

BEACH EXPLORERS



Surfrider
Foundation.

Respect The Beach
Beachology Unit 1

UNIT 1: BEACH EXPLORERS

Activities for Elementary Level Students

This unit consists of four activities, designed to bring home the following Key Concepts:

- **The world’s ocean covers most of our planet. Everywhere the ocean meets the land there is a shoreline or a beach.**
- **Objects found on the sandy beach can be grouped into: evidence of plant life, evidence of animal life, of humans, and of non-living material.**
- **Sand is made up of tiny bits of everything that is found on the beach.**

Two introductory activities, **Blue Planet** and **Beach Blanket Brainstorm**, guide students into the unit by introducing them to global geography and the vastness of our planet’s oceans, and by encouraging them to share what they already know, value, and enjoy about the ocean and beaches.

In the main activity of this unit, **Beach in a Bucket**, students work in small cooperative groups to explore a sandy beach (or, for those who cannot or choose not to conduct this activity at the beach, a simulated sandy beach in a plastic tub). Through a sorting activity, they discover that biotic (once-living) objects found on the sandy beach can be grouped into those that represent: evidence of plant life, evidence of animal life, and evidence of humans. They discover the differences between once-living (biotic) and never-living (abiotic) objects. Also introduced in this activity is the concept that sand is made up of tiny bits of virtually everything that can be found on the beach.

In the final activity, students make **Explorers’ Field Books** to record what they learned about the beach.

Time Frame: Approximate times for completion of each activity are presented below, but teachers may wish to break each activity into a series of shorter sessions.

Unit 1: Beach Explorers

Activity 1:	Blue Planet	(15 - 30 minutes)
Activity 2:	Beach Blanket Brainstorm	(15 - 30 minutes)
Activity 3:	Beach in a Bucket	(60 minutes)
Activity 4:	Making an Explorer’ Field Book	(45 minutes +)

BEACH EXPLORERS: What You Need

What you need

For the class:

- classroom globe, preferably inflatable 'beach ball' type
- 4-6 sheets of chart or butcher paper (approximately 27" x 34)
- markers (4-5 colors, wide tip)
- masking tape
- miscellaneous posters or pictures depicting beach scenes and/or beach organisms (calendar pictures work well because they are large enough to be seen if posted on a classroom wall)

For each group of 4-6 students:

- 1 plastic tub or dishpan, 12" x 9" x 4" (or newspaper to spread out on desks)
- enough beach sand to fill each tub 2" deep
- fine-point markers or crayons
- lengths of cotton string or yarn
- rulers, yardsticks or measuring tape
- 4-6 sheets of 11" x 17" construction paper (and copy of template on pages 15-16, or pre-made version(s) of field book)
- 4-6 photos, pictures of beach organisms or sandy shores with and without marine debris
- pieces of beach drift and marine debris - at least two pieces from each of the following groups:

(If you plan to conduct Activity 2 on the beach, these can be collected by students on the day of the activity. If not, these materials must be collected ahead of time)



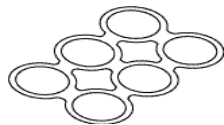
evidence of plants:

driftwood, twigs, leaves, seaweed, kelp or seaweed holdfasts attached to rocks



evidence of animals:

shells; feathers; bones; dried fish parts; shark, skate, or ray egg cases (often called "mermaids' purses"); crab parts; tracks in the sand



evidence of humans:

cans, bottles, candy wrappers, six-pack rings, straws, bottle caps, juice boxes, fishing line, balloons, plastic bags, coins, chicken bones



non-living materials:

rocks, "beach glass" (broken glass worn smooth), plastic, metal

BEACH EXPLORERS: Leave Only Footprints

Leave Only Footprints

When learning about and enjoying the outdoors we should take care to leave it unspoiled for the present and for those who come later.



Many children do not have the opportunity to visit beaches. As teachers and role models, we can still bring the ocean and an environmental ethic to them. If logistics or resources prevent you from taking students to the beach for this activity, you may collect items for the classroom and present all parts of Unit 1 there. When collecting for classroom presentations, take only a small amount of beach drift - the dead animals and plants washed up on the shore. On the other hand, collect as much human litter and debris as you can carry. It is important that we tell students why we collected our beach drift [many students will have the opportunity to learn by using it], that we only collected drift and debris (no living organisms), and that when we are done with it, we will return the drift to the beach where we found it and properly dispose of the litter [in the trash]. Please note that nothing may be taken or collected from a reserve, preserve, or National Seashore, not even beach drift or sand. We suggest that you do not purchase shells and other dead animals such as sea stars or sea horses because most are collected alive and reefs may have been dynamited to find them.

If you do undertake a field trip to the beach as part of this activity, take similar care in replacing beach drift, beach wrack and organisms in the locations where you found them. Make sure you explain these actions to students, as, in addition to teaching an environmental ethic, this will reinforce concepts introduced during the activities (e.g., be sure to replace the organisms you found in the beach wrack back under the kelp and seaweed where you found them. Organisms move to the underside of the beach wrack to avoid exposure to the sun and to predators such as shorebirds). Disposing of any human-generated litter found during the exercise will also reinforce a stewardship ethic that is in keeping with the Surfrider Foundation mission.

BEACH EXPLORERS: Getting Ready

Getting Ready

1. Several weeks before beginning this unit, plan your strategy for gathering a large number

(at least one for every student in the class you will be presenting to) of photographs, pictures, or drawings of sandy beaches and beach organisms (plants and animals). These pictures are used early on in this first activity and again later in the unit. For the second activity, some of these pictures should focus on the sand itself. You can contact teachers, and ask them to have students bring in photos and illustrations, and gather some yourself.

2. **For those presenting Activity 2 in a classroom:** Collect items for the beach buckets. If you don't live near a beach, don't worry! See the "Getting Ready Tips" in the introductory pages of this RTB notebook for ideas.

3. **For those presenting Activity 2 in a classroom:** Assemble the beach buckets by adding two inches of sand to the bottom of each plastic tub, and randomly placing marine debris and beach drift items on top of or in the sand.

4. Have chart paper, markers, and masking tape at the front of the room. Duplicate the field book template (provided on pages 13-14 of this unit guide) and make up sample field books as needed.




5. Divide one piece of chart paper into three columns, each one headed by simple drawings of a plant, an animal, and a human. On another piece of chart paper, draw a large question mark as a heading


6. Hang the posters and/or pictures of beach scenes and beach animals in the classroom. Teachers and/or students could also hang these ahead of time to build interest and anticipation for your presentation.

7. Write out each of the Key Concepts for this activity (below) in large, bold letters on separate sheets of chart paper and set aside.

- **The world's ocean covers most of our planet. Everywhere the ocean meets the land there is a shoreline or a beach.**
- **Objects found on the sandy beach can be grouped into: evidence of plant life, evidence of animal life, of humans, and of non-living material.**
- **Sand is made up of tiny bits of everything that is found on the beach.**

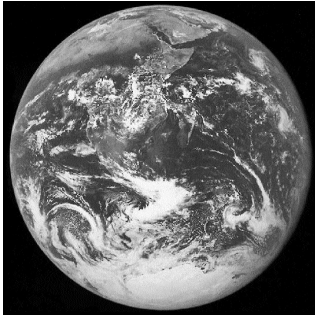
BEACH EXPLORERS: Getting Ready

 PLANT	 ANIMAL	 HUMAN



The things one can find at the beach can be separated into many categories. One can find evidence of things that were once alive (or biotic materials), such as shells, bones, feathers, corals, egg casings, driftwood, and seaweeds. Biotic material can be further subdivided into evidence of plants or evidence of animals. One can also find evidence of things that were never alive (or abiotic materials). A few common types of abiotic materials are rocks, minerals, glass, and plastics. Evidence of people is another category, but these materials can be biotic (paper, pieces of lumber, chicken bones), or abiotic (plastic, glass, metal).

Activity 1: Blue Planet



The ocean has such immense influences over our global environment and our daily lives that it is difficult to study or understand. Even the simple fact of its vast aerial extent over the earth's surface is a difficult concept to comprehend. However, many students do have some prior knowledge of, and experience with, the ocean or the beach. Beginning with these familiar experiences will help students to create a context within which they can place new ideas and concepts about the ocean.

1. Ask students to brainstorm about all the ways that people use and depend on water. Then ask them to think of the largest body of water in the world - most certainly some or all will come up with the correct answer: the ocean. Use a globe to show a "traditional" map view of the world - that is, with the continents in full view and the Americas in the center. Now turn the globe to show the "Pacific Ocean view" - half of the world with almost no land showing. What does this view tell us about the world?

[Most of the earth is covered by oceans.]

2. Ask the students, based on what you have just shown them, what percentage of the earth's surface is covered by water. (A brief and simple explanation of percentages may be necessary). Let them make some of their own estimates. Then tell them that you are all going to play a little game together to make a better estimate of the portion of the earth that is covered by the ocean. If you have an inflatable globe this game can be played by tossing the "earth" from student to student — like playing with a beach ball. As each child catches the globe, she or he will tell whether ocean or land is under her or his right thumb. Make a tally of the student' answers on the chalk board or a piece of chart paper and compute the percentage [# land 'hits' / # ocean 'hits' X 100]. If you only have a traditional globe, the globe should be passed around with the same reporting done by each child — or you could spin the globe and have students stop it with a finger and again report: land or ocean. This is rather a random process, but if you toss or spin the globe enough times, the final score will show that the world ocean covers approximately 70% of the earth's surface.

Blue Planet continued

3. Introduce and discuss the following ideas:

- Most of our planet is covered by ocean.
- People get food and water from the ocean.
- Over half of our oxygen comes from plants in the ocean.
- The ocean plays a major role in moderating our climate. Without an ocean, the surface of our planet would burn up or melt during the day and freeze at night.

4. Tell students that in the next few activity sessions they will be learning more about the ocean and, in particular, about the place where the water meets the land. Ask if anyone knows what this place is called. [beach, shore, shoreline]

5. If the students have learned about measuring, you can have them trace the coast lines of some of the continents using lengths of yarn, then measure the yarn to learn how many miles of coast we have in the U.S. or the Americas, Australia, Europe, etc. (this could be done using the globe, or using maps handed out to students working in small groups).

6. Hold up the Key Concept for this activity, and have one or more students read it aloud. Briefly discuss how this statement sums up the important ideas from this activity. Post the concept on the wall for students to revisit during the rest of the unit.

- **The world's ocean covers most of our planet. Everywhere the ocean meets the land there is a shoreline or a beach.**



BEACH EXPLORERS: Beach Blanket Brainstorm

Activity 2: Beach Blanket Brainstorm

This activity is meant to encourage students to talk about their prior knowledge of beaches and oceans. This discussion activity should also give you and/or their teacher a better understanding of their level of knowledge on the topic of oceans and beaches.

1. Introduce the topic of a beach to your class by asking, “Has anyone been to a beach?” “Where was the beach you visited?” “What kinds of things have you seen at a beach?” Remind students that a beach can be located along a river, creek or lake as well as the ocean.
2. According to the size of the class, the number of volunteers you have to help students and the amount of time allotted for this activity, group students into pairs or small groups. Pass out a picture or pictures of a beach, beach object or beach organism to each student or group of students. The pictures will help the students to think about beaches and respond to a few questions with their group. Pass out a large piece of chart paper or butcher paper to each group.
3. Ask a question from the list below (or make up some of your own questions), and give the groups or pairs a chance to discuss a response.
 - Close your eyes and imagine that you are sitting on a beach. Now look down at the beach, and describe what the beach looks like.
 - Where are some of the beaches you have visited?
 - What are some of the things you like best about beaches?

Ask the students to write down an agreed upon response on the chart paper. Tell them that they don't have to choose just one person's answer, rather their group answer might take the form, for example, of a list that includes everyone's response to the question posed. If you are working with primary level students, you may need a helper to assist each group by writing out their responses. If you are short on volunteers, you and the students' teacher should circulate among the groups to help them formulate their responses and write them down.

4. Repeat this exercise with two or three more questions. Then go over with the entire class, each group's responses to the questions, one question at a time.
5. Once the preliminary questions have been addressed, spend some time with the entire class discussing the following question:
 - If you walked along a sandy beach looking very carefully, what types of things do you think you might find?

Write down class responses on chart paper or the chalkboard, using words and simple drawings.

Activity 3: Beach in a Bucket

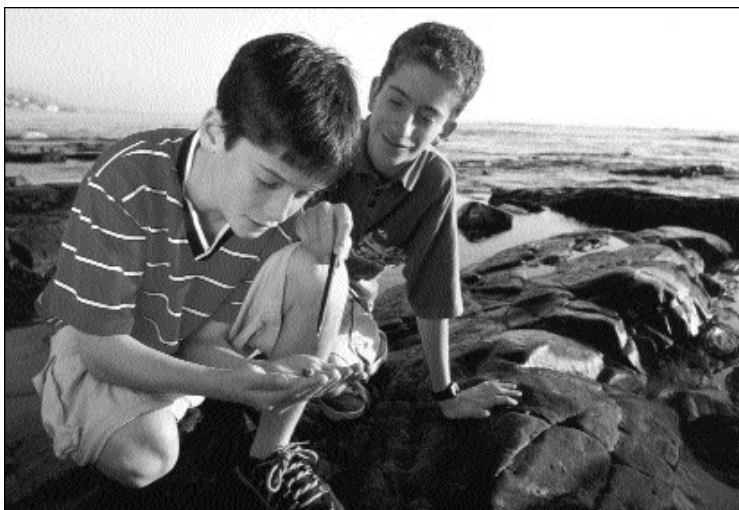
1. Tell students that now they will have the chance to explore a “beach” (either as a field trip or right in their own classroom.)
2. Divide the class into groups of four to six students.

If this is to be a classroom exercise: Show students the pre-prepared beach buckets, distribute one to each group and ask the students to handle the items carefully. Tell them that they can feel the sand and pick up pieces of drift and debris to look at them more closely. They should keep all the sand in their buckets so the classroom will stay clean!

If this activity will be conducted as a field trip: Distribute the empty tubs to the student groups. Have them spread out across an area of beach. Ask the students to collect items as prescribed in the “Getting Ready” section of this activity. Be sure to caution them not to over collect, and remind them that they will be asked to replace all items of drift where they found them. Remember “Leave only footprints.” Encourage students to feel the sand and pick up pieces of drift and debris in order to observe them closely.

3. Circulate among the groups. Ask focusing questions, such as:










- What colors do you see?
- What do the things on the beach feel like?
[fuzzy, rough, prickly, soft, etc.]
- What are some of the shapes of objects on the beach
- Where do you think the items came from?
- What evidence is there of living things?



BEACH EXPLORERS: Beach In A Bucket

Sorting and Grouping

1. After they've made some observations, encourage students to sort or group the items into categories, based on any observable characteristic of their choice.
2. Give groups time to share and describe the categories they devised.
3. Explain that often when we go to a sandy shore, we may not see many living plants and animals at first, but if we look closely, we will always find plenty of evidence of living things.
4. Next, have students re-sort the items into the following four groups: evidence of plant life, evidence of animal life, evidence of humans, unknown items (or items about which they can't agree).
5. Display the piece of chart paper with three columns headed by simple drawings (Plant, Animal, Human). Display the second piece of chart paper headed by a large question mark to record unknown items.
6. Have the groups share again. On the chart paper, record with simple labeled drawings, the items groups share. Explain that everything in the first two categories is evidence of life (or biotic material). Evidence of humans could be biotic (chicken bones or paper) or abiotic (plastic, aluminum). Can anyone identify the unknown items?

 PLANT	 ANIMAL	 HUMAN
 KELP	 SNAIL	 CIGARETTE BUTT
 EEL GRASS	 CRAB	 6-PACK RINGS

Recording student ideas on chart paper provides a permanent “group memory” for which the whole class is responsible. If misconceptions arise, they should also be recorded. If they are challenged by another student, add a question mark in another color next to the idea. Make sure that sometime during the unit, all misconceptions are “discovered” and corrected, preferably by students. Go back to your group memory and physically replace the misconceptions with the new information. No individuals need be ‘wrong.’ The group’s collective knowledge simply changes as it grows.

Sorting and Grouping continued

7. **If you are conducting your activity in the classroom:** Point out pictures or posters you have put up or passed around that show examples of the whole, live animals and plants from which the biotic material came.

If you are at the beach: Gather the class around a mass of beach wrack and have them look through it carefully to find some of the living organisms of the beach. Others could dig and sift through the sand to find hidden animals such as beach hoppers and sand crabs. Remember to handle these creatures with care and return them to the locations on the beach where they were found, once the students have had an opportunity to observe them and note some of their characteristics. Ask the students to observe other animals that may be present, such as shorebirds.

8. Ask students if there are things left in their beach buckets that were never alive. These things, such as rocks and most of the sand, are called non-living or abiotic materials. Ask if there are items that could go in more than one category. In general, things found at the beach are called “beach drift.” More specifically, the things found in beach drift that have been left by humans are referred to as “marine debris.”



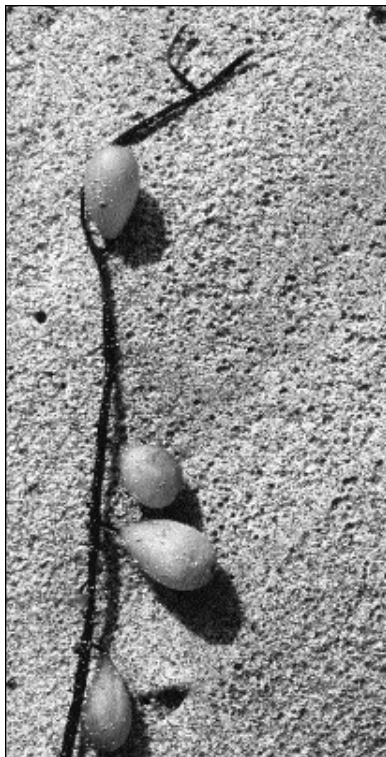
BEACH EXPLORERS: Beach In A Bucket

Sorting and Grouping continued

9. Ask students what might eventually happen to all of this beach drift and marine debris if it were left on the beach? If it doesn't come up in the discussion, explain that many of the items found at the beach will be pounded by wind, waves, tides, and each other, and eventually will be ground into sand. Sand can be either biotic or abiotic, and is usually a combination of both.

10. In closing the activity, hold up the Key Concepts for this activity one at a time, and have one or more students read them aloud. Briefly discuss how these statements review the important ideas from today's activities. Post the concepts in the classroom near your chart-paper record of evidence of plants, animals, and humans for students to revisit during the rest of the unit.

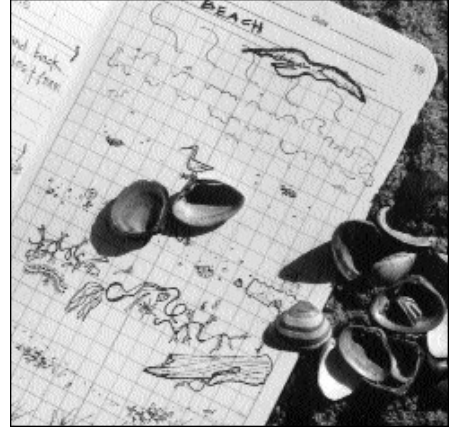
- Objects found on the sandy beach can be grouped into: evidence of plant life, evidence of animal life, evidence of humans, and non-living material.
- Sand is made up of tiny bits of everything that is found on the beach.



Activity 4: Making an Explorer's Field Book

The field book activity is designed to help students organize and reconstruct new information in preparation for future studies in science. This activity also provides opportunities for students to use their creativity and to improve their writing and drawing skills.

1. Explain to students that scientists and explorers often use written notes accompanied by maps and drawings that they make to record their observations at study sites. They make these notes and drawings in pocket-sized books, called 'field books', so that they can later refer to their notes, and retain information in far greater detail than simple recollection would allow. The use of field books is a very old practice, first used by scientists and explorers who lived in times before photography was invented. It is a time honored practice, and still very much used to this day.



2. Tell students that in this activity, they will be making their own field books about their (classroom or actual) trip to the beach. First they will need to make the blank book. Pass out fine-point markers and crayons and 11" x 17" paper. Lead them through the directions on the field book instruction sheet . *(Please see pages 15-16)*

3. Encourage students to write in their field books about what they learned by creating text and illustrations on alternate pages. They can title their books, "My Field Book," "My Beach Book," or make up their own titles. Suggest headings for each two-page spread such as: Heading 1: Plants and Animals; Heading 2: People at the Beach; Heading 3: The Best Thing About the Beach.

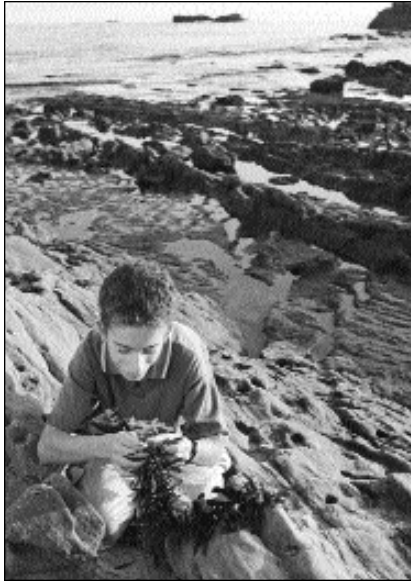
4. Provide students with time to write and draw pictures that are appropriate for each heading. Circulate among the students to answer questions and check their progress.

5. When completed, give the students time to share their field books informally. Students could display the books on their desks, and circulate around the room to view each other's books.

6. After they've completed the field book exercise, ask students to think about two or three of the following questions and then hold a class discussion:

- How did you decide what to put in your field book?
- Was there anything special you did to help you remember what you learned in this activity?
- Are you proud of your book? Could you improve it?
- Do you think this book will help you to remember what you learned?
- Does your book reflect the most important things you learned?

Going Further

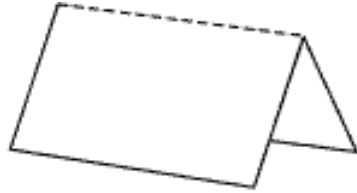


1. Take a field trip to the beach (at a local seashore, stream, river, pond, or lake) and conduct a beach clean-up project. Have students explore the beach and sort what they find into the same categories used in this activity. Bring enough plastic garbage bags so that every pair of students can have one. Divide the pairs into three collection groups: 1) unbroken glass and cans; 2) plastic; 3) paper and other miscellaneous trash. Students should wear gloves and be warned of picking up sharp or toxic items. If you're on an ocean beach, you could have all pairs line up from the water's edge to the dune or cliff area and sweep a half-mile section of beach. Remind students that they should collect only evidence of humans. Take all the debris they have collected and organize it into categories. Weigh or measure the volume of each. Discuss the differences between biodegradable and non-biodegradable, and recyclable and non-recyclable objects. Point out any collected items that are natural, rather than human-made, and ask students to return them so that your impact on the ecosystem is minimized.

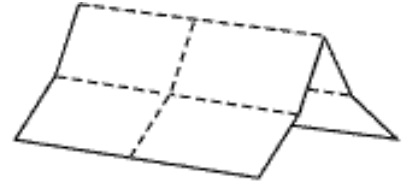
2. Introduce students to Surfrider's Beachscape program by conducting a mapping exercise at a local beach. Have students explore the beach and locate beach features, such as areas of wide and narrow beach, creek or river mouths (or lagoon outflows), structures, outfall pipes and others. Discuss which of these features are natural, which are man-made, and which might fall into both categories.

3. As appropriate, research nearby beach and shoreline conservation projects, and seek out ways your chapter can assist classes in getting involved.

BEACH EXPLORERS: Instruction Sheet for Making Field Books



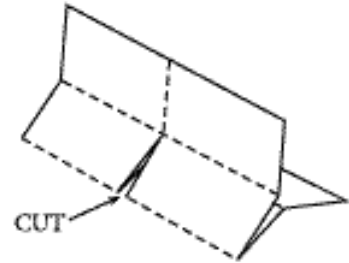
1. Fold the sheet in half crosswise.



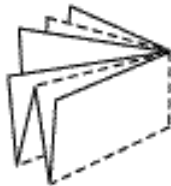
4. Unfold back to Step #1, where the sheet is only folded in half.



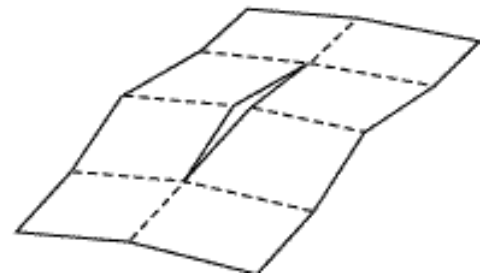
2. Fold up ends separately to form a "W" shape.



5. Face the folded edge closest to you and cut along the middle fold through both sides to the center as in diagram.

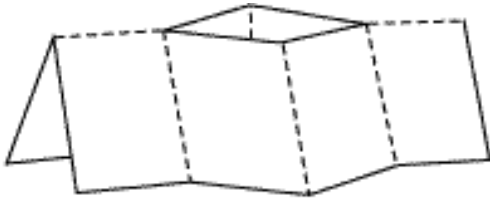


3. Fold the paper in half again to form a small rectangle. Then unfold this last fold, and fold it again back the opposite way, making good, hard creases on each side.

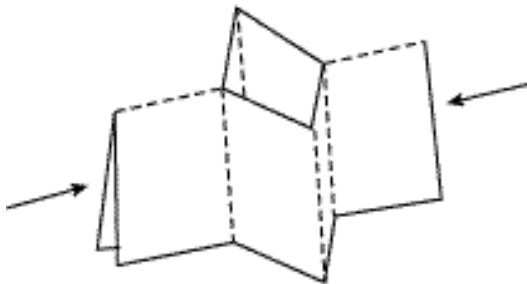


6. Unfold the sheet entirely

BEACH EXPLORERS: Instruction Sheet for Making Field Books

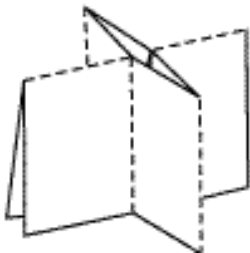


7. Refold the sheet in half, this time lengthwise.



8. Grab the two outside panels and push inward. The part you cut with the scissors should open up and form a diamond.

9. Keep pushing until the "diamond" closes flat.



10. Finally, fold all the pages together to form a small book. make good, hard creases on all sides.



GETTING UP TO SPEED

Unit 1: Beach Explorers

This section is not meant to be read out loud to or distributed directly to students (although this is at your discretion). It is primarily intended to provide the necessary, concise background for you - the Surfrider chapter representative (or teacher) - in presenting Unit 1 activities and responding to students' questions. Please see the "Unit 1 Resources" section for books and other materials that will help you, teachers and students to delve more deeply into the subject matter addressed in this unit.

Overview

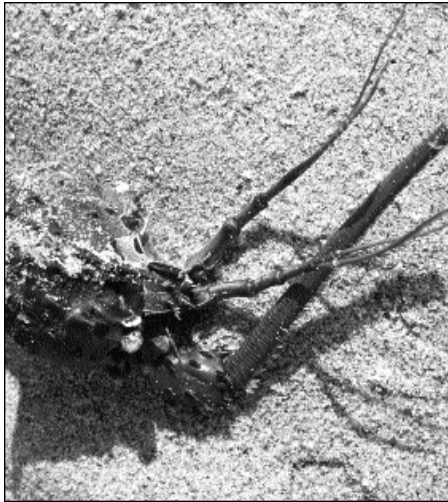
In this unit, students are introduced to the vastness of our planet's oceans and to the characteristics of one type of shoreline we call a sandy beach. Two introductory activities, Blue Planet and Beach Blanket Brainstorm, guide students into the unit by introducing them to global geography and encouraging them to share what they already know, value, and enjoy about the ocean and beaches.

In the main Beach in a Bucket activity, students work in small cooperative groups to explore a sandy beach (or, for those who cannot or choose not to conduct this activity at the beach, a simulated sandy beach in a plastic tub). Through a sorting exercise, they discover that biotic (once-living) objects found on the sandy beach can be grouped into those that represent: evidence of plant life, evidence of animal life, and evidence of humans. They discover the differences between once-living (biotic) and never-living (abiotic) objects. Also introduced in this activity is the concept that sand is made up of tiny bits of everything that can be found on the beach. In the final activity of this unit, students make Explorers' Field Books to record what they learned about the beach.



Background

Our sandy beaches are a special part of our landscape. Our beaches are places we go to relax and play, to contemplate our lives, or just to watch the natural beauty of the sun on the water, the waves and the amazing diversity of life forms that can be seen there.



A sandy beach is also a natural classroom. On closer observation, a beach reveals evidence of natural processes, as well as of man's activities on the adjacent land and ocean (or lake, or river). Distant mountain ranges are weathered by sun, wind, rain, snow and ice, releasing rock and sediments from the mountains' geologic parent material. These eroded sediments are carried by runoff into streams and rivers, which, in turn, transport them to the oceans and the shore. Ocean currents, waves and wind push sediments and "beach drift" from the ocean onto beaches around the world. Marine debris (human-generated refuse that ends up in the ocean or on the shore) is carried from land by the millions of visitors to the world's beaches and dumped from the world's fleet of boats and ships. As waves crash against the shoreline, all of these objects are ground into smaller and smaller bits - rough-edged particles are progressively smoothed and rounded into tiny grains, until they all become part of what most people consider the defining characteristic of a beach: sand.

Look closely at sand and you might see pieces of rocks and minerals that have broken free from the rocky seashore, cliffs, ocean floor and even from the distant mountains. There might be shells or shell fragments from animals that once lived on nearby reefs, bones from animals living in the ocean and on land, algae, coral fragments, glass, driftwood, plastics, feathers, and much more. For more information about the formation of sand, see the "Unit 1 Resources," section as well as Units 2 and 3.

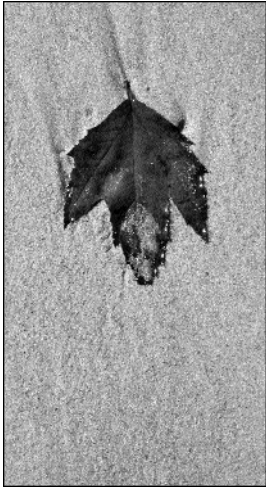


The Center for Marine Conservation reports that the twelve types of trash (the “dirty dozen”) most often found in the United States during the 1998 National Coastal Clean Up were (in order of frequency): cigarette butts, plastic pieces, foamed plastic pieces, plastic food bags/wrappers, paper pieces, plastic caps and lids, glass pieces, straws, glass beverage bottles, metal beverage cans, plastic beverage bottles and metal bottle caps.

Nike Shoe Spill in the ocean, 1990

The Nike shoe spill of May 27, 1990 just southeast of Alaska, was one of the largest releases of human-made drift objects ever with an estimated 60,000 shoes spilling into the ocean. Several months later, Nike sneakers were washing up on the U.S. West Coast. By 1993, the shoes were washing up onto the beaches of Hawaii, many thousands of miles away. Trash, which many nations dump regularly into the oceans, can drift just like Nike sneakers. This is just another indication of the GLOBAL nature of ocean pollution. (Source: *The Wealth of Oceans*, Michael Weber and Judith Gradwohl, WW Norton and Co., 1995, p. 59)

Background continued



The things one can find at the beach can be separated into many categories. One can find evidence of things that were once alive (or biotic materials), such as shells, bones, feathers, corals, egg casings, driftwood, and seaweeds. Biotic material can be further subdivided into evidence of plants or evidence of animals. One can also find evidence of things that were never alive (or abiotic materials). A few common types of abiotic materials are rocks, minerals, glass, and plastics. Evidence of people is another category, but these materials can be biotic (paper, pieces of lumber, chicken bones), or abiotic (plastic, glass, metal).

Beaches throughout the world are strewn with drift and debris, both natural and human-made. “Beach drift” is anything that washes up on the beach, whether it came from living or non-living materials. In later units, students will learn about “beach wrack” in greater detail. You may want to clarify the distinction between beach drift and beach wrack for them. “Beach drift” generally refers to items that wash up on the shore. “Beach wrack” is made up of kelp, other seaweeds, or sea grasses that washes up and often forms a line across an entire beach at high tide. It includes other organisms, shells, beach drift and debris. Many organisms - such as snails, crabs, and limpets - that live on the kelp stipes and fronds are carried into the beach wrack along with the kelp. Worms, flies, and birds feed on the beach wrack as the kelp begins to decay. Most of the animals of the beach wrack are hidden underneath the seaweed to avoid bird predators and the hot sun. The beach wrack forms its own temporary ecosystem on the sandy beach.

The human-made debris, mostly in the form of plastics, is often deadly to ocean and sandy beach inhabitants. It is important to recognize the different types of drift and debris, and to be able to distinguish between those that should be removed for the safety of people and animals from those that should not. For instance, drift and debris such as kelp and broken shells should not be removed from the beach because they form part of an important ecological association within the sandy beach habitat.

Armed with a better understanding of sandy beach habitats, we can protect our beaches and keep them healthy through beach clean-up projects and prevention of behaviors that lead to their degradation.

UNIT 1 RESOURCES

Books

For Children:

Exploring the Seashore, William H. Amos, National Geographic Society, Washington, DC, 1984.

A Field Guide to Seashores Coloring Book, John C. Kricher, Houghton Mifflin, New York, 1989.

One Small Square: Seashore, Donald M. Silver, W. H. Freeman, New York, 1993.

Rocks and Minerals, R. F. Symes, Knopf, New York, 1988.

Sand and Man, Wilma Willis, Children's Press, Chicago, 1973.

Sand Dunes, Jan Gumprecht Bannan, Carolrhoda Books, Minneapolis, 1989.

Seashore, David Burnie, Dorling Kindersley, New York, 1994.

The Seashore, Elisabeth Cohat, Scholastic, New York, 1995.

Seashore, Steve Parker, Knopf, New York, 1989.

Seashore Surprises, Rose Wyler, Julian Messner, Englewood Cliffs, New Jersey, 1991.

Seashores, Joyce Pope, Troll, Mahwah, New Jersey, 1990.

Shell, Alex Arthur, Knopf, New York, 1989.

Shells, S. Peter Dance, Dorling Kindersley, New York, 1992.

Shoreline, Barbara Taylor, Dorling Kindersley, New York, 1993.

50 Simple Things Kids Can Do to Save the Earth, John Javna, The Earth Works Group, Andrews and McMeel publishers, Kansas City, 1990.

For Adults:

A Citizen's Guide to Plastics in the Ocean: More Than a Litter Problem, Kathryn J. O'Hara, Suzanne Iudicello, and Rose Bierce, Center for Marine Conservation, Washington, DC, 1988.

Beachcomber's Guide to California Marine Life, Thomas Niesen, Gulf Publishing Co., Houston, Texas, 1994.

Beachcomber's Guide to the Gulf Coast Marine Life, Thomas Niesen, Gulf Publishing Co., Houston, Texas, 1989.

Beachcomber's Guide to the Gulf Coast Marine Life: Florida, Alabama, Mississippi, Louisiana, and Texas, Nick Fotheringham and Susan Brunenmeister, Gulf Publishing Co., Houston, Texas, 1989.

Pacific Coast, The Audubon Society Nature Guides, Bayard H. McConnaughey and Evelyn McConnaughey, Alfred A. Knopf, New York, 1985.

Pacific Seashores, A Guide to Intertidal Ecology, Thomas Carefoot, University of Washington Press, Seattle and London, 1977.

Sand, Raymond Siever, Scientific American Library, New York, 1988.

Seashells of the World, R. Tucker Abbott, Golden Press, New York, 1985.

Seashore Identifier, Bob Lollo, Mallard Press, New York, 1992.

Seashores: A Guide to Animals and Plants Along the Beaches, Herbert S. Zim and Lester Ingle, Golden Press, New York, 1989.

The Seaside Naturalist: A Guide to Nature Study at the Seashore, Deborah Coulombe, Prentice Hall, New York, 1984.

Shells of the World, A. P. H. Oliver, Henry Holt, New York, 1975.

Shore Ecology of the Gulf of Mexico, Joseph C. Britton and Brian Morton, University of Texas Press, Austin, Texas, 1989.

Waves and Beaches, Willard Bascom, Anchor Books, Garden City, New York, 1964.

BEACH EXPLORERS: Unit 1 Resources

Magazine Articles

“Beaches,” *Scientific American*, August 1960.

“Collecting and Examining Beach Sand: Getting Started,” *Microscopy Today*, 96(5): 18- 20, June 1996.

“Sand,” *Scientific American*, April 1960.

“Sands of the World,” *Scientific American*, 275(2): 62-67, July 1996.

Music

Daughters of Water, Sons of the Sea
by Jesse Boggs
Schneider Educational Products, Inc.
San Francisco. 1991

This cassette is full of delightful songs about the ocean and some of the creatures in it.

Slugs at Sea
by Banana Slug String Band
Music for Little People
Redway, California. 1991

This cassette contains many fun and entertaining songs all about the ocean. The most appropriate song for Beachology is “Life on the Shore” where the lyrics say if you live on the shore “you’ve got to move with the tide...run real fast or burrow and hide.”

Videos

Keepers of the Coast
The Surfrider Foundation
122 So. El Camino Real, PMB#67
San Clemente, CA 92672
(949) 492-8170
31 minutes

Spectacular surfing footage dramatizes the message of this important video. Every year, thousands of beaches are closed due to pollution. This video teaches students about the water cycle, the causes of coastal pollution and the interaction of the ocean, shore, winds and tides that creates waves. The video describes the grassroots efforts of the Surfrider Foundation in battling coastal water pollution.

Oceans In Motion

National Geographic Edventures
1145 17th Street N.W.
Washington, D.C. 20036
(202)775-6563
24 minutes

Professional surfer Robert “Wingnut” Weaver serves as a guide through this video, which illustrates, with helpful animation, how the familiar phenomena of waves and tides are created. The impacts of ocean currents on climates around the world is explained, citing examples from the Gulf Stream in the Atlantic and El Nino in the Pacific. The video also explores how oceans came to be: how all that water got there in the first place and how it became salty. Viewers travel back to the time when the earth was first formed. Dramatic footage from the ocean floor reveals that the formation of the earth’s crust is still taking place. Seismic activity on the ocean floor and formation of tsunamis, as well as ocean floor topography and life forms are revealed. The video is accompanied by a teacher’s guide which includes key concepts and suggested follow-up activities.

New England Aquarium Videos

(various titles)
New England Aquarium Teacher Resource Center
Central Wharf Boston, MA 02110-3399
(617) 973-6590
various lengths

The Teacher Resource Center maintains a large collection of circulating videos, slide shows, software, filmstrips, posters, and small kits available to teachers nationwide. Included are about 10 video titles on a wide variety of topics. Call or write for a list of titles.

BEACH EXPLORERS: Unit 1 Resources

Videos continued

Oceans Alive!
Environmental Media & Marine Grafics
P.O. Box 1016
Chapel Hill, NC 27514
(800) 368-3382

50 minutes (each part has 10 five-minute programs)
available in English or Spanish

Oceans Alive! illustrates the relationships among marine life and supports the teaching of life science. Filmed entirely in the wild in many locations, this series encourages students to ask questions and share experiences. The series is divided into four main parts, each with 10 programs ranging over a wide and diverse spectrum of organisms, habitats, and environmental issues. It is recommended for ages 10 to adult.

Sand Through a Microscope, second edition
Warren A. Hatch Productions
1330 SW Third Avenue, #703
Portland, OR 97201-6636
52 minutes

Shows a wide variety of sands from around the world. The video ends with a question period when the viewer is asked to guess the types of sand shown.

Sea World Videos (various titles)
Sea World Education Department
1720 South Shores Road
San Diego, CA 92109-7995
(619) 226-3834

40 minutes - except Meet the Challenge: Marine Conservation (28 minutes)

Sea World's education department has a wide array of educational materials available to teachers including videos, teacher's guides, posters, information booklets, and even a live TV program. Video topics include marine conservation issues, baby animals, sharks, polar animals, dolphin research, and coral reefs. Call or write for details.

Seashores
Hollywood Select Video Inc.
10010 Canoga Avenue, B5
Chatsworth, CA 91311
(818) 773-0299
25 minutes

This video explores the inhabitants of the Atlantic and Pacific coasts. A detailed view of both is presented in this colorful video.

Trashing the Oceans
NOAA Marine Debris Information Office
c/o Center for Marine Conservation
580 Market Street, Suite 550
San Francisco, CA 94104 (415) 391-6204
7 minutes +

Trashing the Oceans describes the threats of marine debris using graphic video footage.

Posters

Don't Teach Your Trash to Swim
Center for Marine Conservation
580 Market Street, Suite 550
San Francisco, CA 94104
(415) 391-6204

I Help Make the Beach See Worthy/
Annual Beach Clean-up
California Coastal Commission
45 Fremont Street, Suite 2000
San Francisco, CA 94105-2219
(415) 904-5206

If You Take It Out, Matey. Bring It Back
Center for Marine Conservation
580 Market Street, Suite 550
San Francisco, CA 94104
(415) 391-6204

Oceans in Peril
National Audubon Society
National Education Office
Route 1, Box 171
Sharon, CT 06069
(203) 364-0048

BEACH EXPLORERS: Unit 1 Resources

Many marine sanctuaries and estuarine reserves provide educational posters for teachers. Contact any of the following for more information. These estuaries and marine sanctuaries can also be a great source for local information.

National Estuary Program Contacts

For general information on the National Estuary Program and profiles of all 28 estuaries, visit the EPA's NEP Home page:
www.epa.gov/OWOW/estuaries/nep.htm

West Coast:

Puget Sound, WA
Puget Sound Water Quality Authority
(206) 407-7300
web site: www.wa.gov/puget_sound/index.html

Lower Columbia River Estuary, OR
Lower Columbia River Estuary Program
(503) 229-5247
web site: www.lcrep.org

Tillamook Bay, OR
Tillamook Bay National Estuary Program
(503) 322-2222
website: www.orst.edu/dept/tbaynep/nephome.html

San Francisco Estuary, CA
San Francisco Estuary Project
(510) 662-2465
web site: www.abag.ca.gov/bayarea/sfep.html

Morro Bay, CA
Morro Bay National Estuary Program
(805) 528-8126
web site: www.mbnep.org

Santa Monica Bay, CA
Santa Monica Bay Restoration Project
(213) 266-7515
web site: www.smbay.org

Gulf of Mexico:

Corpus Christi Bay, TX
Corpus Christi Bay National Estuary Program
(512) 985-6767
web site: www.sci.tamucc.edu/ccbnep

Galveston Bay, TX
Galveston Bay National Estuary Program
(713) 332-9937
web site: gbep.tamug.tamu.edu

Barataria-Terrebonne Estuarine Complex, LA
Barataria-Terrebonne National Estuary Program
(504) 447-0868 or (800) 259-0869
web site: www.btnep.org

Mobile Bay, AL
Mobile Bay National Estuary Program
(334) 990-3565
no web site

Tampa Bay, FLA
Tampa Bay Estuary Program
(727) 893-2765
web site: www.tbep.org

Sarasota Bay, FL
Sarasota Bay National Estuary Program
(941) 359-5841
web site: pelican.gmpo.gov/gulfofmex/estuarypartner/sarasota/sarasotabay.html

Charlotte Harbor, FL
Charlotte Harbor National Estuary Program
(941) 995-1777
web site: www.charlotteharbornep.com

South Atlantic:

Indian River Lagoon, FL
Indian River Lagoon National Estuary Program
(407) 984-4950
web site: www.epa.gov/OWOW/oceans/lagoon

BEACH EXPLORERS: Unit 1 Resources

South Atlantic continued:

Indian River Lagoon, FL
Indian River Lagoon National Estuary Program
(407) 984-4950
web site: www.epa.gov/OWOW/oceans/lagoon

San Juan Bay, PR
PR Environmental Quality Board
(809) 751-5548
Puerto Rico Department of Natural Resources
and Environment
(809) 724-5516
no web site

Albemarle-Pamlico Sounds, NC
Albemarle-Pamlico Estuarine Study
NC Department of Environment, Health and
Natural Resources
(919) 733-5083 ext. 585 (general info)
(252) 946-6481 (education)
web site: h2o.enr.state.nc.us/nep/default.htm

Maryland Coastal Bays, MD
Maryland Coastal Bays Program
(410) 213-2297
web site: www.dnr.state.md.us/mcbp

Delaware Inland Bays, DE
Delaware Inland Bays Estuary Program
Delaware Department of Natural Resources and
Environmental Control
(302) 645-7325
web site: www.udel.edu/CIB

Delaware Estuary, DE, PA, and NJ
Delaware Estuary Program
U.S. EPA, Philadelphia PA
(215) 597-9977
web site: www.delep.org

Northeast:

Barnegat Bay, NJ
Barnegat Bay Estuary Program
(732) 506-5313
web site: www.bbep.org

New York-New Jersey Harbor Estuary Program,
NY and NJ US EPA Region 11
(212) 264-5170
Hudson River Foundation
(212) 924-8290
web site: www.hudsonriver.org/nep

Peconic Bay, NY
Peconic Estuary Program
Suffolk County Department of Health Services,
Office of Ecology
(516) 852-2077
web site: www.co.suffolk.ny.us/health/pep

Long Island Sound, NY and CT
Long Island Sound Office
(203) 977-1541
web site: www.epa.gov/region01/eco/lis

Narragansett Bay, RI
Narragansett Bay Project
Rhode Island Department of Environmental
Management
(401) 277-3165
web site: home.earthlink.net/narrabay

Buzzards Bay, MA
Buzzards Bay Project
(508) 748-3600
web site: www.buzzardsbay.org

Massachusetts Bays, MA
Massachusetts Bays Program
(800) 447-BAYS
web site: www.epa.gov/region10/eco/massbay

New Hampshire Estuaries, NH
New Hampshire Estuaries Program
(603) 433-7187
no web site

Casco Bay, ME
Casco Bay Estuary Project
(207) 828-1043
no web site

BEACH EXPLORERS: Unit 1 Resources

National Marine Sanctuaries

For general information on the National Marine Sanctuary Program and profiles of the sanctuaries, visit the NOAA's NMS Home page:
www.sanctuaries.noaa.gov

Channel Islands National Marine Sanctuary
113 Harbor Way
Santa Barbara, CA 93109
(805) 966-7107 fax(805) 568-1582
web site: www.rain.org/~cinms/

Cordell Bank National Marine Sanctuary
Fort Mason, Building 201
San Francisco, CA 94123
(415) 561-6622 fax(415) 561-6616
web site:
www.ocrm.nos.noaa.gov/nmsp/nmscordellbank.html

Fagatele Bay National Marine Sanctuary
P.O. Box 4318
Pago Pago, American Samoa 96799
(684) 633-5155 fax(684) 633-7355
web site: www.fbms.nos.noaa.gov/

Florida Keys National Marine Sanctuary
9499 Overseas Highway
Marathon, FL 33050
800-942-5397
(305) 872-2215 fax(305) 872-3786
web site: www.keyswreckdive.com/

*Key Largo National Marine Sanctuary
P.O. Box 1083
Key Largo, FL 33037
(305) 451-1644 fax(305) 451-3193

*Looe Key National Marine Sanctuary
Rt. 1, Box 782
Big Pine Key, FL 33043
(305) 872-4039 fax(305) 872-3860

*Part of Florida Keys National Marine Sanctuary

Flower Garden Banks National Marine Sanctuary
216 West 26th Street, Suite 104
Bryant, TX 77803
(409) 779-2705 fax (409) 779-2334
web site: www.flowergarden.nos.noaa.gov/

Gray's Reef National Marine Sanctuary
10 Ocean Science Circle
Savannah, GA 31411
(912) 598-2345 fax (912) 598-2367
web site: www.graysreef.nos.noaa.gov/

Gulf of the Farallones National Marine Sanctuary
Fort Mason, Building 201
San Francisco, CA 94123
(415) 556-3509 fax (415) 556-1419
web site: www.gfnms.nos.noaa.gov/

Hawaiian Islands Humpback Whale National Marine Sanctuary
726 South Kihei Road
Kihei, HI 96753
(808) 879-2818 fax (808) 874-3815
website:
www.ocrm.nos.noaa.gov/nmsp/nmshawaiiislands.html

Monterey Bay National Marine Sanctuary
299 Foam Street, Suite D
Monterey, CA 93940
(408) 647-4201 fax(408) 647-4250
web site: www.mbnms.nos.noaa.gov/

Olympic Coast National Marine Sanctuary
138 West First Street
Port Angeles, WA 98362
(360) 457-6622 fax (360) 457-8496
web site:
www.ocrm.nos.noaa.gov/nmsp/nmsolympicoast.html

Stellwagen Bank National Marine Sanctuary
14 Union Street
Plymouth, MA 02360
(617) 982-8942

BEACH EXPLORERS: Unit 1 Resources

National Marine Sanctuaries *continued*

Monitor National Marine Sanctuary
The Mariners Museum
100 Museum Drive
Newport News, VA 23606
(804) 599-3122
web site: monitor.nos.noaa.gov/welcome.html

Proposed Sanctuaries:
Sanctuaries and Reserves Division
National Oceanic and Atmospheric Administration
1305 East-West Highway
SSMC4, 12th Floor
Silver Springs, MD 20910
(301) 713-3125

Curriculum Resources

Adopt-A-Beach School Education Program
Curriculum
California Coastal Commission
45 Fremont Street, Suite 2000
San Francisco, CA 94105-2219
(415) 904-5206
web site:
www.ceres.ca.gov/coastalcom/publicized/aab/educate.html

Año Nuevo Education Packet
Año Nuevo Interpretive Association
95 Kelly Avenue
Half Moon Bay, CA 94019
(415) 879-2025

A Child's Place in the Environment
Konocti Unified School District
Lake County Office of Education
1152 South Main Street
Lakeport, CA 95453
(707) 263-7249

Bayshore Studies Program (Locally-based curriculum and programs)
Richardson Bay Audubon and Sanctuary
376 Greenwood Beach Road
Tiburon, CA 94920
(415) 388-2524

Critters: K-6 Life Science Activities
Education Foundation
PO. Box 8120 Fresno, CA 93747
(209) 255-4094

Earth Island Institute
Earth Island Institute
300 Broadway, Suite 28
San Francisco, CA 94133-3312
(415) 788-3666

MARE Curriculum Guides and Teachers' Guide to
Marine Science Field Trips
Marine Activities, Resources & Education (MARE)
Lawrence Hall of Science
University of California
Berkeley, CA 94720-5200
(510) 642-5008

Marine Science Project: FOR SEA Grade Two
Marine Science Center
17771 Fjord Drive N.E.
Poulsbo, WA 98370
(206) 779-5549

Marine Debris Teachers and Educators Packet
Marine Debris and Entanglement Slide Show
Trashing the Ocean Video and Curriculum
Center for Marine Conservation
580 Market Street, Suite 550
San Francisco, CA 94104
(415) 391-6204
web site: cmc-ocean.org/mdio/teacher.php3

Plastic Eliminators: Protecting California
Shorelines
CASEC University of California
Santa Barbara, CA 93106
(805) 893-2739

Project MER, Elementary Curriculum
Learning Resource Services-Publication Sales
Office of the Alameda County
Superintendent of Schools
313 W Winton Avenue
Hayward, CA 94544
(510) 887-0152

BEACH EXPLORERS: Unit 1 Resources

Curriculum Resources *continued*

Zoobooks Exploring Ocean Ecosystems
Wildlife Education
9820 Willow Creek Road, Suite 300
San Diego, CA 92131
(800) 477-5034

Other

Wavelets

These are handouts on different ocean topics. Each one contains background information on the topic, and a game, puzzle, or activity. Single copies are free. For a list of these and other marine education publications, write to:

Sea Grant Communications
Virginia Institute of Marine Science
Gloucester Point, VA 23062
(804) 642-7000
web site: www.vims.edu/adv/ed/

The Monterey Bay Aquarium
has printed educational materials, slide sets, and a video. For more information, write to:
Monterey Bay Aquarium
Education Department
886 Cannery Row
Monterey, CA 93940
(408) 648-4941
web site: www.mbayaq.org/

Aquatic Project WILD

has materials covering topics which cover both fresh and salt water environments in broad categories such as diversity and ecological principles. These can be obtained only through your state fish and wildlife or fish and game agency.

Cool Web Sites

American Oceans Campaign home page
www.americoceans.org/

The Bridge
Online resources for marine science education
www.vims.edu/bridge/

Center for Marine Conservation home page
cmc-oceans.org/

Education Index
A guide to education-related sites on the web
www.educationindex.com/

EPA's BeachWatch homepage
Contains links to EPA beach reports and references, Beach Program overview, meetings and events, and links to other beach related sites
www.epa.gov/ost/beaches/

La Jolla Surfing
Ocean and beach news, photos,
Weather, reviews, etc.
facs.scripps.edu/surf/surfing.shtml

National Ocean Service
Inventory of NOS educational materials including CD roms, lesson plans, literature, posters, videos and more.
www.nos.noaa.gov/education/education_products.html

NOAA Central Library
Photo collection, historical maps and charts,
online journals, and links to other NOAA sites
www.lib.noaa.gov

Smithsonian Institution's Ocean Planet
A travelling exhibition
Seawifs.gsfc.nasa.gov/ocean_planet.html

Surfrider's Education web page
Info on beach and ocean topics,
Plus "Top 40" links
www.surfrider.org/educational/html.

ABOUT THIS PUBLICATION

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Design by MOZDZEN, Laguna Beach, California

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