filters purifying the water that flows through it before entering the ocean. Maintaining our coastal wetlands in addition to maintaining a home for wildlife also helps to minimize the impact to the oceans from storm water runoff. This is a significant and important concept with today's changing focus of environmental protection.

There are many things that we as ordinary citizens can do to reduce the threat of urban runoff such as recycling, keeping our yards and homes clean, not dumping trash, wastes and chemical products into storm drains, and being aware of our connection to the ocean, no matter where we live.

Suggested Activities

1) To observe the effects of pollution on water take a gallon (4 liter) glass jar, pour 1/2 cup of water into it. Add 2 drops of red food coloring. Stir in. Add 1 cup of clear water at a time to jar and stir. Continue doing this until the red color disappears. Even though at some point the red is no longer visible, molecules of red are still in the water. This is what happens with pollutants. Life forms that ingest the seemingly clear water are, in fact, also ingesting the pollutant.
2) Get a map or list of your local area's storm drains from city hall. Have students find your school on the map and trace the path to the ocean, sea, river, or lake. Also have them trace a path that starts from their home. Have a discussion.
3) Give students a basin filled with water. Have them add "pollutants" and try different methods to clean the pollution out of the water. Some sample pollutants are dirt, leaves, plastics, soaps, and oil. Some sample methods of cleaning include straining, absorbing, and boiling.
4) To simulate an oil spill, give each group of students a basin filled 1/2 way with water and several objects they will use to try and clean up the spill. They will need to devise their own methods of oil cleanup. Some of those objects could be: a feather, straw, paper towel, twigs and sticks to make a boom, soda straw, deter-

gent, sand, Kaolin, aquarium net. Add oil (motor oil works best.). Have students use one object at a time in the oily water to remove the oil. Add more oil as needed. Place "contaminated" items in plastic garbage bag. Tilt basin to simulate waves. After students finish their objects, have them write up which methods worked best and which didn't.

5) To have students understand what wild animals feel like when they are caught up in plastic trash, give each student a rubber band. Have them put it on the back of their hand around their thumb and little finger. Give them 30 seconds to try to get it off without using their other hand, teeth, or rubbing it against something. The band could be a plastic six pack ring or fishing line and their hand the neck of an animal. Many animals die each year because they are entrapped by our trash! Show students how to make 6 pack rings safe by cutting them up.

6) To see how animals can mistake plastic for food, give each group of students a tray with popcorn, birdseed, packing foam, and plastic pellets in it. Mix ingredients. Have students "feed" at tray for 30 seconds with a plastic spoon, putting food into a cup or bowl. Have students count and record pieces. If students are able, make ratios, percentages, and fractions of how much the "animal" ate of real food and how much plastic.

7) Have the students make a list of nonpoint source pollutants (i.e., motor oil, grease, antifreeze, paint chips, pesticides, herbicides, fertilizer, paint solvents, etc.). Then have them make a list of ways we are all capable of making personal contributions to curb urban run-off (i.e., recycling used motor oil, using non-toxic gardening supplies, taking toxic products to local collection sites for safe disposal, etc.). Have your students share their lists.

8) Ocean water consists of many elements, especially salts. Using the following information, have the students make a graph of the percentage per 1000 parts of each of the following salts:sodium chloride, 77.75%; magnesium chloride,10.89%; magnesium sulfate,4.73%; calcium sulfate,3.60%; potassium sulfate, 2.46%; calcium carbonate, 0.35%; magnesium bromide, 0.21%; other salt traces, 0.1%. When analyzing their graphs, students should have gained some insight into how complex ocean water is.

9) Pollutants can change the density or temperature of water. To discover the effect different densities (salinity) and/or temperatures have on water, here is a simple demonstration that works every time. Take two glass jars that are big enough to fit a smaller jar inside. Club sized pickle or sauerkraut jars work well for the large jars and baby food jars or glass test tubes work well for the small jars. Fill one large jar with hot water and the other with cold (or, for density [salinity], use salt water in one, fresh water in the other). Fill the small jar or test tube with the opposite water colored with food coloring. Put in the bottom of the large jar, making sure water can come out-you may have to put small jar on its side. The results are incredibly easy to see (example- hot water in large jar, cold colored blue in small. Cold water sinks so the blue water will spread only on the bottom of the big jar. If doing the opposite, colored hot water will rise, making a top layer of colored water.)
10) Give each student a cardboard box. Have each student collect all the plastic they use at home for two weeks, bringing it daily to school and placing it in their box. Have them weigh their daily plastic and make a chart. Have them make a graph from their results and compare graphs of other students.

Loss of Surf Habitat

The sport of surfing goes back millennia to the Polynesian civilization, though it is probably the Hawaiian culture that is most responsible for the introduction of surfing to the rest of the world. Today there are an estimated 1.62 million surfers throughout the world with a significant percentage living in the United States. Waves are a natural part of life; be they sound waves, energy waves (light) or ocean waves. The physics of a wave and the way a wave propagates is a fascinating area of science that has broad-based application. Ocean waves provide a natural example to demonstrate this concept.
Unfortunately, the factors that must be present to produce a surfing wave are complex and susceptible to damage by human activities. Some of the factors that go into the formation of waves suitable for surfing include a source of wave activity (wind, storm,

earthquake), currents, ocean bottom configuration, sand flow, wind speed and direction, orientation of the beach to the wave source, tides and others. Surfing is a growing sport as is the desire to live and play by the ocean. A conflict of uses is brewing where influential users such as boat owners and ocean front dwellers are building marinas, harbors, breakwaters and seawalls, causing the loss of waves due to alteration of the coast and the factors cited above. This loss of waves is occurring while the demand for waves among surfers is growing. In many cases, those whose activities affect the enjoyment of natural waves are not aware of the negative impact of those activities. The impact is felt not just by surfers but by society as a whole. Alteration of waves also leads to alteration of currents which can lead to coastal erosion and damage. This type of damage frequently costs millions of dollars for repairs that are often short-lived. It is the position of environmental organizations that the beach should be left alone.

The film presents a good overview of the pressures on the coastal environment and the causes of wave loss. This section of the film can be broken into a coastal element as well as an applied physics lecture depending on the age group of the class.

Suggested Activities

1) Ocean water pressure increases with depth at a rate of 14.7 lbs per square inch (psi) which is called 1 atmosphere, or 1.03 kg per square cm for every 33 feet or 10 meters. Have students write a story about what would happen to them or something they invent (such as a balloon) as they take a deep ocean dive. The average depth of the ocean is 4,150 meters but in some parts it goes down to more than 11,000 meters!
2) Make an ocean density column. Use a large graduated cylinder or a tall clear container. Add to the container (it doesn't matter in what order, it will always come out the same!) : water, cooking oil, syrup, a grape, a cork, a lego or similar type of block. Have students come up with new items to try and see how they effect the column. This activity will demonstrate that different liquids have

different densities. The ocean is actually layered like the density column. Many animals can only live in a narrow density range. Pollutants, including water of a density not usually present, can change the ecosystem by changing the density.

3) To discover the effect of water pressure, take a two liter plastic bottle and fill it with water. Make a hole in the side of the bottle and measure how far the water spurts. Make a second hole above the first and measure the distance the water spurts from here. Make one more hole below the first and measure this. Compare. Which hole throws the water the furthest and why? You can also make all three holes first and plug them up, unplugging one at a time.

4) To discover how currents disperse water, have each group of students fill a rectangular pan with water. Put a few drops of food coloring in the center of the pan. Take a straw and have a student blow on the water. Watch as the food coloring moves to the end of the pan and then spreads around outside of pan. If the center of the pan is the equator, its easy to see why ocean currents move as they do.

5) To illustrate ocean currents and temperature, fill a wide mouthed glass jar with fresh, warm water. Sprinkle pepper or sand on top (it will sink and represent bottom sediment). Place a colored ice cube in the water and watch what happens as the ice cube melts. What direction does the water move? What happens to the cold water as it warms up? What happens to the pepper or sand as the water currents created move along the bottom?

6) Split your class into two groups. One half of the room are boat owners who want to build a harbor and a marina. The other half are surfers who like to surf at a break that will be lost if the marina is built. Have each group present their argument to a panel of students representing the Coastal Commission who will vote on this issue.

7) Fill a large pan with water. Turn a portable fan on at one end of the pan and watch wind waves form. Experiment with placing blocks of wood in the pan to diffract waves.

8) Have students identify the parts of a wave (crest, trough, wavelength, period, amplitude) and draw a diagram.

9) Have students draw a typical beach profile in the winter and summer. What would happen in future years if some of the sand was carried away and not replaced?
10) Using a fishtank or other 3-D model, make a model of the ocean bottom. Use sand on one side sloped to make a beach. Use bars of parrafin wax placed at a 90 degree angle from the beach to represent jetties or groins. Fill with water. Use small small straws (such as coffee stirrers) to blow on water from one predominant direction. What happens to the sand? Now switch the predominant "wind" to a different direction. What happens now?
11) Have students identify variable features of a beach. If possible, a field trip would be ideal. How do they think these features would change if the rivers upstream (or up current) were dammed and sand was not allowed to flow?

Clean Water Act

In 1972, Congress enacted the Clean Water Act which was designed to protect our nation's waters in general, with a goal of making all of our bodies of water at least swimmable and fishable. It is amazing that although the goal was simply to have water suitable to swim and fish in, after almost 25 years we have still not realized that goal! The Clean Water Act operates with a permit system referred to as the National Pollution Discharge Elimination System (NPDES). Under the Clean Water Act, an NPDES permit is required of all dischargers who release pollutants into the waters of the United States. The Clean Water Act has resulted in significant improvement in water quality in some areas. Unfortunately, there are efforts to reduce the protections afforded by the Clean Water Act in the name of reducing excess government involvement in our lives. The film covers some of the important aspects of the Clean Water Act debate currently underway in Congress and stresses the importance of protecting that 1% of water that is actually usable at the current time.

Suggested Activities

1) Make a filter that will show how wetlands clean water, and how the plants and animals in the wetlands remove chemicals and particles. Get 4 beakers or jars. Label them 1-4. Put one cup of clean water in the first 3 jars. Put some dirt and sand in jars 2 and 3. Take a strainer and line with a coffee filter. Pour water from jar 3 through strainer into jar 4. Compare the water in the jars. Jar one is clean ocean water. Jar 2 is unfiltered polluted water. Jar 3 is for mixing and pouring. Jar 4 is filtered water that has been through the wetlands. Repeat several times using different pollutants and different types of filters (straw, cotton, rocks, cloth).
2) Pretend students have been elected by their community to write a law protecting a local water supply that has been declining in recent years. Have students write their own "Clean Water" law. Have them present it to their class. They should include the following: why it is important to protect water, who will enforce the law, where the money will come from, how the community will be affected, where the money from fines will go?

Beach Sand Erosion

Another of the natural cycles presented in the film is the flow of sand from inland locations to the beach and the importance of allowing that flow to occur. Sandy beaches are formed by the transport of sands derived from erosion and other processes, that are taken down rivers to the ocean where that sand is deposited along the ocean's edge by the various currents in the ocean. The sand involved is the basis for the beaches that we all love to visit and play on and also has a tremendous impact in the formation of waves as well as the stabilization of geologic processes along the coast.

Numerous activities are interrupting the natural sand cycle and cause significant environmental and economic damage as a result. When dams are built along rivers that drain to the ocean, the transport of sand is stopped and the beach stops growing. Structures built on the beach such as jetties and walls, interrupt the currents

that transport the sand that is available to the beach. A common occurrence is to see a build up of sand along the upcurrent direction of a jetty and a loss of sand along the downstream side of the jetty. Unfortunately, a common response to this development is to construct another jetty further down the beach with the same results. Significant erosion, loss of beach and damage to structures along the beach can and do occur as a result of the introduction of shoreline structures. This coupled with the damming of rivers and the resulting shutdown of the source of sand, is changing the nature of the beach and threatening our natural environment. This is not to mention the loss of waves that results from alteration to the ocean floor. The film presents this issue with explanations of how we can stop this phenomenon.

Suggested Activities

1) Ocean currents and temperature. Fill a wide mouthed glass jar with fresh, warm water. Sprinkle pepper or sand on top (it will sink and represent bottom sediment). Place a colored ice cube in the water and watch what hapens as the ice cube melts. What direction does the water move? What happens to the cold water as it warms up? What happens to the pepper or sand as the water currents created move along the bottom?
2) How does the ocean change the coastline? To find out, get a 5" high dishpan; a board that is also 5" high that will fit in the pan to divide it in two; soil; sand; and water. Put the board in the pan and fill one side with soil. Wet the soil until it is the consistency of paste-like mud. Let it dry for a few days. After it has dried, put 2" of sand on the other side. Add 1 1/2" of water above the sand. Remove the board and use it to make "waves". Observe what the waves do to the soil. Try this with larger and smaller waves and see what happens.
3) Habitats. Gather pictures of different marine habitats including, but not limited to, kelp forests, coral reefs, deep ocean, shallow ocean, tide pools, sandy shore, rocky shore, estuaries, wharf or pier piling communities. Show students pictures and have them determine physical and biological factors that might determine

which animals would inhabit each area. Examples of physical factors are salinity, temperature, pressure, light, type of bottom, wave and/or current action, pollution, available space, available oxygen. Examples of biological factors may include food, feeding behavior, protection, predators, competition.

Activism

KEEPERS OF THE COAST explains what is being done at the current time to address the concerns cited above and within the film. Unfortunately, one of the most significant battles that is faced by those trying to protect the ocean is the lack of knowledge that we are all part of the problem. Until we become aware that what we are doing is having a negative impact, we will not be able to change that behavior. The most important tool to help protect the ocean is education: education about the problems and solutions.

We are all able to make a difference in the quality of the oceans and of our lives. Activism can take many forms, from the visible and dramatic act of chaining one's self to a bulldozer, to testing local water quality, or minimizing the introduction of pollutants to storm drains. Activism is basically taking action. When it comes to protecting the ocean, the importance of becoming an activist stretches way beyond the surfing community to all those who enjoy spending time at the ocean. Over 50% of the United States population lives within 50 miles of the ocean. That is a highly significant segment of our population. In addition, coastal tourism accounts for several billion dollars in revenue to our economy. So for the sake of both private enjoyment and a health economy, a clean ocean is very important.

Suggested Activities

1) Have your class make a stencil that reads, "No Dumping! Drains to _____" and fill in whatever body of water your storm water drains into (ex: ocean, bay, lake, river). Have the class stencil this message on the curb in front of storm drains in your area.

2) Break students into cooperative groups. Have each group decide on an environmental topic they would like the world to know about (such as recycling motor oil instead of dumping it down the storm drain). Have them write a song about their topic. Give them a time limit. Use a tape recorder or video and record each group singing their song. Get the class back together and play all the tapes. Have the class vote on the best message.
3) Have your students investigate who their local senators and representatives are and find out what their position is on the Clean Water Act. Have them write letters discussing whether they agree or disagree with their representatives' viewpoints.
4) Have the class scout out local sources of pollution to nearby bodies of water (restaurants, businesses, farms). Then ask violators to clean up their act if they want your continued business.
5) Have students write to their local water district and get information on a variety of things such as: local water use, how storm drainage is handled, how water disposal is planned and zoned for, what happens to treated sewage, whether sewage is treated to primary, secondary, or tertiary levels?
6) Get a map that shows water drainage and have students trace where the water from their area ends up. Is it a lake, river, ocean?
7) Have students study water use in ancient cultures. How did these cultures get their water, clean it, and dispose of it when they had used it? Compare and contrast to today's water use plans.
8) Have students find out what, if any, local efforts there are to clean up their local environment such as beach cleanups, annual home toxic waste pickups, etc. Is there a local lake or river that needs to be cleaned? Have students organize their own cleanup if there is not one already organized.
9) Have students find out, from their local or state chamber of commerce, how many tourist dollars are spent in their area. How much money is spent by industry to keep their recreational areas clean? Have them predict how one could influence the other.
10) Have students write to their representatives in the state and federal government with their concerns about their environment.
11) Have students use an almanac and find out population growth statistics. Have them make a graph. Could the growing popula-

tion have an effect on future water use and/or pollution? Have them analyze their results.

Questions & Answers: Sewage in the Ocean

Q. What does the term "sewage" actually mean?
A. Waste water from human activity that goes down drains and toilets.

Q. Is it correct to call urban runoff from street gutters sewage?
A. No. Urban runoff is technically called nonpoint source pollution because it comes from many different sources. Around cities, urban runoff that enters the ocean through storm drains is the greatest cause of surf zone pollution. Any chemical or organic matter that sits on the pavement will be washed into the ocean during a rain. The runoff problem is often worse in agricultural areas where manure, fertilizer and pesticides flow into streams, rivers and lagoons. In general, it is a health risk to swim or surf 24 to 48 hours after the end of a rainfall.

Q. Is it correct to call the discharge that goes directly from a factory or an industrial facility into the ocean, sewage?
A. No. It is industrial waste water. If this waste water is sent to the sewage system, it must meet specified standards before it is allowed into the sewage treatment plant. These standards require pre-treatment before the waste water can be discharged into the sewer system.

Q. What is the difference between primary, secondary and tertiary sewage treatment?
A. Primary means that the solids are settled out. Secondary means that more solids are removed by bacterial digestion. Tertiary treatment usually involves filtration and chlorination/dechlorination. Tertiary is the highest level. It is generally cleaner than most urban coastal water.

Q. Is primary, advanced primary, or secondary treated sewage ever dumped directly into the surf zone?
A. Never intentionally. Treated sewage is typically discharged through an outfall pipe. It is usually a few miles offshore and in deep enough water so that the thermocline keeps the discharge from coming to the surface. The thermocline is an underwater thermal horizon that separates the warm surface layer from the cold bottom water.

Q. Do sewage treatment plants treat toxins?
A. No. These treatment plants are designed to remove organic matter from waste water, some of which contain bacteria and viruses. Toxic chemicals can contaminate the environment or disrupt biological sewage treatment processes. Sewage treatment facilities try to keep high levels of these chemicals out of their sewers by making industry pre-treat their waste water. Industry must then dispose of their own hazardous materials in accordance with government regulations. Non-hazardous materials go into sanitary landfills or are incinerated.

Q. When is sewage a big problem for surfriders?
A. The greatest threat from sewage is from combined sewer overflows, leaks in sewer pipes, back-ups at sewer pump stations, breakdowns in equipment at the sewage treatment plants or problems with the outfall pipes. Any one of these problems can cause raw (untreated) sewage to empty into the ocean. When rain water floods the streets, it flows into sewer manholes and the system can overflow. In addition, many urban areas have grown faster than the sewage infrastructure. It is a risk to surf in areas that have large numbers of septic fields or poorly maintained septic tanks connected to the beach houses. (In other words, areas where there are no sewage treatment facilities). If the tanks are not maintained, the sewage will leak into the ground water and surface runoff water and eventually find its way to the surf.

Glossary

Activism The theory, doctrine, or practice of assertive, often militant action, such as mass demonstrations or strikes, used as a means of opposing or supporting a controversial issue, entity, or person

Bar A ridge of sand or gravel on a shore or stream bed, that is formed by the action of tides or currents.

Barrier Island An elongated sand island essentially parallel to the shore, commonly having dunes and separated from the mainland by a salt marsh or lagoon.

Breakwater A barrier that protects a harbor or shore from the full impact of waves.

Clean Water Act The primary law in the United States that protects rivers, lakes and coastal waters from pollution. It is also the only national law that protects wetlands. Originally passed in 1972, it comes up for reauthorization every five years, giving Congress the opportunity to amend it.

Coast Region Extending inland from the sea, ordinarily as far as the first topographic change in the land surface. A stretch of the shore together with the land nearby. In general, an area where maritime influences prevail.

Coliform Of or relating to the bacilli that commonly inhabit the intestines of human beings and other vertebrates, especially the colon bacillus.

Dam Barrier, commonly across a watercourse, to hold back water, often forming a reservoir or lake.

Effluent Any substance, particularly a liquid, that enters the environment from a point source. Generally refers to waste-water from a sewage treatment or industrial plant.

EPA Environmental Protection Agency, created in 1970, has the responsibility of enforcing most federal environmental laws (including the Clean Water Act); for administering the Superfund to clean up abandoned toxic waste sites; and for awarding grants for local sewage treatment plants.

Erosion The process by which the earth is worn away by glaciers, rivers, waves and currents.

Evaporation Gradual change of a liquid into a gas without boiling.

Harbor A sheltered part of a body of water deep enough to provide anchorage for ships.

Indicator Species A species whose condition points to the relative health or ill-health of a given environment.

Jetty A structure, such as a pier, that projects into a body of water to influence the current or tide, or to protect a harbor or shoreline from storms or erosion.

Nonpoint Source Source of pollution in which wastes are not released at one specific, identifiable point but from a number of points that are spread out and are difficult to identify and control.

Point Source Source of pollution that involves discharge of pollutants from an identifiable point, such as a sewage treatment plant.

Pollutant Something that pollutes, especially a waste material that contaminates air, soil, or water.

Pro Bono Done without compensation for the public good: a lawyer's pro bono work. [Latin pro bono (publico), for the (public) good : pro = for + bono, ablative of bonum = the good.].

Sand Erosion Term for the processes by which the surface of the earth is constantly worn away into sand, principally by the abra-

sive action of running water, waves, glaciers, and wind. Streams and ocean waves, for example, erode sand and bedrock by their own impact or by the abrasive action of the debris they carry.

Sand Mining The process or business of extracting sand from the ground.

Sand Replenishment Filling or making complete again with sand; adding a new stock or supply of sand to a beach.

Sewage Liquid and solid waste carried off in sewers or drains.

Spit A narrow point of land extending into a body of water.

Storm Drain A pipe or channel for carrying off water or sewage, particularly from city streets.

Swells Long period waves with a smooth profile that move out from the storm area and travel great distances across the ocean.

Tides Alternate rise and fall of sea level in oceans and other large bodies of water. These changes are caused by the gravitational attraction of the moon and, to a lesser extent, of the sun for the earth.

Toxin A poisonous substance, especially a protein, that is produced by living cells or organisms and is capable of causing disease when introduced into the body tissues but is often also capable of inducing neutralizing antibodies or antitoxins.

Treated Water Water which has been subjected to a process, an action, or a change for its improvement; refers especially to a chemical or physical process or application.

Trough The lowest point on a wave profile between wave crests

Urban Runoff Also known as nonpoint source pollution; includes materials and chemicals which are washed into the storm drain

system from a variety of sources. According to the National Urban Runoff Pollution Study, 60% of the pollutants in our nation's waterways comes from nonpoint sources.

Wastewater Water that has been used (for washing, flushing, or in a manufacturing process) and so contains waste products; sewage.

Water Cycle The cycle of evaporation and condensation that controls the distribution of Earth's water as it evaporates from bodies of water, condenses, precipitates, and returns to those bodies of water. Also called the hydrologic cycle.

Water Vapor Water in a gaseous state, especially when diffused as a vapor in the atmosphere and at a temperature below boiling point.

Wave A phenomenon of energy transfer in physics. In water, a ridge or swell moving through or along the surface of a large body of water.

Wave Crest The highest point along a wave profile.

Wetlands Ecosystems in which the water table is at or near the surface. They are divided into estuarine and freshwater systems and subdivided into bogs, swamps, and marshes. Their sluggish water often creates a rich habitat for plants and wildlife, and they are spawning and feeding grounds for numerous animal species. Many wetlands were destroyed by urban growth and farming before their value was recognized, but environmental regulations and groups now attempt to protect or restore them.

Resources

There are a number of environmental groups around the world working to protect our world's precious water supply. Among them is the Surfrider Foundation, a non-profit environmental organization dedicated to the protection and enhancement of the world's oceans, waves and beaches through conservation, activism, research and education.

The Surfrider Foundation has two programs available to students and teachers which are implemented by over 30 chapters throughout the U.S. For more information on either program described in the following contact Surfrider's national office at 1-800-743-SURF or one of the regional chapters listed below.

Respect the Beach

A coastal educational program that includes videos and booklets designed to teach the basics of beach safety, marine ecology and ocean stewardship. The program is delivered to students by a Surfrider Foundation spokesperson or a representative of a Lifesaving Association. Presentations with these programs include discussion and student hand-outs. Appropriate for all grades.

Blue Water Corps

The Blue Water Corps Program incorporates aspects of the Surfrider Foundation's Blue Water Task Force (introduced in the film) and the Respect the Beach program. It provides students a hands-on educational experience with local water and coastal quality. It brings a water testing program directly to the school for immediate implementation. Local science classes conduct water testing under the supervision of their teachers who include it as part of a science curriculum. Teachers are trained by Surfrider representatives in proper water testing protocol. Surfrider can also provide educational handouts and present the Respect the Beach Program. Appropriate for high school.

U.S. Surfrider Chapters

Boston Organizing Committee (617) 424-1776
Box 462, Astor Station
Boston, MA 02123-0462

Cape Fear Chapter (910) 256-0233
6766-G Wrightsville Ave #230
Wrightsville, NC 28403

Delmarva Chapter (302) 436-9576
33 Cleveland Avenue
Selbyville, MD 19975

Eugene/Oregon Chapter (541) 344-4502
P.O. Box 40861
Eugene, OR 97404

Humboldt Chapter (707) 445-1336
P.O. Box 4605
Arcata, CA 95521

Isla Vista Surfrider Club (805) 562-9222
6881 Del Playa
Isla Vista, CA 93117

Laguna Beach Chapter (714) 494-0059
2955 Laguna Canyon Rd.
Laguna Beach, CA 92651

Long Beach/N. Orange County (310) 438-6994
P.O. Box 3087
Long Beach, CA 90803

Maine Organizing Committee (207) 324-3738
1 Costwold St.
Sandford, ME 04073

Malibu/Santa Monica Chapter
1220 Venice Blvd.
#307
Venice, CA 90291
(310) 451-1010

Maui Chapter
480 Kenolio Rd., #5-103
Kihei, Maui HI 96753
(808) 879-7111

Monterey Chapter
P.O. Box 1410
Carmel Valley, CA 93924
(408) 626-1543

New Jersey Chapter
127 Memorial Pkwy.
Atlantic Highlands, NJ 07701
(908) 291-2424

New York Chapter
11 Spad Lane
Holbrook, NY 11741
(516) 244-9019

Newport Beach Chapter
P.O. Box 7842
Newport Beach, CA 92658-7842
(714) 631-6273

North Coast Chapter (Sonoma)
P.O. Box 138
Bodega, CA 94922
(707) 542-8795

Oahu Chapter
59-272 Pupukea Rd.
Haleiwa, HI 96712
(808) 638-8484

Outer Banks Chapter
P.O. Box 1576
Kill Devils Hills, NC 27948
(919) 480-9287

NW Washington State Chapter
P.O. Box 1664
Westport, WA 98595
(360) 705-8202

Puerto Rico Chapter
P.O. Box 5112
San Juan, PR 00906
(809) 761-8942

Rhode Island Chapter
P.O. Box 146
Newport, RI 02840
(401) 845-9727

San Clemente Chapter
P.O. Box 865
San Clemente, CA 92674
(714) 492-8248

San Diego Chapter
P.O. Box 230754
Encinitas, CA 92023
(619) 792-9940

San Luis Bay Chapter
3543 Main #C
Pismo Beach, CA 93449
(805) 773-1489

Santa Barbara Chapter
P.O. Box 21703
Santa Barbara, CA 93121
(805) 969-399

South Bay Chapter
P.O. Box 3825
Manhattan Beach, CA 90266
(310) 791-0413

South Florida Chapter
9506 Aegena
Boca Raton, FL 33496
(561) 470-0030

San Francisco Chapter
750 La Playa Ste. 620
San Francisco, CA 94121
(415) 665-4155

Santa Cruz Chapter
P.O. Box 3203
Santa Cruz, CA 95063
(408) 423-7667

Ventura Chapter
105 S. Oak St., #185
Ventura, CA 93001
(805) 667-2222

Virginia Beach Chapter
2100 Mediterranean Ave. #14
Virginia Beach, VA 23451
(804) 422-3821

Walla Walla Chapter
334 Sittner Hall
College Place, WA 99324
(509) 527-2739

Washington D.C. Chapter
10004 Forest Grove Dr.
Silver Spring, MD 20902
(301) 681-8488

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